Mónika Besenyei

Comparative Analysis of University Sustainability Initiatives

Department: Department: Institute of Economic Geography, Geo-economics and Sustainable Development / Department of Marketing

Supervisors: Prof. Dr. Sándor Kerekes, DSc.

Prof. Dr. Ágnes Zsóka

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Comparative Analysis of University Sustainability Initiatives

Doctoral Thesis

Prepared by: Mónika Besenyei

Supervisors: Prof. Dr. Sándor Kerekes and
Prof. Dr. Ágnes Zsóka

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Acknowledgement

Curiosity and the fact that I did not know how hard granite I will bite played the main role in my taking up doctoral studies. The KÖVET Society was an inspiring environment for me to set to obtain a PhD degree at the Corvinus University next to my little son and work, not calculating upon the quantity of the tasks awaiting me.

Since then, I often recalled the beginning and the advice of Professor Gergely Tóth (who was a PhD at that time), namely, that the most important thing is to choose a "master". I thank him for the take-off and the lots of useful advice and the conversation, without which I would surely not be here now.

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1 Introduction

> "Till now man has been up against Nature; from now on he will be up against his own nature."
>
> *Dénes Gábor* (Gábor, 1964, p. 154.)

In selecting my research topic, I wanted to contribute to the scientific study of sustainability with my results. Within this broad topic, the appearance of awareness-raising and sustainable development in education are the most interesting to me. In addition to the personal ties, I was also driven in the choice of the subject by that studying this area still has plenty of reserves in Hungary. I examine the relationship between sustainability and education in the context of higher education. I trust that my research will not only contribute to the wealth of scientific evidence but that my results will also support the transition to sustainable development.

1.1 Justification of the topic and key research questions

The positive collective effects (benefits) of education are extremely diverse. Knowledgebase (and culture, traditions, relations and organisational knowledge), which, together with the competencies can be the key to the success of a particular community (region, country), is not just an abstract concept but a significant economic factor.

Income is highly correlated with educational achievement (OECD, Education at a Glance, 2018). More educated people pay more taxes and contributions and receive fewer social benefits than the less educated. (Ma, et al., 2016) In addition, there is less risk of becoming unemployed among those with higher educational qualification. (Bonin, 2017)

Higher education is also one of the economic sectors that can be named as a winner of the fourth industrial revolution. Researching the different aspects of higher education is experiencing a golden age. The situation and perception of higher education institutions are favourable at the social level and the responsibility of the universities is also significant due to the appreciation of knowledge. The institutions are operating with different educational offers and ambitions in countries with different social, economic and cultural backgrounds, yet they must become more competitive in the fight for the best students and teachers due to globalisation. Despite the many differences, there are

common traits that characterize all higher education institutions and there are initiatives with identical objectives although their implementation may differ. Sustainability is a process of transformation, which is a challenge for all higher education institutions regardless of academic profile, culture or economic conditions.

In the process of becoming an intellectual (educated leader), higher education is usually the last stop before entering the labour market. This is the environment where the knowledge acquired so far is synthesized and put into context. With luck, the previously acquired knowledge elements are put in their place while the approach of the institution concerned exercises a decisive influence on the student's approach and, often, his subsequent career as well. (Gorman, et al., 1997)

One of the biggest tasks of the 21st century is to manage the challenges related to sustainable development. "We have only one globe with which to experiment." (Ostrom, et al., 1999, p. 282.) In addition to scientific research, the education system plays an important role in raising awareness among the young generation by integrating the knowledge required to sustainability and developing responsible thinking into the curriculum. (Csáfor, 2008) Even if we do not want to be too strict, we still have to say that the responsibility of the leaders, the intellectuals and higher education is also important. Transferring the knowledge on sustainability and education for sustainability are the duty of not only the universities, but it is inconceivable that higher education does not play its part. (Khalili, et al., 2015), (Sedlacek, 2013)

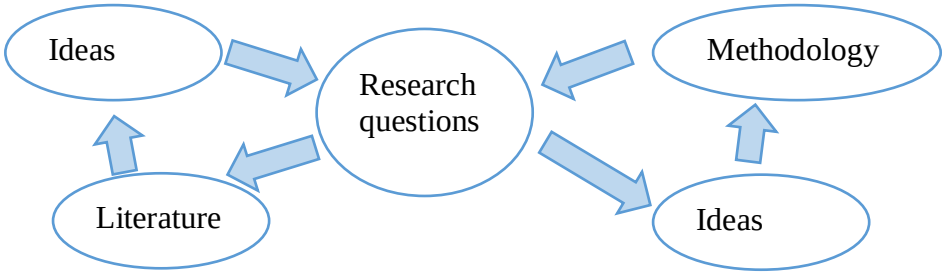
1.2 Main phases of the research

The development of the research questions in my thesis can be described by applying the two-cycle system in Figure 1 (O'Leary, 2004). The research questions go through two filters that affected the final research question relatively independently of each other. The basic idea, that is, studying the relationship between sustainable development and higher education, occurred as a result of the literature examined based on my interest. The third factor, namely, the placement of managerial competencies in this context, occurred while studying the literature.

During the other cycle, my duty was to select the methodologies fitting the research questions. As shown in the Figure, it relates back to the basic idea and modified and refined it. Finally, the final hypotheses were formulated through the two-cycle development, taking into account the scientific tests (conferences, feedback on articles),

the recommendations of my consultants and the comments made during the workshop dispute.

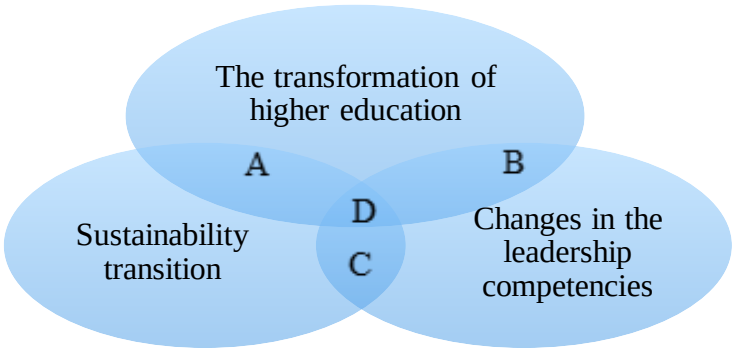
Figure 1: Development cycles of the research question



Source: Edited by the author based on (O'Leary, 2004).

My research required the examination of three large areas (Figure 2). In processing the literature, I examined the connection of the sources, found in the different areas, to the topic of the thesis.

Figure 2: Areas of research on which the dissertation is based



Source: Edited by the author.

Earlier research has mostly examined the interrelation of two of the above areas (see the areas A, B and C). Thus, the framework was provided by these empirical data. On the other hand, a major added value of my thesis is the fact that I examined the correlation of three areas, that is, sustainability transition, the transformation of higher education and changes in the leadership competencies, simultaneously (D). The fulfilment of a part of the hypotheses formulated for the research question was examined in the course of empirical research, while the questions 7 and 8 were answered based on the literature (see Table 4).

The correlation of the topics outlined above and the applicable methodologies are presented in a separate methodological section.

1.3 Structure of the thesis

Given that the subject of my thesis is the examination of the correlations of the transformation of higher education, sustainable development and leadership competencies, I will present their background and evolution, as well as their impact on economic and social development in the theoretical chapters, first individually and then taking into account their effects on each other.

From those above, education and the economic and social implications thereof are one of the longest-studied areas. It is followed by the study of managerial skills, which is already linked to the economic development triggered by the industrial revolution. The transition to sustainability is closely linked to the environmental crises caused by the first industrial revolution and the reflection to try to solve the problems generated.

The double sections of the above dimensions mean that I studied the correlations of the sustainability transition and higher education and their effects on one another. The development of the sustainability transition and the transformation of leadership competencies are also interrelated. The new technologies and the changes in the socio-economic environment transform the success criteria in terms of competencies.

Higher education and the development of leadership competencies are also closely related. Although it is not a requirement in the business sector for a manager to have higher qualification, the statistics show that at least 90% of the top managers have higher qualification and holding a diploma has become a requirement in the case of a third of the professions where secondary education was sufficient earlier. (Rosenkoetter, et al., 2018)

It is important to note that managerial competencies do not strictly mean that I focus only on managers in my dissertation. This paper examines primarily the possibilities for successful career development by those holding a higher qualification in the context of the fourth industrial revolution as an external factor. Using the term “leader” refers to the possibility that managerial (leadership) positions are typically filled by ambitious people with a higher education qualification, who can exercise a greater influence on the development of the future thereby.

In examining the triple correlation, I will study if higher education, transforming as a result of the sustainability transition, is able to respond adequately to the development of the competencies required for leaders. Considering that one of the primary forms of the economic contribution of higher education is the provision of highly skilled human

resources, a key issue is the relationship of the skills instructed with the competencies that are necessary for the suitable management of current or upcoming challenges.

Related to this is the question whether the main stakeholders (higher education leaders, teachers and students) know what to expect from education and whether they need the changes and the related variations in the organisation, operation and the curriculum.

Then, I present the hypotheses and the methodological framework designed to carry out empirical research on the three areas.

1.4 Research questions and research planning

What are the main characteristics of the sustainability transformation of higher education institutions? What is the reason that some universities have begun to integrate the topic 15-20 years ago, while others have not even got to the point of developing a tailored strategy? Environmental management systems developed for manufacturing companies have been available for more than 25 years to support the integration of environmental considerations into decision-making (EMAS: 1993, ISO 14001: 1996). Of course, this also means that the environmental consciousness of companies looks back on a longer history, as the spread of the EMS systems shows that the regulators have adapted to the market demands.

I was interested in why the higher education institutions, one of the missions of which is to be pioneers, follow the changes in the world with such a significant delay. At the same time, it is not possible to state, either, that the knowledge related to sustainability is not required in almost all jobs and, most of all, at the managerial levels. Seemingly, the stakeholders' needs are in place and the information is available (research is functioning), yet there is no institution-level transformation as, for example, in the case when the aspects of economic efficiency are taken into account. Economic aspects are part of the management decisions, while sustainability considerations are rarely included.

In the case of universities, institution-level integration should cover all essential functional areas of operation and stakeholders. Universities differ from other organisations in that they provide the infrastructure and intellectual support necessary for the operation of higher education studies organised within the framework defined by the

law[1]. The performance of the core business of the universities is supported by the institutional background (technical, administrative and educational support staff) and the involvement of external partners. The universities should work closely together with their stakeholders, as the universities offer a "service" and, less often, products. This means that there is no intermediary "market" but the customers are contacted directly with the institutions. If we define 'consumer' as a person who pays for the service (product), it is clear that the students (families of the students) should be regarded as the consumer. But, after all, the end-users are the employers. Students "purchase" knowledge as an investment in the hope that it will pay them back many times after they get employed. This is important because knowledge and the university as a "brand" are equally important in terms of the investment over and above building a network of contacts. (Pearman, 1990)

To analyse the functioning of the universities and, thus, the transformation of sustainability, it is essential to come to know both the operation and the main stakeholders. The operating, human and infrastructural characteristics should be studied from the perspective of the catalyst of the changes and in terms of the features of the implementation process. In this paper, I am going to address infrastructure only tangentially, as I am not examining the actual realisation but only certain typical patterns thereof.

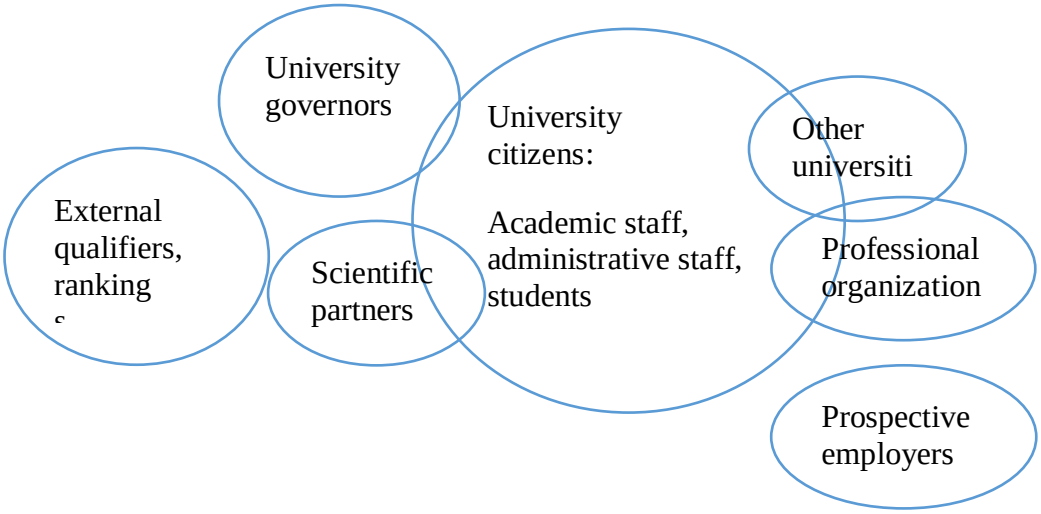
The main stakeholders of the universities are the following:

- University leaders and bodies;
- Teaching and research staff and bodies;
- Students associations (special colleges, student unions, etc.).
- Administrative and support staff and organisations;
- Corporate partners and associations;
- Scientific partners and associations;
- Administrative and steering organisations.

(Córcoles, Peñalver, & Ponce, 2011)

[1] In Hungary, the legal framework is provided by Act CCIV of 2011 on National Higher Education.

Figure 3 Academic stakeholders relevant to the thesis

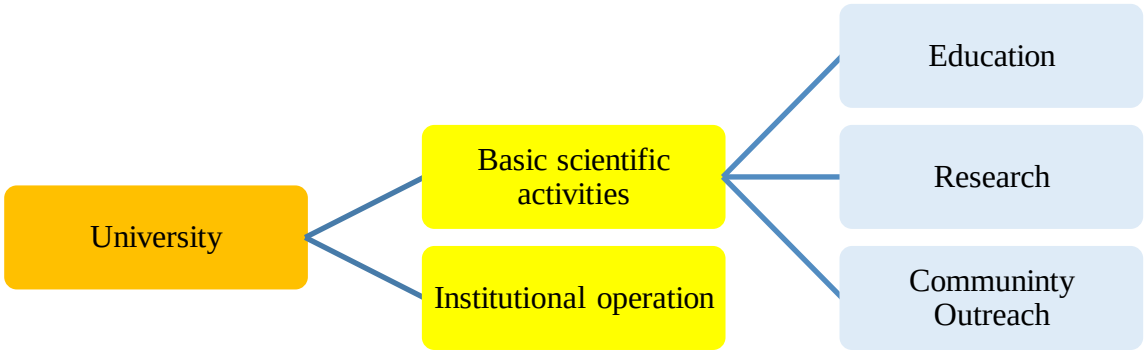


Source: Edited by the author.

The areas of operation can be divided into core activities (scientific activities and roles in society) and institutional operation to support the core activities (provision and maintenance of infrastructure, administrative tasks, etc.).

The knowledge and the overview of the operational areas and stakeholder involvement play an important role both in the sustainability transition and the present study.

Figure 4 Operating areas of universities



Source: Edited by the author.

When we speak of the institution-level integration of a process, it is worth examining its appearance in all operating areas, as well as if the widest scope of stakeholders is involved in the process.

Taking the needs of the stakeholders into account is a key indicator of socially responsible operation. “Social responsibility is when a group of people (separated by their specific situation in the society) consciously takes the consequences of their decisions and actions.

However, this requires factual and continuous information exchange, as the consequences will not only be individual but also collective." (Barát, 2012, p. 48.) Having regard to the social aspects is one of the pillars of sustainable development in addition to economic sustainability and environmental considerations.

The integration of sustainability at the institutional level means that all the following conditions are met or there is a clear ambition to realize them.

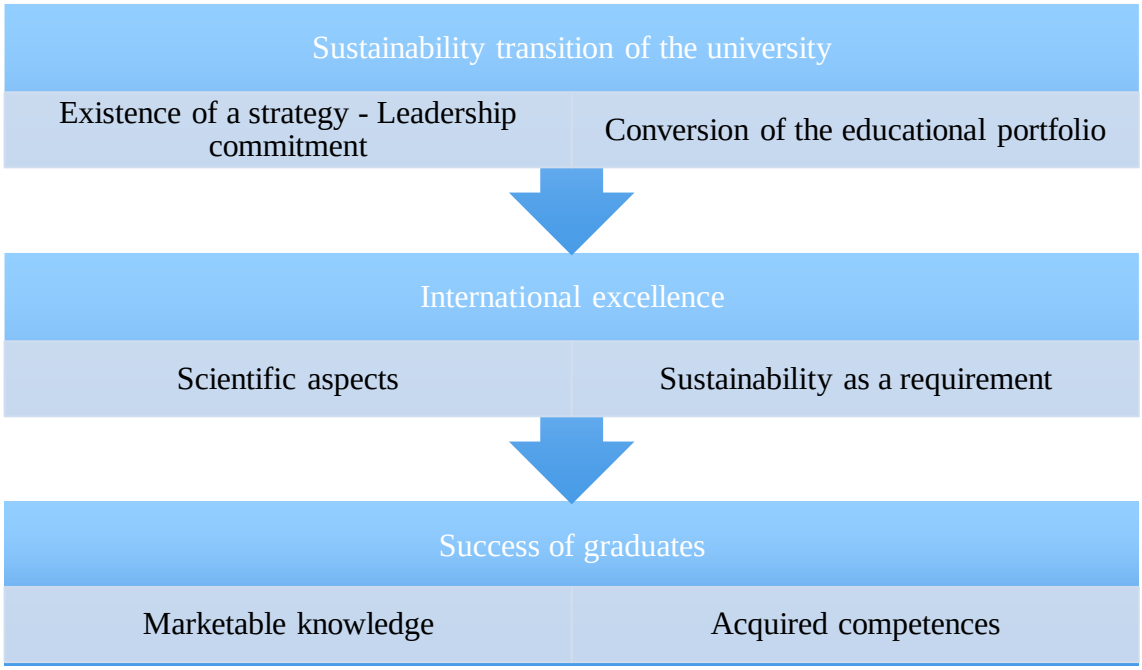
- Sustainability strategy – discussed and agreed;
- Regard for the (external and internal) stakeholders' aspects – an existing procedure;
- The topic of sustainability is part of the training portfolio:
    - It is optional or mandatory as a separate course in all degrees;
    - It appears in the knowledge content of the relevant courses (horizontal);
    - All graduating students have a general understanding of sustainability and sustainability knowledge relevant to their profession;
- Research in the topic of sustainability in a number of relevant areas (not isolated);
- Sustainability is part of the university's operational aspects;
    - It is a criterion in the leaders' decision-making (procurement, investment, operation);
    - It is part of the everyday practice during the implementation (e.g. optimizing energy, water and raw material consumption, waste minimisation, selective waste collection);
    - Awareness-raising and internal training;
- Communication:
    - Tracking of results;
    - Sustainability report.

I further narrowed the focus of the research in the course thereof. In addition to the above, I examined areas that can be measured and the existence and operation of which can be considered as indicators when examining the sustainability integration. In the final version of the research and when processing the results, I focused on the examination of the areas below, taking into account the opinions of the opponents and the comments made during the workshop discussion:

- Relationship between the existence of a sustainability strategy commitment and leadership commitment,
- Stakeholder demands and the appearance of sustainability in the training portfolio,
- Academic excellence and sustainability.-

In addition, I also examined what benefits a graduate student (and, thus, the university indirectly) can make from that his *alma mater* has integrated sustainability at the institutional level. What can be the added value of such a transformation?

Figure 5 Development of the research questions and hypotheses



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Based on the research questions outlined, the following hypotheses are examined in this thesis:

1. The existence of a university sustainability strategy reflects the commitment of the leadership.
2. An essential component of the institutional level integration of sustainability is the conscious integration of the topic of sustainability into education.
3. The sustainability of higher education institutions has become an element of excellence by now.
4. A legacy of the institutional integration of sustainability is the marketability of the skills that can be acquired.

1.5 Formulation of the hypotheses and method of analysis

Hypothesis 1: The existence of a university sustainability strategy reflects the commitment of the leadership.

In this paper, leadership commitment is understood in a way that:

1. The leaders understand the importance of the subject,
2. They are aware of the need for their proactive role to make the implementation successful and, as a result,
3. Visible changes take place in the institution concerned.

The first sign of the sustainability transformation is that an adopted strategy is in place, but it is an important condition that the process does not stop at this stage.

To justify the hypothesis, the first task was to select an institution that already has a sustainability strategy. Then, I examined if the leaders understand the importance of the topic of sustainability from the perspective of themselves and the university. I also examined if they were prepared to take on a proactive role in the implementation.

The institution I chose is the National University of Public Service, which has a sustainability strategy (since 2013). And I used the Q methodology for surveying the leadership attitude.

Individual and organisational (environmental) awareness can be identified through five dimensions:

- Environmental knowledge,
- Environmental values,
- Environmental attitudes,
- Willingness to act,
- Real action." (Zsóka, 2005)

In the present study, I examine the "sustainability" aspects in the broader sense rather than the "environmental" considerations. I defined leadership commitment on the basis of the (environmental) awareness manifestations. Thus, I simplified the five dimensions to three in the present study.

Using the Q method, I tested if the leaders of the National University of Public Service are committed to the existing sustainability strategy and this is reflected in real changes.

In addition to the existence of the strategies, I examined the fulfilment of the trio of knowledge, attitude and action. I considered the manifestations of leadership commitment justified if all three conditions below were fulfilled:

- Understanding the importance of the subject (knowledge and values),
- "Adoption" of leadership role (attitude and willingness to act),
- Existence of changes for sustainability (real action).

Hypothesis 2: An essential component of the institutional level integration of sustainability is the conscious integration of the topic of sustainability into education.

In order to examine conscious integration into education, I understand the concept as follows:

Conscious integration into education means that the sustainability knowledge is integrated into all the specialized knowledge contents: it is a separate course, on the one hand, and appears in the content of the courses with a relevant subject, on the other hand. It also means the existence of methodological and content elements. The most important (output) indicator (target to be achieved) is that there should be no graduate student who does not know the general aspects of sustainability and the aspects of sustainability relevant to his profession.

Integration into education can be complemented by thematic programmes and student initiatives addressing the subject (e.g. special college courses) as well.

To verify the hypothesis, I examine the content elements of the university sustainability statements and the university (campus) sustainability schemes [2] (UI GreenMetric, AASHE STARS) on the basis of the expectations concerning education. I examined the areas in respect of which they included requirements regarding education. I studied the expectations formulated by the internal stakeholders on the basis of a questionnaire survey conducted at the chosen university (based on the NUPS questionnaire). I tried to find an answer to how the responders felt about the appearance of the sustainability transformation and sustainability topics in the courses. In addition, I examined the results of the international survey as to

[2] They are regarded as external stakeholders.

- Whether the universities are dealing with the topic of training during the sustainability transition,
- Whether the universities consider the topic of education important,
- What measures the universities have taken to launch the transition and how the appearance of the subject in training ranks among these.

Hypothesis 3: The sustainability of higher education institutions has become an element of excellence by today.

The reasons triggering the sustainability transition may include the conviction that a pioneering university should address certain global topics in the 21st century if the goal is to train the intellectuals of the future. I was looking for the answer to the question whether the universities understand their responsibility in the implementation of sustainable development and, therefore, excellence is associated with that institutions that give priority to the subject, regardless of the academic research profile.

To test the hypothesis, I examined the universities that are the "best" independent of the sustainability considerations. The subject of the study is the analysis of the most excellent institutions (top 10 in the overall rankings) of the 2015-2019 QS, Times and ARWU rankings (the best-known international university rankings). I am looking for an answer to the following questions:

1. Do the institutions have a sustainability (corporate social responsibility) strategy?
2. Are there any written traces of the implementation of the strategy (reports, data)?
3. Are there sustainability programmes in the institutions?
4. Is sustainability research operated in the institutions?
5. Does sustainability appear in education (degrees, programmes, courses)?
6. Are there efforts to involve the stakeholders? - internal and external communication (Internet, social media).

I also carried out an examination of the content elements of the higher education rating systems, where I was looking for expectations regarding the sustainability theme. I also examined when those expectations were included into the rating system, that is, if the fact that they are striving to meet the qualifications could be the reason for the sustainability transition of the leading institutions.

I assume that, in the case of the pioneering institutions, the integration of sustainability took place regardless of the expectations due to awareness and commitment to the topic.

This was triggered and initiated by the stakeholders' expectations, as excellence is independent of sustainability transition, but the excellent ones felt the subject voluntarily as their own.

Hypothesis 4: An important legacy of the integration of sustainability: the marketability of the skills that can be acquired.

One of the priority tasks of the universities is to prepare the students for entering the market. Universities, in respect of which employability does not improve significantly and the expected income does not increase after graduation, constitute an investment that attracts only a narrow niche (e.g. commitment to the subject, majors in art). The universities, as market players, can produce added value to the society through the development of the knowledge and, increasingly, the skills of human capital. It is important, both at the individual and social levels, that such added value should be as great as possible and that the invested resources are repaid in the short term.

The 21st century and the digital revolution bring new challenges that can be mainly answered by university education. The labour market, which is changing due to the fourth industrial revolution, and robotization mean that different competencies are needed for success in the future.

In order to verify the hypothesis, I compared the competencies that are required for those choosing an intellectual profession in the digital age (potential leaders) to become successful with the competencies that must be improved for the implementation of sustainable development. To this end, I reviewed the currently available literature and conducted secondary research on the subject. I compared the competencies that can be found in the relevant articles.

2 Foundation of the subject with literature

In the next Section, I review the relevant literature on the basis of Figure Figure 2. I present the development and the main findings of each sub-area and, where relevant, the section of the areas to be able to place the triple section in the proper context. Studying the three areas, that is, the sustainability transition, the transformation of education and the change of the competencies required for success, has become increasingly popular in recent decades. As a result, I had abundant resources at my disposal to substantiate my thesis.

2.1 Sustainability transition

The analysis of sustainable development and sustainability transition is a relatively young science and research subject. Nevertheless, recognizing the importance of the theme, a number of universities and research centres are dealing with the topic of sustainability transition (STRN, 2019). The issue of sustainability (unsustainability) itself became widespread in the world only in the mid-20th century when the effects damaging the environment due to the socio-economic development have become more apparent. Given that the initial period was more a period of recovery and identifying the problems (Takala, 1991), we can speak of sustainability transition only if a long-term, multidimensional and fundamental transformation of the socio-technical systems is taking place. (Markard, et al., 2012) This also means that 'transition' is understood as programmes and/or planning implemented at the national level and in international cooperation. So, this does not mean a passive happening or positive changes occurring as a result of certain measures, but that the process is implemented in a coordinated way through the conscious cooperation of several areas (society, technology) in a planned manner, with both target and the direction being well defined. (Avelino, et al., 2016)

Setting out of the classical triple[3] optimisation pillars of sustainable development, that is, environment-society (individual)-economy[4], I use the definition as the basis, which

[3] Triple optimization (Triple bottom line: TBL, People, Planet, Profit), definition by John Elkington, founder of Sustain Ability. (Elkington, 1998)

[4] Additional definitions and explanations: Sustainable development is development that ensures the satisfaction of the needs of the present without compromising the satisfaction of the needs of future generations. (Kerekes, 1998)

Sustainable development also means a relationship system (culture) between people and their environment, which does not harm the chances of the existence of future generations. To do so, our resources must be

focuses on the harmony of social well-being and natural resources, namely: “sustainable development means improving the quality of human life while staying within the limits of the carrying capacity of supporting ecosystems.” (Economics of Natural Resources). (Kerekes, 1998)

‘Sustainable development’ is a term that everyone likes but no one is sure what it exactly means. (Daly, 1997, p. 1.) The definition and content of the sustainable development as a concept is a topic that is put on the agenda again and again (Lélé, 1991)(Costanza & Patten, 1995), (Kates, et al., 2005), (Holden, et al., 2016). In order to be able to determine what is not sustainable, it is important to clarify, from the perspective of scalability, what is meant by sustainable development, so the direction of the changes can be tracked. A more accurate definition can be given once the sub-area, the sustainability of which we wish to study, has been precisely circumscribed. In this context, environmental sustainability is a condition of that “as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity.” (Morelli, 2011, p. 6.)

So, starting from the general wording, it is always better to study the factors relevant in terms of the actual area. In this paper, I examine sustainability in the relationship between education and competencies. A basis for the first topic (education) is offered by the UN Sustainable Development Goals, while I will explore the relationship of the competencies based on the research. The complexity of the sustainability transition is characterized by that 16 non-independent research sub-topics of the four major sub-areas (Transition management, Strategic gap management, Multi-level perspective and Technology and innovation systems) of the domains addressing this research subject have been identified. (Markard, et al., 2012, p. 957.)

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managed in an environmentally sustainable manner, that is, they should be used to the extent they renew. reference

2.1.1 Relationship of sustainability and well-being

Well-being[5], as a condition of social sustainability, depends on a number of measurable factors, in addition to a number of others that are difficult to quantify. Such measurable factors include the material standard of living (income, consumption and welfare), ***health,*** education, individual activities (***including work***), political representation and governance, social and personal relations, environment (present and future conditions), and ***economic*** and physical ***uncertainty*** (Ross & Wu, 1996).

Certain typical patterns can be observed in the relationship between well-being, economy and sustainability. In the developing (poorer) societies, economic growth can provide financial benefits that meet urgent needs through the appropriate institutions (production and distribution). In the developed (rich) countries, however, it is found that economic growth also leads to complex social and environmental costs. This may explain the fact that the satisfaction surveys showed stagnation despite that, after the Second World War, production, personal income and consumption have increased greatly. The article by Easterlin also shows that the differences between the countries can be significant in terms of the percentage of happy people and the per capita GNP. It also follows that, although there is a correlation between income and satisfaction (feeling of well-being), the relationship is not linear and is rather stagnant above a certain income level. (Easterlin, 1974)

This is confirmed by the study of Doh C. Shin, who concluded that because well-being is a multidimensional concept, the well-being profile also changes due to development. Comparison of the 1963 and 1974 welfare profiles showed that the "biogenic" dimension became 60% more significant in the past 11 years, while the importance of interpersonal well-being and personal growth fell by 20% over the same period. Thus, economic growth leads to growth in some respects and a decline in other aspects. (Esterlin, 1980)

[5]Welfare mainly takes into account the financial/economic considerations, while well-being also examines a number of subjective aspects beyond the financial means. The researchers on sustainable development tend to prefer well-being, as the financial situation often does not correlate to satisfaction or even the health status. Cultural differences can be better avoided if well-being is analysed and compared. WELFARE: noun (ornate). Favourable financial situation in which we live without problems or financial difficulties and in which we can individually say that we are in clover. WELL-BEING: noun (rare). Condition expressed with the term “to be all right”; the fact that someone is healthy and has a good general condition (Bárczy, et al., 2016).

2.1.2 Sustainability transition. A multilevel approach

In drafting the research questions and the hypotheses, starting from the large-scale changes, I first narrowed and then broadened again the scope of the investigation. This approach means that I arrived at the focus of the research starting from a more general point of view and then narrowing the topic, after which I placed the results achieved in a wider context by examining the experiences from a different perspective. I started from the fact that the sustainability transition of the higher education sector, including the higher education institutions, is a narrower interpretation of the sustainability transition. This change affects the students (knowledge, attitudes, competencies), which can, in return, react to the whole social transition thanks to the employment of the graduates.

The method of the Multi-Level Perspective (MLP) (Geels, 2011) approach is excellent for the presentation of the span of my study in the higher education respect of the sustainability transition. The methodology examines the phenomena in their social (Geels, 2014) and technological (Levidow & Upham, 2017) aspects. It interprets the phenomena at the various levels of social changes, as a function of other variables, such as, typically, but not exclusively, on the basis of technological changes. The point of the multi-level perspective is that it approaches the processes based on the following interactions (Geels & Schot, 2007):

a) Gap-filling innovations trigger certain internal changes (initiatives coming from below),

b) The large-scale (landscape) effects apply pressure (from above), thus destabilizing the *status quo*,

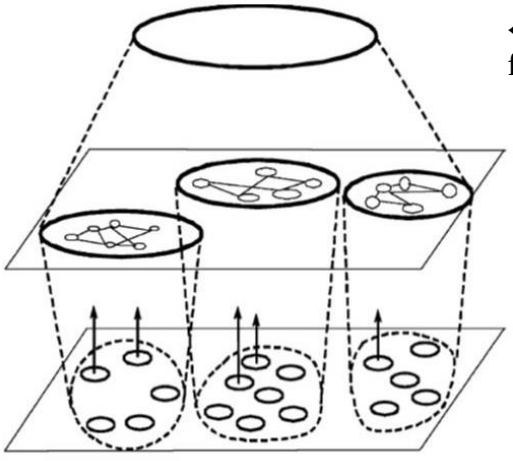
c) The destabilisation of the system is an opportunity for the spread of gap-filling innovation and, ideally, the development of the new system.

The transformation processes allow for the innovations to compete with the current system (Geels, 2010), (Geels, 2011) and transform it. However, the technological and methodological innovations do not automatically gain ground, even if their absence is obvious and their suitability seems scientifically justified. The MLP method aims to take into account and integrate the sociological part of the changes in order to interpret the processes. In this way, the technological aspects are complemented by sociological, cultural and social aspects in the case of all actors involved, so regard is had to the interpretations of not only the technological (Bijker, 1997) but also the socio-technological system. (Geels & Schot, 2007)

I construct the whole of my thesis by applying this to the transformation of higher education, and I kept this methodology in mind also during the design of the research. The analytical method is in harmony with the experience that logical and seemingly obvious transformations are often not realized. When we explore the deeper reasons for this failure, it becomes obvious that the barriers are most often cultural or social closures. To change this, we need totally different tools than the creation of new technology. "Lock-in effects are given if a system is stabilized in its current state due to the strong interdependence of system components." (Pahl-Wostl, 2002, p. 399)

Presenting my research by means of the multi-level approach, the parts of the system are as follows. The system level, in this case, is "higher education" as a whole, being one of the many existing systems. The "landscape" or large-scale events are the fourth industrial revolution and the important global challenges relevant in terms of sustainability, such as climate change or social inequalities, which are best summarized in the UN Sustainable Development Goals (UN, 2016). The lowest level comprises sets of gap-filling innovations. In our case, these various academic sustainability initiatives include "green campus", sustainability courses, rankings, research, programmes and student movements. These initiatives do not necessarily transform the entire existing system but can launch changes at the level of individual universities.

Figure 6 Basic figure of the multi-level criteria



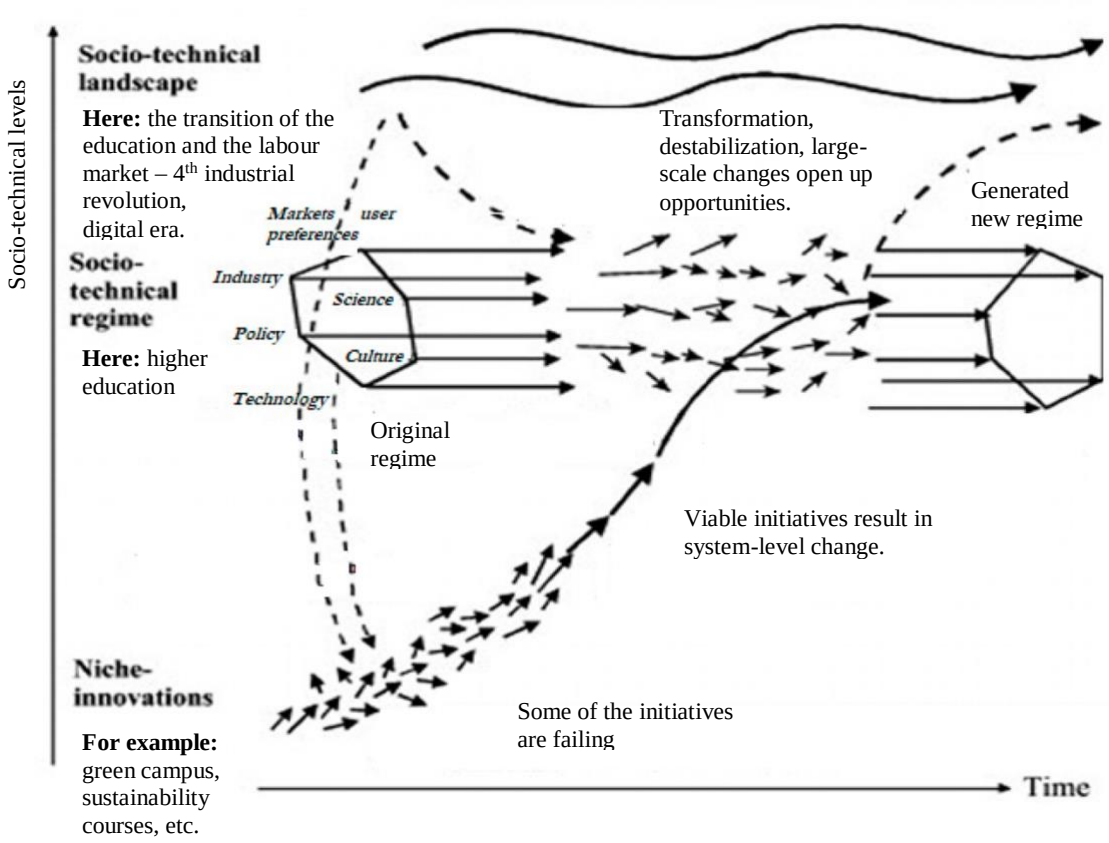
Source: Edited by the author based on p. 1261 of (Geels, 2002).

Selecting a system, which is higher education in our case, I examine which of the gap-filling initiatives emerging as a result of the large-scale changes have proven successful

and how they affect higher education as a whole. Figure Figure 7illustrates the multi-level approach in relation to higher education.

Based on the experience of research, I drew conclusions on the typical patterns of the sustainability transition of the higher education system, which can serve as a useful starting point also for institutions where the transition has not begun yet. In evaluating the results, I analysed how the change emerging at the level of higher education affects the transformation of the employment system, which is also affected by the fourth industrial revolution at a large-scale level.

Figure 7 Application of MLP to the transformation of higher education



Source: Edited by the author based on (Geels, 2011, p. 28.).

Technological development and, thus, the industrial revolutions have brought major changes in all areas of our daily lives. The technological and social changes combined influence various social and economic sectors (e.g. education, industry, agriculture, services and, thus, employment) and the transformation of the sectors relates back to technology and the society itself.

The first industrial revolution put the power of water and steam in the service of the industry. During the second one, electricity made mass production possible. In the third, processes could be automated by means of electronics and information technology. Since the middle of the last century, the fourth industrial revolution, building on the third one, combines the technologies to wash away the boundaries between the physical, biological and digital worlds (artificial intelligence, robotics, self-driving vehicles, 3D printing, nanotechnology, biotechnology, etc.). (Schwab, 2015)

Already the third industrial revolution put an uncontrollable amount of information on our table. We cannot do anything with the information, knowledge and news, which is available to everyone and is pouring indiscriminately on us. By the time of the fourth industrial revolution, data fraud and data theft, as well as cyber-attacks have been included among the 10 most significant threats. (WEF, 2019)

The fourth industrial revolution, currently taking place, changes not only the way the society operates but also transforms the individuals as well. "The Fourth Industrial Revolution has the potential to make inequalities visible, and to make them less acceptable in the future, and hopefully to gather and garner political support to take the necessary to reduce the gap." says Peter Mauer of the Red Cross, Switzerland (The Fourth Industrial Revolution, 2016).

The fact that the per capita GDP is growing faster in the world than the population of the world indicates that we could achieve global well-being. Through automation, we need less and less human labour to manufacture products. Income due based on subjective rights is no longer a utopia. If we want it, nobody should starve because the goods produced in the world can provide "respectable poverty" to all. However, it is also a real possibility that inequalities and, therefore, tensions continue to increase in the world. (The Fourth Industrial Revolution, 2016)

On the other hand, not only comfortable life and well-being have become more common in much of the world as a result of economic development but the level of inequality at the global and regional levels also increased in parallel. Meanwhile, the complexity of global problems has also increased due to the growth of environmental load (growth of the population in one part of the world, respectively, increase in consumption elsewhere), globalisation and the political and economic tensions. So, we rarely talk about "just"

environmental education but, rather, use the term ‘education for sustainable development’, which refers to broader sustainability issues. (Rest, 2002)

It also raises another problem if we start in a more favourable direction, meaning, that no one should live in privation. Sándor Kerekes points out that people are not necessarily able to creatively and usefully spend the time won, which they no longer have to use for producing the income necessary for their living. It is typical that the time and the energy thus saved can lead to vandalism by bored groups. (Kerekes, 2017) Education can also play an important role in this, as the scope for action of the individuals increases through the development of skills and awareness-raising, which helps find creative and useful ways to spend the time. Increase in literacy results in reduced susceptibility to vandalism and more people are able to keep up with the transformation of the labour market of the future. Education is a useful tool to mitigate the inequalities and population growth observed in developing countries. (Jungho, 2016)

Obviously, those living in differently developed parts of the world do not start with the same opportunities, in fact, there are significant differences even within a given country. But the world has become completely open by now to those who want to learn (The Fourth Industrial Revolution, 2016) even if exploiting the opportunities requires sometimes more, sometimes less effort. The experiments of Professor Sugata Mitra also confirm that rapid change can be achieved with minimal effort even in extremely underdeveloped parts of the world (here: in India) as well. (Sugata, et al., 2005) He proved that the scene of education (obtaining knowledge) is no longer the traditional (institutionalized) school either in the first place or necessarily. (Sugata & Vivek, 2001) Digital development has opened the doors that create the possibility for equalizing opportunities. Of course, creating the conditions is only one of the dimensions of education and, thus, the possibility to obtain the necessary knowledge.

2.1.3 Some economic aspects of the sustainability transition

“It is naivety or cynicism to claim that economic growth will solve environmental problems. On the contrary: it causes them. Especially if economic growth - as is unfortunately the case for developing countries - is based on the use of obsolete technologies and on the rise of environment-intensive economic sectors (intensive, monoculture agriculture, mining, heavy industry, chemical industry, non-sustainable forest-based furniture industry, etc.)” (Boda, 2006, p. 5.).

Both the above and the UN (UN, 2015) sustainable development goals, adopted in 2015, clearly show that we have come to a point in the 21st century where we are able to recognize the extraordinary complexity, severity and urgency of the problem.

And although the goals are accompanied by action plans and indicators (UN, 2018), there are only weak signs that we are able to cope with this challenge. Theories and calculations have been made to see the risks in case we do not take steps (Stern, 2006). The economic analysis of each major risk factor can be read from year to year (WEF, 2018), however, they were probably understood by the audience only at a scientific level due to the absence of pressure.

Although the degree of scientific interest for the topics of sustainability has increased in recent decades, the increase thereof and that of research potential have not, in parallel, improved the environmental performance indicators. (GFN, 2018)

Even though there are obviously positive trends and efforts (electric vehicles, increasing the share of renewables, etc.), they are overall unable to reverse the processes. In the meantime, more and more people speak out that the decision-makers should take account of the global threats and take radical steps to solve the problem.

I would like to contribute to this effort with my research topic and results by turning the attention of the higher education sector to the fact that their responsibility through their contribution to the achievement of sustainable development is greater than ever. The sustainability transition has already begun, but its pace has been significantly lagging behind, which could provide a favourable outcome for the global crisis.

2.2 Transformation of higher education

The subject of my thesis is higher education, including the examination of university sustainability efforts. Therefore, I consider it important to present the transformation of education and its role in career building. So, I discuss the role of education, including higher education, from the perspective of the economy, the environment, including our environmental impact and, of course, the social point of view. It is worth noting that the economic and social aspects are closely related, so their presentation can be hard to split.

Education and the educational level are decisive economic factors both at the individual and social levels. A number of indicators are closely linked to education. (Nagy, 2016) The relationship also means that significant improvements can be made in respect of certain indicators as a result of education. Thus, there is a correlation between the

educational level and life expectancy (health status, loss of earnings, cost of supply) and labour market success (unemployment rate, average income, mobility, flexibility).

The aspects above are examples of how the education level can be an individual and social advantage at the same time. The consequences of these indicators, relevant to the topic, will be detailed later.

As regards the environmental implications, not only knowledge but also awareness and attitudes, which are building thereon, as well as the development of competencies can bring a significant step forward among the better educated. (GEM Report, 2015) However, the knowledge of facts and attitude does not induce environmentally responsible behaviour or change the relationships of people with nature. Therefore, environmental education should aim at not only transferring environmental knowledge (depending on the level of education) but, more and more, developing a wide range of environmentally conscious attitudes. In addition to enhancing the knowledge and the skills during the process, environmental awareness, the value judgement, the sense of responsibility, the forms of behaviour and sensitivity must also be improved. (Varga, 2004) On the other hand, the research also shows that the content can also affect the raising of awareness of environmental issues, which is the first step towards changing the attitudes. "The results of research carried out both in higher education and the high school sample pointed out the role of environmental education in shaping attitudes and developing environmentally conscious behaviours." (Marjainé, et al., 2012, p. 33.)

In addition, the individual environmental impact is significantly influenced by other factors as well, so the relationship between the ecological footprint and education is unclear. However, the World Values Survey 2005-2008, made with the involvement of 47 countries, shows that the higher the educational level of the individual is, the more likely is that they are interested in environmental issues. Moreover, in the case of the World Values Survey 2010-2012, when a choice between protecting the environment and enhancing the economy had to be made, a higher proportion of the responders with secondary education favoured the environment than those with lower-than-secondary education. (GEM Report, 2015)

2.2.1 Social and economic importance of education

The importance of education, from the point of view of sustainable development, can be properly presented if we look in how the educational level affects the economy, society

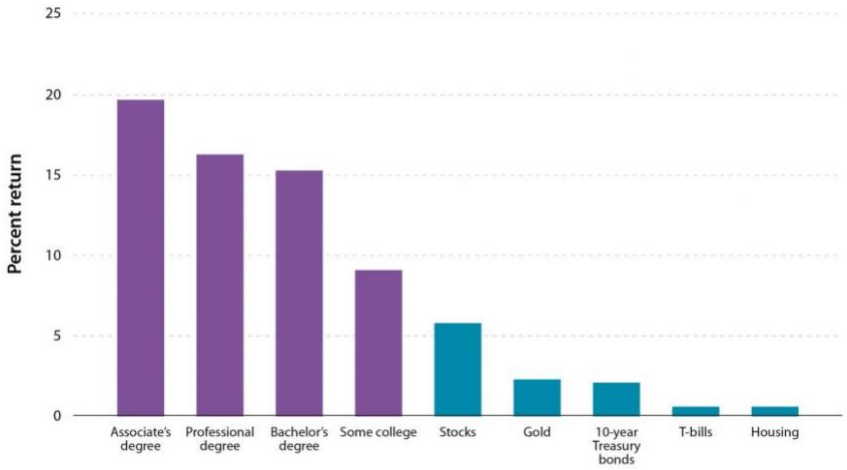
and individuals. We present some points, without aiming for being exhaustive, which illustrate this relationship properly.

Education and economic development are closely related. At the individual level, the educational level has a direct impact on income. The advantage usually comes from the extra income, taking into account the costs incurred, including the income lost during higher education (Psacharopoulos, 1994).

For the society, the economic benefits of education include that the productivity of the participants increases as a result of the educational level. Higher earnings express higher productivity. This can be seen as the direct and relatively predictable benefit of education. Although the number of years spent in school also correlates with economic development, the impact of the quality of education is much more important. (Hanushek & Wößmann, 2007) Similarly, there are also "direct" benefits among personal benefits: higher expectable income, finding employment easier and less chance of becoming unemployed.

The individual rate of return has increased to date until education has become a favourable investment opportunity. It can be said that an investment of the same amount yields less profit in the stock market or gold than obtaining a higher education qualification (see Figure Figure 8).

Figure 8 Comparison of the return on investment in education with other investment alternatives



Source: (Hamilton, 2013)

According to the calculations of the US-based Hamilton Project, the annual yield of 4-year higher education is 15.2%, which is more than twice better than the average stock market returns over the last sixty years (6.8%). Even unfinished college is a better investment than any other non-educational alternative. (Hamilton, 2013)

The outstanding return on "adult education"[6] results from that obtaining a degree based on secondary qualification requires much less additional expenditure compared to graduate education. On the other hand, if the income is projected to the total lifetime, those holding a bachelor degree (BA, BSc) earn more than those graduated in adult education. (Greenstone & Looney, 2011)

It can be concluded based on the national data that the rate of return of higher education is very favourable (both at the level of the individual and the society), as well as that this figure increased again in recent years after a decline. (T. Kiss, 2012)

Hungary is in a particularly favourable position, compared to the other countries, also in regards to that the rate of return of higher education is one of the highest among the OECD countries both at the individual and societal levels. (OECD, 2009)

The economic importance of education is demonstrated by that, of the Good State Indicators, data linked to education are included not only in the Sustainability[7] or Social Well-being[8] indicators, but also the Financial Stability and Economic Competitiveness[9] indicators. These data provide information both about the volume and certain quality aspects of both education. (Kis, et al., 2017)

Education and economic development have a mutually positive impact on each other. But the important fact that education (and the associated positive individual and social effects) has a generally positive effect on well-being, points beyond this. (Nagy, 2016)

2.2.2 The sustainability context of education

Sustainable development can be achieved in a way that conscious, responsive, creative and active citizens who are open to problems have up-to-date and credible information regarding the affairs of the nature-society-economy triad (in view of their correlations)

[6] Associate's degree (AA, AS, AAS) is a less common form of training in Hungary. It is most similar to the NTR training. It is advertised by colleges especially in the USA and represents a level lower than bachelor training (BA, BSc).

[7] Rate of students studying in eco-schools.

[8] Rate of those underperforming in the PISA survey. Rate of early school-leavers. Rate of young people with higher education qualification.

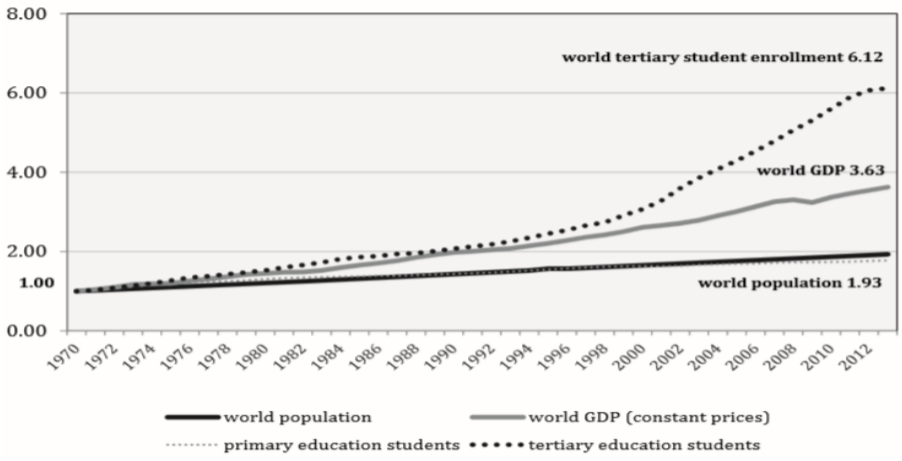
[9] Participation in adult education [lifelong learning] in the 25-64 age group. Annual expenditure of the government on education in proportion to the GDP. Number of people with a degree in engineering and natural sciences

and are able to make responsible decisions on that basis at the individual and community levels alike (Barth, et al., 2007).

We must, however, also take into account that we cannot be in possession of all necessary information. In this way, there is some uncertainty in all our decisions, which is proportionate with the level of information, the degree of novelty of the problem and the ability to assess the consequences of the alternatives (Zoltayné, 1997).

It also confirms that the responsibility of science is appreciated. Education or the lack thereof is crucial both at the micro and macro levels. Some individuals or nations can emerge as an impact of education and science. On the other hand, education is a long-term investment. The impact of changes in the education policy or greater economic subsidy appears in the economy only after decades. This is shown, for example, by the story of the Finnish education reform. In the 1970s, the country was at the bottom of the OECD rankings in terms of research and development intensity but now is the second to Sweden with a share of 3.5%. As a result of the bold reforms that started in the 1980s, the Finnish education system and its results have now become one of the most popular research topics among the scientists dealing with education. (It is worth noting that they achieved the success primarily, other than by increasing the material resources(Sahlberg, 2009).) However, due to the decline caused by the delay, you will have to start from even lower when the decision is finally made.

Figure 9 Evolution of the population's GDP and higher education



Source: (Marginson, 2016, p. 244.)

An exciting turnaround in relation to higher education was seen in the 70s when the upturn of higher education surpassed the economic momentum as a result of the economic development and showed growth even higher than the GDP.

According to a definition of sustainability, sustainable development is none other than providing well-being within the limits of the carrying capacity of the Earth. That is, long, happy and meaningful life with a minimal ecological footprint (IUCN/UNEP/WWF, 1991).

The main mission of education **is to provide an opportunity for creating a *meaningful life* at the individual level.** Then, a move towards sustainability can be expected at the local, national and global levels as a result of the individuals' meaningful value-creating life/work. Education is one of the best solutions for eliminating (child) poverty. It is also important to note this because the fact that the tasks are not realistic for the developing countries (or the needy layers) is mentioned as a common obstacle to the realisation of sustainable development. Can we afford to be sustainable (Curtis, et al., 2010)? That is, taking the sustainability aspects into account spoils economic competitiveness in the case of the developing countries (and those in need) (expensive investments) and/or it is not feasible at the individual level (responsible products are more expensive). Although this topic is not part of my thesis, I consider it important to show that the development of education also has a positive effect on society as a whole, in addition to supporting sustainable development.

In addition, education is far more than just information transfer or competency development. "The value system of the individual is mostly shaped by the stimuli of the immediate environment, it is primarily the family, friends and teachers for young people. Accordingly, education provides a lot of impulses for individual behaviour through knowledge, values, attitudes, emotions and examples of life and so on." (Marjainé Sz. Zs., 2012, p. 17.)

By transferring knowledge and values and shaping attitude, as well as strengthening conviction, education is of paramount importance to help revalue lifestyle and habits harmful to the environment at the individual level(GEM Report, 2015).

The Toyne Report (Toyne, 1993) shows that all dimensions of education contribute to sustainable development.

The third pillar of the triple optimisation is the protection of the environment. This can be measured, in addition to the technical aspects, through environmental awareness, attitude and real actions. Today, there is more talk about sustainability education and training.

Sustainability education does not narrow the relationship between man and his environment to shaping the emotional approach to the natural environment. Rather, this kind of approach puts in context and emphasizes the system of the topics of economy, politics, well-being and social justice and the importance of their relationships. In this case, not only the biological and ecological system approach is relevant, but also how it can be approached on socio-ecological grounds(Orbán, 2018).

"Until the manifestation of environmental awareness in action, there is a long way to go. This requires, among other things, that we have relevant knowledge, understand the relationships between the different processes, and identify with the problem." (Marjainé, et al., 2012, p. 227.)

Given the fact that, due to my work, I pay special attention to the sustainability-related domestic and international regulatory environment, I consider it important to mention here a few initiatives that have had an impact on academic life.

The United Nations declared the 2005-2014 period the Decade of Education for Sustainable Development. It was intended to integrate the principles, values and practices of sustainable development into all aspects of education and learning, thus enabling the realisation of a more sustainable and fairer society for all. In its conclusions of 19 November 2010, the Council formulated a recommendation on education serving sustainable development (UN, 2010), which based on the UNESCO World Conference on Education for Sustainable Development in Bonn in 2009, where the parties agreed in the closing statement that investing in education serving sustainable development is an investment in the future, and can even prove a life-saving measure in some cases.

Of the criteria for sustainability education, which are laid down in the UN documents, it is worth highlighting some, which may be important in terms of research. Based on these, education for sustainability encompasses all three dimensions of sustainability, that is, environment, society and economy, as well as the cultural aspects of sustainability. (Könczey, 2014)

The pedagogical methods of training encourage participatory learning and skills for higher-order thinking, about which I asked in my research as well, but there were no evaluable responses on the topic at the National University of Public Service. The teaching methodology developments have not got in the focus of interest yet. The existence of training on sustainability topics was an assessment criterion considered in connection with the educational content (course developments). The results of the relevant questions were analysed in detail in the presentation of the research results. I also paid attention to the integration of the topic of sustainability into the courses and its appearance as a course.

The most exciting and most important question for me was one of the last paragraphs of the policy document, namely, that education for sustainability strengthens the adaptability of the workforce and the skills for improving the quality of life. (Tilbury, 2007)

The UN Education for Sustainable Development (ESD) Programme is implemented as a continuation of the highlighted decade. (UNESCO, 2017)

The (ESD) programme aims to empower people to change their way of thinking and strive towards a sustainable future. (Erdogan, 2009) This is clearly linked to the transition to sustainability in higher education. (Ferrer-Balas, et al., 2009), (Rieckmann, 2012)

So, we can declare that the transformation of education is supported by a number of recommendations and programmes at the international level. These programmes are intended as a guide, rather than a method applicable by all institutions. These documents are important for the decision-makers, as they can legitimize internally prompted initiatives and support implementation with tools and a professional community.

2.2.3 Development of the situation and role of higher education

My research focuses, within the theme of education, on the appearance of sustainable development in the higher education space. In my research, I tried to find an answer to what is the importance and effect of the sustainability transformation in higher education and how it can be most successfully implemented.

The importance of higher education is increasingly appreciated today, thanks to the advance of science. As we will see later, those can be the winners of the fourth industrial revolution (at the individual level) who will possess knowledge that supports systematic approach and a complex vision and enables the performance of non-routine tasks. (Schwab, 2015) To put it simply, those will be “safe” who cannot be replaced by robots.

At the country level, it appears in that knowledge-intensive economies will be much more competitive than the raw material-intensive, manufacturing-based systems.

The interpretation by Humboldt of a modern university mentions three main tasks. First, the unity of research and teaching; second, the protection of academic freedom (teaching and learning) and, third, the central role of philosophical studies. (Kwiek, 2006) By the 21st century, education has undergone substantial changes in many ways.

The term "university" (in Latin: *universitas* = universality, totality) is a "rank" and responsibility at the same time. From the very beginning, universities have been institutions that serve social development with the tools of science. The social responsibility of universities is of key importance and unquestionable (Schultz, 1961), (Coleman, 1988), (Ehrlich, 2000).

It is also the mission of the universities to prepare the students to enter the labour market (knowledge workers). By promoting individual development, the universities also contribute to increasing the social knowledge base (Benhabib & Spiegel, 1994), (Cortese, 2003).

According to the Hungarian regulation, a university is a higher education institution whose "core activities are education, scientific research and artistic creation" based on the Hungarian Higher Education Act. In the framework of its educational activities, it offers the possibility to obtain a bachelor's, master's or doctoral degree (diploma). (Felsőokatási törvény, 2005)

The cultivation of sciences and the role of the universities has expanded a lot by today. The palette has expanded with many tasks and opportunities, which is better suited to the (economic and social) arrangement of our age. Obviously, not all of these changes had a positive effect on the functioning of universities, but judging this would be a difficult task. Today, the main tasks of the universities are education, the dissemination of knowledge, promoting learning and research, encouraging innovation, exploitation of research results (government, industry and society) and providing trained professionals for the economy; contributing to social welfare, social justice and supporting cultural vitality. (Altbach, 2008), (Li, et al., 2008).

A quieter, yet also very significant change is taking place at the same time as the fourth industrial revolution. This is the headway of knowledge as power. (Gabbard, 2007) Industrial revolutions and education are closely related. (Blinder, 2006) To satisfy the

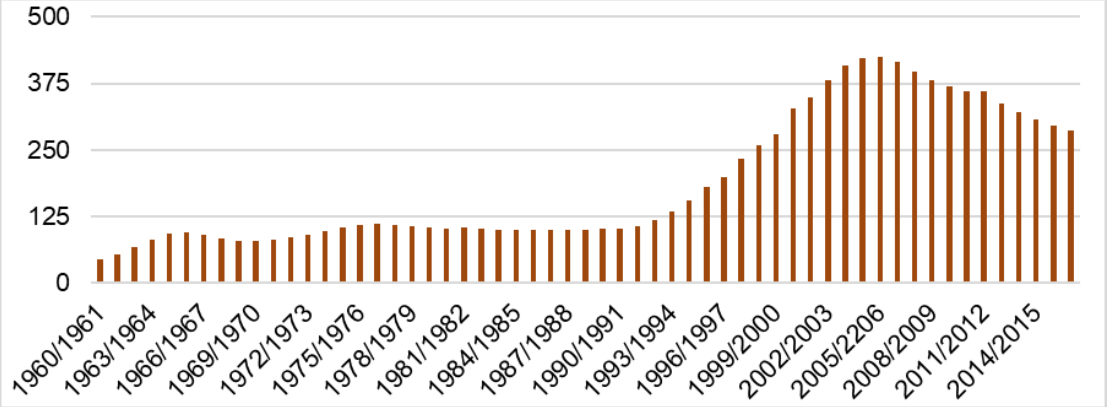
production needs of the second and third industrial revolutions, education went through huge changes through the spread of public education. (Becker, et al., 2011) This allowed the developed countries to enable all citizens to access education and illiteracy has been practically eliminated. (West, 1978)

The development of higher education well reflects the changes taking place in the society and is an indicator of intellectual and economic independence and development. Higher education is a kind of "luxury" of the developed world, which can be afforded only by those layers and countries that can cover an independent development path by breaking away from the "server" status. Today, China is a very vivid example of this. The boom in higher education is experienced not only within the country but the proportion of Chinese students in foreign universities is high, too. The proportion of university students in China, as a percentage of the population, has quadrupled since 2000, from 0.5% to 2%. (NBS of China, 2017). (WBG, 2017) This is an important message because while China is becoming an increasingly important factor in all areas of the economy, it can also be said that the internal social transformation is taking place rapidly. The growth process is pending not only in absolute but also in relative terms.

It is important to note all these because the transformation of higher education is very important to the content and structure of education and its role in the society. If we ignore this, we will not be able to understand, either, the significance of the serious consequences the backlog of higher education in the sustainability transition can cause.

In Hungary, higher education has travelled a different path. Not even the highest number of students reached 0.025% of the population. The scientific and spiritual recovery after the regime change is well shown by the increase in the number of students as well (Figure 10). This is the result of the combined effect of several factors (Harsányi & Vincze, 2017) but the significance of its social effect may prove only later.

Figure 10 Number of higher education students in Hungary (in thousands)



Source: (CSO, 2017)

The decline in the number of students in recent years raises the question of whether there is a contradiction between economic interests and education policy decisions. As we saw, the most important tool for becoming a winner of the fourth industrial revolution is the proportion of highly skilled responsive employees. In addition to taking account of the direct and predictable returns (Moretti, 2004), it is important to consider that skills, awareness and innovative approach significantly increase the flexibility of society against the changes.

The essence of such flexibility is to enable more and more responsible citizens to accept the changes openly in both a proactive and reactive manner among the continuously and rapidly changing socio-economic conditions (Schofer & Meyer, 2005).

Obviously, the evolution of education has taken a really big boost significantly earlier. The first major breakthrough began with the elimination of illiteracy. This significant step (although still an existing challenge) is a precondition for subsequent changes. In addition to serving economic goals, mass education and the training of masses (Boli, et al., 1985), (Caldwell, 1980) has been significant also (and perhaps especially) from the social perspective.

As illiteracy declined a result of education, (West, 1978, p. 381.) education has become an increasingly important factor and power. The initial targets to minimize the number of illiterates has been sidelined with respect to the goals of quality education in the developed regions. Although becoming literate by the start of young adulthood is not obvious and general in all places, the number of illiterates has now fallen below 20% worldwide owing to the World Wide Web, digitisation (Kupathil, 2015), (Annan, 2001) and globalisation. (Roser & Ortiz-Ospina, 2018)

The resulting education system has adapted to the needs and is built on the principles of factory production. So, a number of other aspects are overshadowed in the interest of effectiveness (ignoring any educational and methodological reasons). (Robinson, 2008) This system worked relatively successfully up until the fourth industrial revolution. But now, the time has come when it is no longer able to meet the challenges (Collin & Halverson, 2010) and the need for a radical change has become increasingly obvious. (Becker, et al., 2011)

While "mass education" (or, officially, public education) filled its role (Meyer, et al., 1992) the new social and technological challenges present new challenges to education policy and the educational institutions. (Abu Mezied, 2016) The kind of knowledge and skill-set this system is able to deliver can be used less and less for the challenges of the fourth industrial revolution. The resulting skills shortage became known as functional illiteracy. "In the case of functional illiteracy, the acquired level of literacy skills is less and less suitable to be used to absorb, process and interact with new knowledge. Its development is attributed, on the one hand, to the disruption of the "electronic visual" - television, computer, etc. - mass effect and, on the other hand, to the disruption of public education and the changing socio-economic environment." (CSO, 2010)

Starting from public education, this change has a knock-on effect up to higher education as well. A number of studies are dealing with the question of how the resulting skills shortage can be remedied. According to most of the proposals, the "gaps must be filled"(Chao, 2017) and special attention should be paid to radically transforming the structure and content of higher education. (Altbach, et al., 2009)

2.2.4 Relationship of sustainable development higher education

One of the most important and most difficult tasks is the delineation and analysis of the sections of the three topics (transformation of higher education - sustainability transition - success competencies). A number of publications were published that demonstrate the implementation of university sustainability, (Shriberg, 2002), (Lozano, 2006), (Lozano, 2006 b) but they are more focused on the specific conditions (Shephard, 2008), (Lozano, 2012) or effects achieved by the transformation (Zilahy & Huisingh, 2009) and do not focus on the process or the root causes or motivations. So, they are more inclined to help in how a performance indicator can be improved but do not shed light on, and rarely

explain, how a particular institution started on the road to becoming sustainable and what were the difficulties it had to overcome in order to achieve a specific state.

A part of the analyses examines in considerable detail the characteristics of the status that has emerged and the nature of the sustainability structure achieved (Roorda & Martens, 2008). They were a useful additive to my research, as I wanted to compare the resulting conditions with the processes leading to them.

The analysis of the sustainability indicators provided only limited help because the investigation aspects of my research were not directed primarily at the environmental or social indicators but focused on the internal and external factors behind the institutional sustainability efforts. Although the pattern of the root causes, the difficulties and the method of implementation can be less described with objective indicators, I still tried to make the typical motifs measurable and analysable.

Due to the above, I do not consider it necessary to define sustainable development more accurately than using the triple optimisation (or the quadruple if the individual is examined separately within the societal dimension) as the basis. Based on the high (or strict) sustainability model, it is understood as a set of natural resources constant over time (Kerekes, 2011). This means that we assume the harmonious development of the systems involving each other: Economy $\subset$ Society (Humanity) $\subset$ Environment. Translating this into the language of the different sciences and challenges always depends on the specific context. The fact that a more precise definition does not exist is very useful, despite many difficulties, in the sense that the present socio-technological system does not have a subset, to which none of its aspects applies. The result of the efforts to define sustainability more accurately in all cases leads to certain aspects falling prey to the clarification effort. Or, the definition becomes too complicated if we insist on all aspects. Therefore, it is worth sticking to the general definition and highlighting and placing in the foreground the aspects of the area in which the research is carried out. So, we draw the attention to a global (or even local) issue without losing sight of the bigger picture.

Common Future (Brundtland, 1987) and its updated versions (UN, 2012), (Holden, et al., 2014) approaches the topic of sustainability at the system level and globally. The Rio, Rio20+, UN Sustainable Development Goals (SDGs) and Sustainable Development in the 21st Century (SD21) programmes represent the holistic approaches that call for a global move.

The 17 objectives set out in the SDGs (Zlinszky & Balogh, 2016) and their sub-targets focus on specific problems that are currently the biggest global challenges of sustainability. By including the Planetary boundaries (Steffen, et al., 2015) and in considering the Global risk factors (WEF, 2017), a three-dimensional model can be obtained in which the challenges, their levels of appearance and economic risk factors are included. We cannot continue along this thread, as the examination and analysis of these relationships could be the topic of another research. This is important only from the perspective that we must notice that education is of paramount importance in every system, either directly or indirectly.

Social transformation always has an influence on nature because of the interdependence and relationship of the subsystems. And the economy, as a subsystem of the society, has increasingly assumed the leading role due to globalisation after the industrial revolution. The fourth industrial revolution is based on competencies that assume a completely new, highly advanced society and support system. Although creativity, cooperation and emotional intelligence or critical (WEF, 2016) thinking are clearly the competencies that ensure a successful future at the individual and social levels, and they are the key competencies for sustainable development, (Faham, et al., 2017) unfortunately, they do not appear in the field of education even at a strategic level, not to mention practice.

When we want to make certain that sustainability (highlighting the environmental and social aspects and placing the dimension of the campuses in the fore) plays an important role in the life of the individual institutions, it is worth casting a look at the "role models". Although the university rankings give rise to a lot of criticism, it is still undeniable that the leading institutions play a crucial role in the scientific world. So, if these institutions believe (because of their prestige and not out of necessity) that sustainability is a priority area then we can accept that the topic should have room in any university that considers its role and mission seriously.

I made a preliminary survey, a kind of benchmark, on how the leading universities relate to sustainable development.

The preliminary research (see Annex 22) showed that there is separate (postgraduate or executive) continuing training on certain topics of sustainability in some institutes. Moreover, not only a single university department is dealing with the topic of sustainable

development, but more and more people consider the matter of sustainable development as their own as a result of integration and the consequent spread of the topic.

I examined rankings (ratings) such as the UI Green Metric Ranking (GreenMetric, 2014) or the STARS system (AASHE, 2016), which evaluate universities expressly based on sustainability considerations. These initiatives are better known and more popular, partly due to the increasing demand of the stakeholders (primarily, the students) for the greater social engagement of higher education institutions. (Weber & Duderstadt, 2011)

Having reviewed the main activities of certain institutions regarding sustainability (Annex 23), I found that sustainability is increasingly an integral part of the programme of the universities, regardless of the profile, size or geographical location. Here, I highlighted the top 5 universities of the given year (combined ranking), and the best ones in Hungary, as an example. Since the comparison of the topics aims to determine whether some kind of "pattern", that is, a group of typical measures exists, it may be sufficient to analyse a smaller set. (Velazquez, et al., 2006) As part of the analysis of the 3rd hypothesis in Section 6 of the thesis, I examined in details the highest-ranking institutions' initiatives and practices related to sustainability.

I tested in advance the areas typically addressed by the universities that have already begun the integration of sustainability topics. As Annex 23 also shows, a part of the main topics is already known about the subject of environmental sustainability from international literature. The minor differences arise in part from the fact that there are universities that have started to deal with the topic 20-25 years ago, so the goals and the objectives have been refined and are less general by now (e.g. MIT: Moving of people to, from and within the campus. Harvard: Campus Climate Flexibility Plan, Products more favourable from the environmental point of view). It is also worth noting that the objectives and deadlines are quite magnificent and seem unattainable for the institutions that have only just begun the transition to sustainability. In many cases, there is little support even for the more far-reaching changes in this initial phase (e.g. fully green public procurement), so it is desirable to set more realistic targets (that promise more success).

I do not cover in my paper the reasons or, as the case may be, initiators of the individual initiatives and, for reasons of extent, I did not analyse the student movements, either (it is not part of the research focus). Although the latter is a key factor in terms of implementation and also the creation and implementation of the sustainability strategy, I

am not addressing this aspect in my research. Nevertheless, I am aware that students, as a stakeholder group, must be given priority.

2.2.5 The sustainability transformation of higher education

Higher education, which is in transformation, is already beyond the first stages of change. Thus, although the sustainability transition is still in its infancy in our country, there is internationally well-published literature on the subject. Nevertheless, it is also clear that the changes are much slower than international consent would suggest. (Tilbury, 2001), (Cotton, et al., 2009)

Based on the literature reviewing the publications published on the topic, the studies covering higher education sustainability are mainly focusing on the difficulties of introduction, the necessary curriculum changes and organisational changes, as well as the teaching techniques (Figueiró & Raufflet, 2005). Against this background, the present study aims to contribute to expanding the common knowledge by placing the triad of *institutional features-road travelled-success* in the focus. So, we do not doubt why a particular institution has chosen the given way, but we examine, on the basis of the lessons learned, the difficulties and the benefits of their choice and the lessons the other institutions can learn from it. It is also crucial to present, in addition to the many possible paths, why covering the path is important if a university would like to offer knowledge to its students that will be marketable also during the fourth industrial revolution.

When planning the research, I aimed to develop a set of criteria, which makes the most typical sustainability initiatives measurable and comparable with the institutional characteristics.

The approach is based on preventive environmental protection, including the theory of careful treatment[10] (Zilahy, 2001). On this basis, and keeping the development life cycle in view, I put the emphasis on the examination of certain milestones:

[10] A part of preventative environmental protection can be achieved at low cost or even no cost. These measures and their methods leading to their identification and implementation are called careful treatment. (KVVM, 2005)

Table 1 Method of the analysis of the university sustainability process

	Why?	Who/What?	How?
System	Motivations Catalysts	Initiators Sponsors Opponents	Tools Resources Areas
Outset	Endearing Success factors Failures	Operational changes Curriculum development Stakeholder management	Objectives Positioning
Becoming a champion	Competencies	Survival tactics Allies Networking	System-level incorporation

Source: Edited by the author.

Changes are, in part, processes that are taking place without planning, also in the life of an institution. New colleagues enrich the common set with new knowledge and technological advancement also gets inside the walls in this way without any strategy. But programmed and conscious transformation is present in the life of every organisation. These changes primarily aim to improve the quality and optimize the operations, as well as to ensure adaptation to the changing external circumstances.

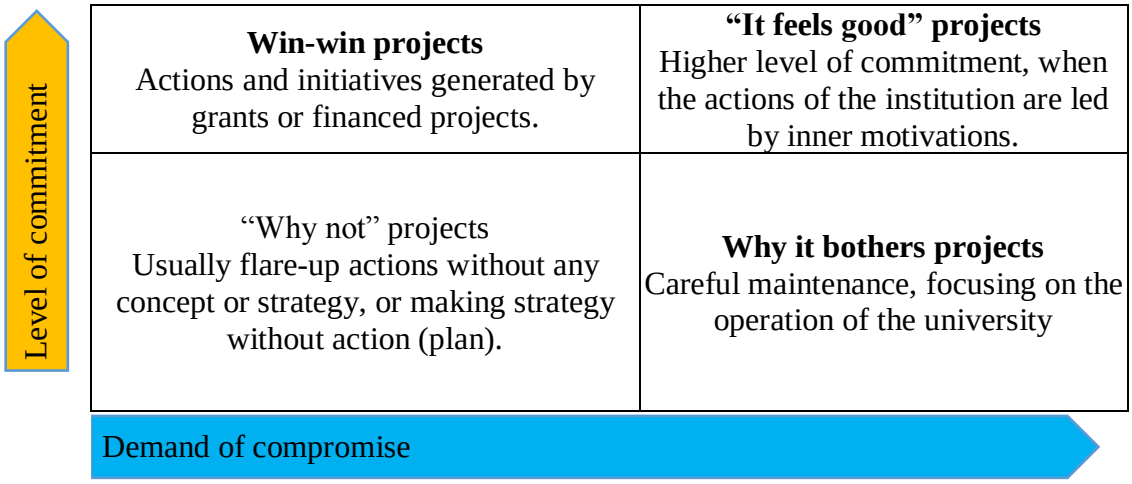
As I have shown, the operation of the university is taking place in a continuously changing environment (e.g. strengthening of sustainability aspects, fourth industrial revolution and changing roles of universities). As a result, and because technology and science are constantly evolving, universities are usually shaping their operations and developing the knowledge content in a planned manner to better align with the objectives and last, but not least, the expectations of stakeholders.

I wish to note here that the spread of the so-called MOOCs (Massive Open Online Courses), which is one of the most radical changes affecting higher education, is not the subject of my thesis, yet I believe that this significant change, which affects all dimensions of higher education, cannot go unnoticed since it is of utmost importance in terms of sustainability. Although I intend to deal with this issue only tangentially, MOOCs are a good example of the effects that are global, demonstrate the development of info-communication and have and will have an impact on virtually all universities all over the world. (Yuan & Powell, 2013), (Altbach, 2014), (Alraimi, et al., 2015)

Table

Table 1summarizes the criteria that serve as the basis for the development of the tools when planning the research. In order to answer the research questions, I am looking for the answers to the who/why/how questions in the university context both during the investigation of the content and the empirical research. Since it is my basic assumption that universities are trying to react to the changes in some way or are in transition in anticipation thereof, the study examines the root causes, motivations, process and the details of this transformation.

Figure 11 Motivations for achieving sustainability



Source: Edited by the author based on (Kerekes, 2012).

The sustainability transformation of organisations is always individual, implemented in a manner specific of the organisation and influenced by the culture and goals of the organisation and the causes triggering the changes. Yet, there are typical patterns that can be used as a basis for grouping these transition criteria. The university sustainability initiatives can also be organized into groups based on commitment and compromise dimensions, as a classification of corporate sustainability (see Figure 11). In the course of the sustainability transition, the measures classified as shown in the figure (does not apply to the whole organisation) can be implemented and be present both alongside and parallel to one another.

2.2.6 Criteria defining the sustainability transition of higher educations

To define each dimension, in order to be able to interpret and "improve" the system piece by piece, we need to understand its operation and the purpose for which we have engaged in the development. The operations of an organisation, as an organic unit, can be

appropriate if not only its individual components are working properly but their cooperation is also smooth.

Following the emergence of the concept of sustainable development, it was especially the corporate sector that has got into the focus of attention. The manufacturing (usually heavy industry) companies have been forced to rapidly respond to the challenge raised by the rapid spread of green awareness triggered by global problems around the world.

In the initial phase, the organisations saw the advantages of introducing environmental awareness in that more cost-effective operation and a strategy that applies the legal changes in a proactive way would prove to be economically recoverable.

The different strategies, or their combination, became general by the end of the 20th century. The emergence of environmental management systems (standards) (ISO 14001, EMAS 1995) gave a new impetus to the process, which has achieved its full potential through the spread of the environmental (sustainability) reports (e.g. Global Reporting Initiative or GRI).

The use of these instruments in the large enterprise sector is now a basic need either for market or economic or legal reasons. Of course, the causes and the strategies vary from region to region and between industries, but 'environmental perspective' and, even more, 'social responsibility' are known and applied concepts.

As the companies' environmental awareness increased, a new labour market situation has emerged, which has become open to employing more and more professionals experienced in the management of environmental issues. To exploit the opportunities appearing one after the other, courses have emerged where people can learn about environmental issues in this way (environmental manager, environmental engineer, etc.). (Tilbury, 1995). However, the emergence of the higher education programmes faced serious difficulties since proficiency in the nature science subjects is not sufficient for a student to understand and see through complex environmental problems (Palmer, 2002).

"We have fragmented the world into bits and pieces called disciplines and subdisciplines, hermetically sealed from other such disciplines. As a result, after i z or 16 or zo years of education, most students graduate without any broad, integrated sense of the unity of things. The consequences for their personhood and for the planet are large. … As a result of incomplete education, we have fooled ourselves into thinking that we are much richer than we are." (Orr, 1994) p. 11.

A comprehensive assessment completed in 1992 identified *inter alia* the following shortcomings in respect of domestic environmental education (Havas, 2001): the situation of higher education is rendered difficult by the lack of ability to use the knowledge learned in practical application; outdated textbooks and methods and lack of foundations.

The results of further research also highlighted obstacles, some of which perfectly characterized academic problems as well (Havas, 2001).

- These correlations have remained hidden in training due to fragmentation.
- The dominance of abstract knowledge carved out of the context makes the curriculum indigestible, untraceable and out of touch. This causes a multitude of learning motivation problems.
- There is a lack of active and interactive learning strategies and the students are mostly doomed to inaction and unilateral inclusion.
- There are poor connections to social media, especially the local community.

The integration of voluntary programmes into the educational and training programme launched in recent years tries to provide a solution for the last shortcoming but has not yet become an integral part of the system. It is a little bit unfamiliar today.

In Hungary, significant steps are now being taken to incorporate the sustainability approach. They range from Green Kindergarten and Eco-School programmes to a more pronounced appearance of the environment and natural sciences in the curriculum.

Since the birth of the concept of sustainability education, it is repeatedly put on the agenda how the different areas thereof, that is, environmental and global education, health education, education on citizenship and cooperation, moral and democracy education, as well as multicultural awareness-raising, relate to the preparation for the active implementation of sustainability. (Chikán, et al., 2015), (Vitályos, 2014), (Wheeler & Bijur, 2013) Education on sustainable development means that education should create relationships between the environmental, social and economic systems and present the main characteristics and dimensions of the relations. A holistic approach means, in this case as well, highlighting the entire unit. This can be called the systems approach or system-level approach. Increasingly, the view is gaining ground among the researchers dealing with the subject and educational professionals, namely, that only this and the model of high sustainability describe and approach truthfully how the world works. So,

this is the only way to understand the processes and the global problems of the present time (Csete, 2012).

The National Environmental Education Strategy (Vásárhelyi, 2010) highlights some important pedagogical tools from the topic of education on sustainability. However, it is worth mentioning that sustainable development is the symbol of a kind of front-ranking/pioneering thinking. So, one has to be constantly up-to-date to be able to transfer and receive skill-level knowledge. "The aim of environmental education is to promote environmentally conscious behaviour and to promote a responsible lifestyle. From a distant viewpoint, environmental education aims to preserve and maintain the harmony of nature and of human society in particular. Its purpose is to establish the emotional, mental, aesthetic, and moral foundation of the built and social environment, the respectable human system." (Vásárhelyi, 2010, p. 59.)

To date, their success is ensured by the programmes that were based on the involvement of the community, democratic methods, cooperation, creativity and flexible and open approach (Heimlich, 2010). Instead of maximizing personal benefit, a mindset giving priority to community values is sustainable in the long term, so critical thinking is also crucial because one of the biggest obstacles to sustainability is the wasteful and selfish attitude communicated in order to maintain the present economy (Carleton-Hug & Hug, 2010).

The European Council also deals with the methodological tools of education for sustainable development, even if it does not currently handle environmental education as a priority (EC, 2010), (Eurostat, 2017). It names the competencies of system-based, critical and creative thinking, the recognition of problems at the global, local and regional levels and responsibility, as the key factors to achieve sustainable development:

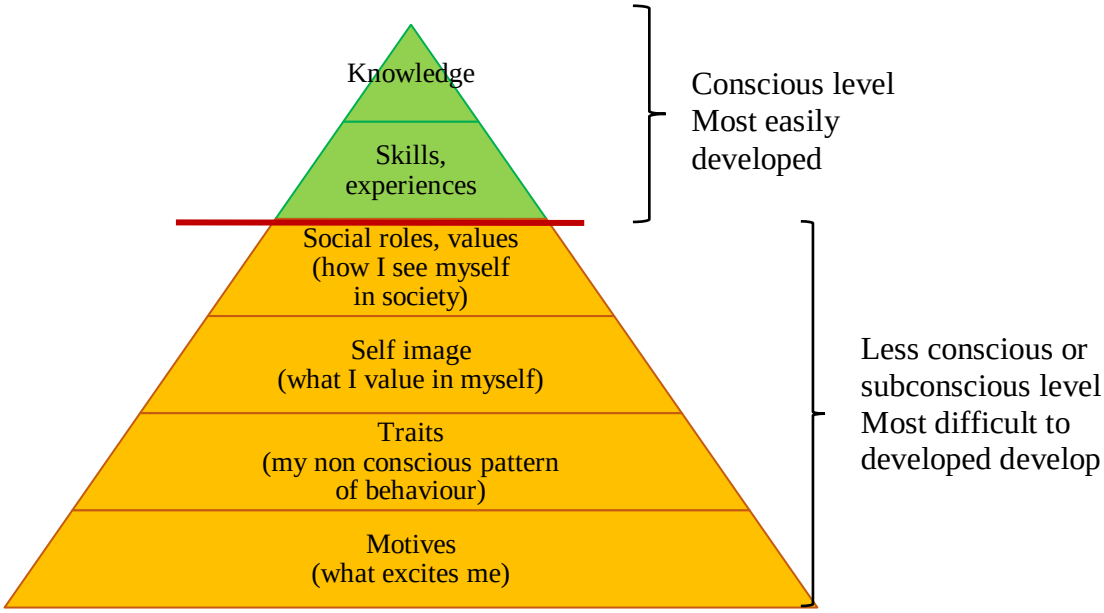
2.3 Transformation of the competencies required for success

The skills needed to become a successful leader are not eternal. Although there are elements that are needed for efficiency in all historical periods, economic sectors and organisational life cycles, most of them are dependent on the external conditions in which the organisation or country concerned is functioning. "The competencies of the company are determined by the individual competencies and the way they are connected. Competence presents at every level of the company, but undoubtedly the competence of the leader determines the competence of the whole company." (Kapás, 1999, p. 6.)

Research usually distinguishes two tendencies in the analysis of competencies: one puts the results of input-focused, while the other puts the results of output-focused investigation to the fore. My goal here is not to give a detailed presentation of research on leadership competencies. Instead, I just want to highlight the most cited conclusions from the literature, so that I can compare them with the results of my research.

Before listing the specific competencies, I present the iceberg model as a framework for grouping the core leadership competencies (Figure Figure 12).

Figure 12 The iceberg model



Source: (Spencer, et al., 1990)

Based on the iceberg model, knowledge and skills are the visible parts above the water, which are the most obvious to the individual and the environment.

- Knowledge: knowledge, which the individual has but may not actually use.
- Skills: talents and expertise in fulfilling challenges and duties. It is the ability to apply knowledge.
- Social role: values a person deems important and exemplary.
- Self-image: the term ‘self-image’ means all the ideas that constitute the entirety of our attitudes towards ourselves, that is, who we are and what do we find ourselves.
- Personality: all the personality traits (inherited and acquired: physical, cognitive)

- Motivations: the deepest least conscious level. They influence behaviour and choices. (Hegyi, 2012)

Beyond the presentation of the individual skills, the iceberg model also notes that the competency elements can be developed differently and that some of them are clearly visible for the outside world while others are hidden and more difficult to identify: there are competencies (competency ingredients) that are easier and harder to develop.

Whatever the change is, the competencies of organisational culture and leadership are both keys for a successful transition. "Technological abilities and skills alone (to any extent) are not sufficient to enhance business and individual adaptation, knowledge, innovation, and competitiveness. The ability to recognize business opportunities and the entrepreneurial approach makes technology knowledge economically profitable." (Dobák, et al., 2012, p. 44.)

In the case of this paper, the concept of 'competitiveness' can be replaced with the concept of 'sustainability'. In my view, only the long-term success of an organisation (i.e. its development in a sustainable way) can be competitive. This statement is confirmed by several research. Eccles et al. (2012) found that companies that are highly committed to sustainability have drastically outperformed the less sustainable companies both in terms of the stock market and the accounting results. The annual yield of the highly sustainable companies above the market average was by 4.8% higher than that of the competitors and they also showed a much better performance in terms of return on equity and assets (Eccles, et al., 2012).

The transformation of leadership competencies is due not only to the fact that the necessary knowledge and skills are changing (which is the "tip of the iceberg") but also that social relations and connections and, thus, the individuals also change due to the global transformation. The digital world and the fourth industrial revolution transform not only the labour market but the entire society.

A recent study (Giles, 2016), comprising interviews with nearly 200 leaders, was looking for the answer of which are the most important leadership competencies. Based on the responses, ethics and morality lead the list by almost 70% (Giles, 2016).

- High ethical and moral standards (67%)
- He sets the goals and gives loose guidance (59%)
- He clearly communicates the requirements (56%)

- He is flexible to change his view (52%)
- He supports development (43%)
- He communicates often and openly (42%)
- He is open to new ideas and approaches (39%)
- He creates a "shared success and failure" mood (38%)
- He constantly develops himself (38%)
- He creates a safe atmosphere for experimentation (37%)

Without examining the results in more detail, I emphasize that the leaders must act as a kind of central point rather than filling a simple managerial role in the rapidly changing external conditions.

It is worth comparing the list compiled by the leaders with the one prepared based on the responses of the employees and examine what the new generation thinks about a good leader. They are: collaborative approach, team building personality, (work is an integral part of life for young people), technical expertise (he must be familiar with the technology of the latest generation of employees), global perspective and cultural sensing (ability for international cooperation), and future-orientation (innovation, promotion, multiplication). (Bach, 2017, p. 10.)

In the publication of the World Economic Forum, which addresses jobs created after the fourth industrial revolution and the skills necessary for successful career development, the changes in the competencies necessary to succeed, as projected for 2020, offer clues for education planning as well (WEF, 2016). Table Table 2comes from the Future of Work Report, which is based on research with the involvement of the HR directors and senior consultants of more than 371 large corporations (WEF, 2016).

Table 2 The 10 most important competencies

2015 (research result)	**2020 (forecast)**
1. Solving complex problems	1. Solving complex problems
2. Alignment with others	2. Critical thinking
3. People management	3. Creativity
4. Critical thinking	4. People management
5. Discussion	5. Alignment with others
6. Quality control	6. Emotional intelligence
7. Service orientation	7. Judgement and decision-making
8. Judgement and decision-making	8. Service orientation
9. Active listening	9. Discussion
10. Creativity	10. Cognitive flexibility

Source: (WEF, 2016)

In this context, it is worth mentioning the professions that are least exposed to the risk of "termination", that is, substitution by robots, in terms of the effects of digitalisation and the fourth industrial revolution (Frey & Osborne, 2017). They include crisis managers, social workers, mid-level managers and the fire and disaster management.

"Our findings thus imply that as technology races ahead, low-skill workers will reallocate to tasks that are non-susceptible to computerisation – *i.e.*, tasks requiring creative and social intelligence. For workers to win the race, however, they will have to acquire creative and social skills." (Frey & Osborne, 2017, p. 269.)

Comparing this with the key competencies forecast for 2020, we can also say that the activities of those who have the "skills of the future" are not exposed to the risk of substitution by computers.

Summing up the competencies marked as the pledge of future success, it is worth classifying them into categories based on the iceberg model. Knowing and analysing the competencies are important in terms of how they relate to sustainability. In addition to their relationship, their capacity for being improved is a priority area. Any competencies can be developed in some way. The question is how much energy these developments require and what tools are needed for a successful implementation.

Table Table 3 demonstrates well that the competencies that are essential for success in the future are all located in the part of the "iceberg" that is not visible.

Table 3 Competencies of the future and the iceberg model

Giles (2016)	**Bach (2017)**	**WEF (2016)**	**Iceberg model Spencer (1990)**
Morality			Personality
Objective/Guideline		People management	Social role
Communication	Collaborative approach		
Flexibility		Creativity	Personality
Fuelling development	Forward-looking, future-oriented		Self-image
Openness	Global oriented and culturally tuned	Critical thinking	Personality
"Shared success and failure" mood	Team building	Alignment with others	Social role
Self-improvement	Technical competence	Solving complex problems	Self-image
Balanced atmosphere		Emotional intelligence	Personality

Source: Edited by the author.

Its significance is, inter alia, that these competencies cannot be developed by conventional methods. So, all the invested energy and resources, which are used for example in higher education to develop the tip of the iceberg, should be considered wasted. I do not wish to draw the conclusion that everything that is currently taking place in higher education in terms of skills development should be discarded, but that deliberate and strategic-level restructuring is needed for the success of higher education in the shortest possible time.

At the end of my paper, I will examine the research question of how this transformation should be carried out according to the literature and research and what tools should be used to ensure success.

2.3.1 Social and economic transition

The importance of the economic sectors has changed dramatically as a result of the fourth industrial revolution. The shift has increased to such considerable size that it can be well quantified now. So, the strengthening of the individual economic sectors (and, in parallel, the decline of others) is also reflected in the way their labour market significance has changed. An increased part of the activities in the primary and secondary sectors (Z. Karvalics, 2007, p. 35.), especially in the developed countries, is carried out other than through work by man. An analysis of employment data also found that while there was a slight decline in the case of middle-income jobs as a percentage of the total employment, there was a significant drop in the case of low-paying jobs (Kutscher & Personick, 1986, p. 7.). In societies where the fourth industrial revolution had started earlier, most of the labour market restructuring has already taken place. For example, in the United States or the western European countries, the number of those working in the first and second sectors accounts for 20-30 per cent of the active population, while it is still hovering around 70-80% in the less developed countries. (ILO, 2018)

The fourth sector is usually broken down further because of the growth in its importance. Education, which is now considered the fifth sector (and appears inside the fourth sector, i.e. services) therefore plays an increasingly important role in knowledge-oriented societies. In developed societies, the share of those employed in the first two sectors has shrunk to those working in the service sector. (ILO, 2018)

The change can be experienced even in the case of China (which, based on the comparison, is in an earlier stage of the transformation) where the change is expected to be faster than in countries with an already transformed economic structure. Every

transformation takes place in parallel in the technological and societal levels (one is the condition of the other). Thus, the technologies developed can be able to trigger systematic changes if the society is ripe for a change (Geels, 2011). However, this also means that if a change is successfully completed in one part of the world, it is now able to spread rapidly thanks to the efficiency of info-communication.

If we want to see a more complete picture of the changing importance of higher education in the info-communication society, it is worth investigating beyond the educational and research activities. In addition to the traditional activities, universities have by now become actors that launch and operate spin-off (innovation) undertakings based on the output of their higher education researchers, which can be used in a business-like manner. On the other hand, a growing phenomenon is that companies have some of their activities carried out in the framework of cooperation outside the company (outsourcing), for example, by mandating a higher education institution (Holczer, 2007).

What I undertake in my thesis is to examine the answers given by higher education to the challenges of sustainable development and the fourth industrial revolution. I examine:

- The strategies (tools, methods) the universities use to get prepared for the global challenges, such as flexible adaptation required by sustainability and to prepare the students for the restructured labour market;
- How much the universities take into account the challenges I have just identified in the research and their other activities; and
- If the universities are able to benefit from these opportunities or, at least, keep up with the leaders by applying the follower strategy.

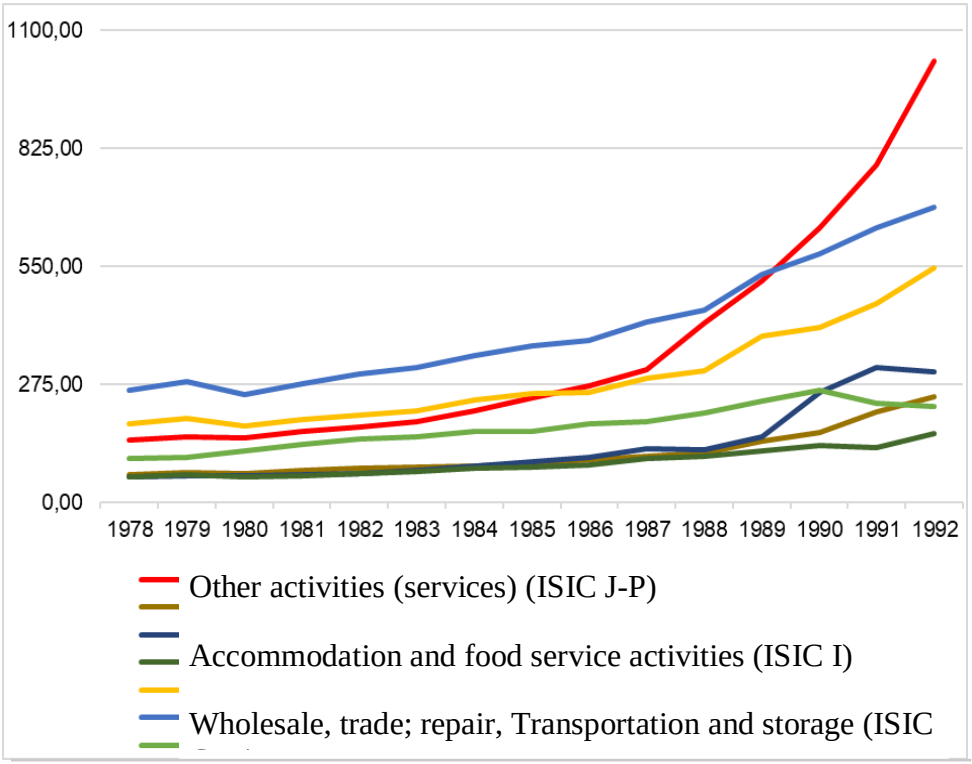
The labour market has changed as a result of the fourth industrial revolution. The significance of the various sectors of the economy has changed both based on the number of employees and their contribution to the GDP. The transformation of the labour market shows a similar run-off in all countries (ILO, 2018) even if the processes are slightly offset from each other in time. The situation is similar in terms of economic impact. The example of Hungary (Figure 13, Figure Figure 14) shows well that the fourth sector took the lead at the time of the system transformation and has been providing a continuously increasing contribution to the economy.

With a constantly increasing social and economic weight, the importance of the fourth sector is the most outstanding from the perspective of the future (Acemoglu, 2002). One

of the conditions to adapt to the accelerating pace of change is that a country must be able to best utilise the available natural and social capital, that is, put the existing resources in the service of social welfare with the smallest loss. One way of achieving resource efficiency is education, just because it tries to use the existing human capital in the most economical manner to obtain maximum performance.

The restructuring of the various economic sectors took place at a different speed in each country. The development of different patterns is partly a result of the economic opportunities and, on the other hand, political and social considerations. The structure generated by the political situation that had emerged in Hungary after World War II changed significantly after the system transition. The competitive disadvantage of some sectors disappeared due to the termination of subsidy to other sectors.

Figure 13 Gross value added by the type of economic activity, at current prices - Hungary (bn HUF) 1978-1992



Source: (UN, 2015) [11]

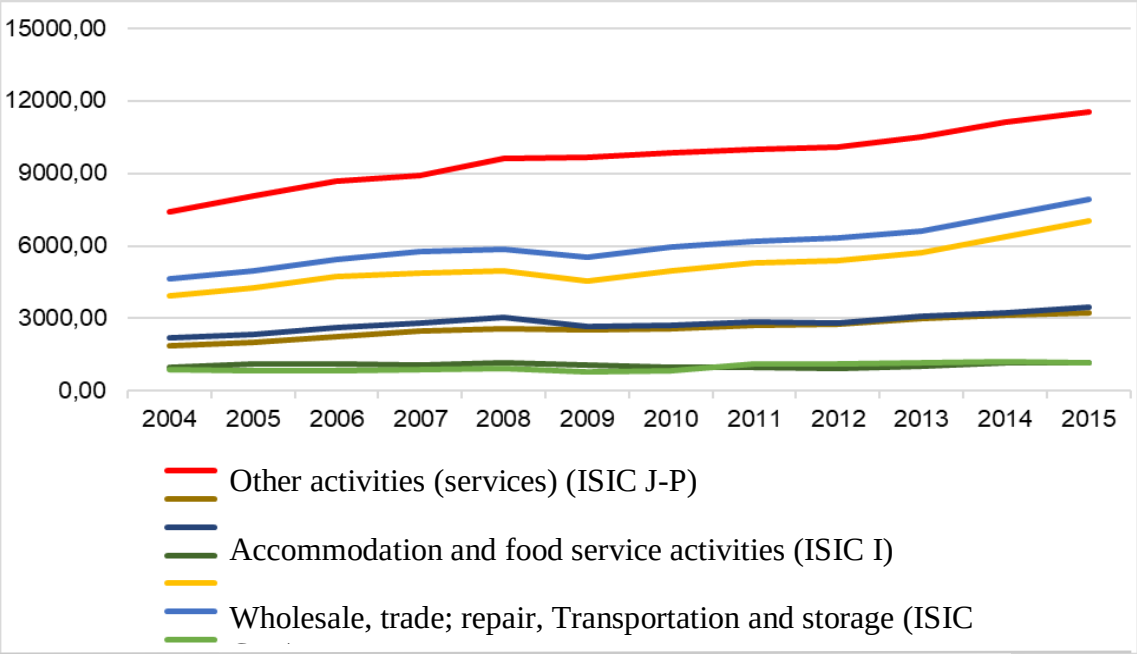
[11] ISIC: According to the international sectoral classification system (International Standard Industrial Classification): (UNSD, 2017) J Financial intermediation, K Real estate, renting and business activities, L Public administration and defence, compulsory social security, M Education, N Health and social work, O Other community, social and personal services, P Activities of private households as employers undifferentiated production activities of households.

Education (ISIC M), which belongs to ‘other activities’ according to Figures Figure 13and Figure 14, began to develop rapidly at the time of the system transition and still holds the leading position it achieved then. (See Figure Figure 14)

The decline of the second sector marks the end of the industrial era or ‘de-industrialisation’ in the foreign term. Over the past 25 years, the share of the manufacturing industry in the total employment fell drastically in the world’s most advanced economies. (Rowthorn & Ramaswamy, 1997, p. 1.) It received a significant boost during the regime change in Hungary, especially when industrial downsizing induced by the political changes, rather than the market, took place.

In addition, Szalavetz also points out in his study that the job-creating capacity of services and the increase of the demand for highly qualified labour in this sector toppled the former belief that services generate low-prestige, low knowledge-intensive and low-paid jobs. (Szalavetz, 2008)

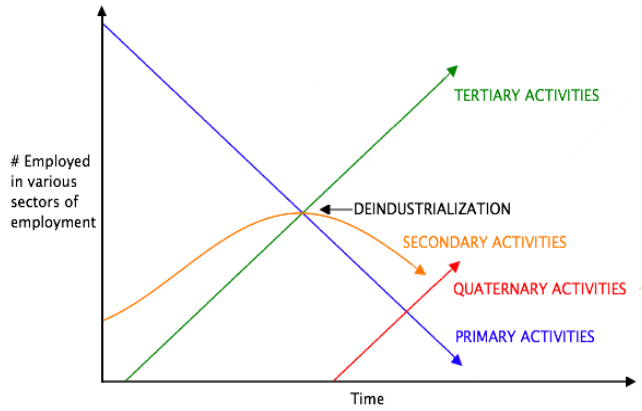
Figure 14 Gross value added by the type of economic activity, at current prices - Hungary (bn HUF) 2004-2015



Source: (UN, 2015)

The schematic depiction of the transformation of the economic sectors (Figure Figure 15) presents the general course of development that more or less all the countries covered during development. Developed countries have arrived sooner to the ‘de-industrialisation’ turning point, while this transition is still in progress in the case of the developing countries.

Figure 15 Transformation in the economic weight of market sectors



Source: Clark's sector model (Clark, 1957), quoted by (Nagle, 1998)

The demand for highly skilled professionals generated by the fourth industrial revolution, on the one hand, and the fact that the ways of communicating the contents in education have significantly changed with the development of the info-communication technology, which can affect the content itself, on the other hand, have exercised a significant effect on higher education. The expanded opportunities (tools and technology) open up new roads in terms of the skills that can be improved. Linked to this is the part presenting the transformation of the leadership competencies in Section 7.2.

2.3.2 Economic development and changes in the quality of education

The economic weights of certain social values have transformed as a result of the fourth industrial revolution. One of the key factors in our current world is knowledge and the opportunity to acquire knowledge as a key to sustainable development. On the other side, ignorance provides an opportunity for others to exert power over us (Scitovsky, 1950). This, that is, inequality at the global level creates the biggest current social problem.

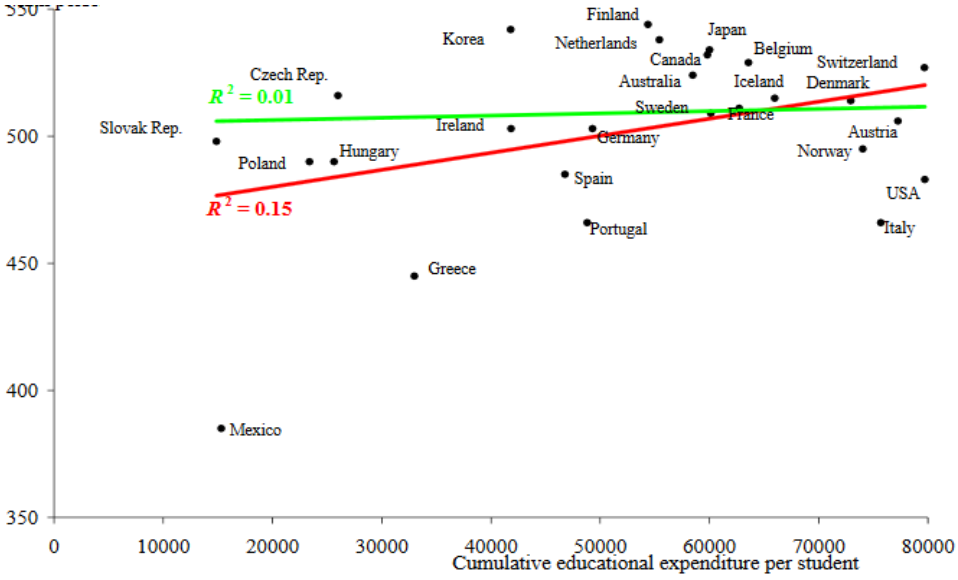
The econo-philosophical approach to knowledge is important, namely, that knowledge, unlike the frequently observed phenomena in the economy, is not behaving as a zero-sum game. "Knowledge is not a shared property. With the increase of knowledge is we are not take it away from someone else. We could say that knowledge is not an economic property." (Pléh, 2004, p. 58.)

It is also proven (Barro, 2013) that economic growth is closely linked to the quality of education. The countries that perform well in international education surveys (PISA) show a better economic picture. Thus, it can be clearly seen that investment in human

capital through formal education can be an engine for economic development (Glomm & Ravikumar, 1992). While the studies examined the different aspects of the effect of education on the economy (Hanushek & Wößmann, 2007), they agreed that the quality of education is a much more important factor than the number of years spent in education. Pritchett points out that economic growth is slow and the real wages are falling in some countries despite improvements in the workers' qualifications (Pritchett, 2001). One possible reason here is the occurrence of the *quality versus quantity* dilemma. While education greatly influenced the enrichment of knowledge and skills in some countries, it was essentially useless and did not develop the skills in others (Pritchett, 2001).

Another important factor is the properly implemented education reform. As we will see later, the challenges of new times require entirely new competencies if a country wants to belong to the world. The education reform, however, is not limited to financial issues. As shown in Figure Figure 16, the per capita cost of education does not correlate with the results achieved by the students.

Figure 16 Relation of spending per student and performance (Mathematics performance in the PISA survey (2003), USD)



Source: (Hanushek & Wößmann, 2007, p. 60.)

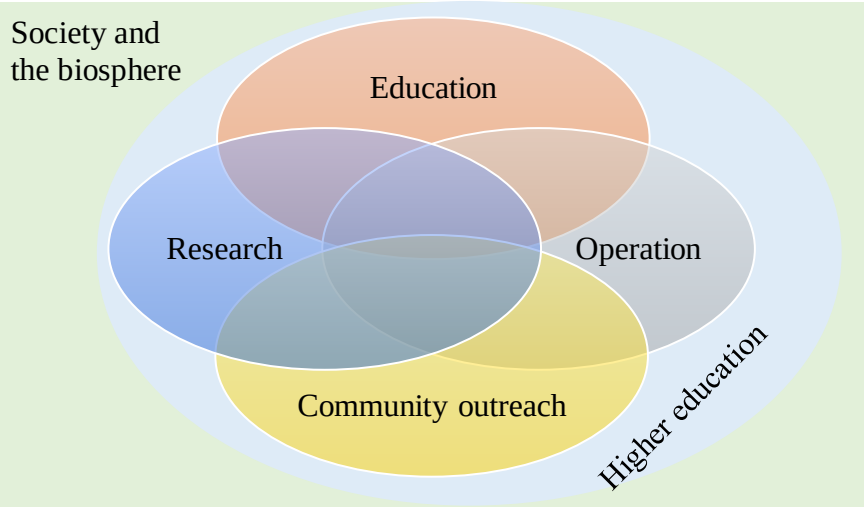
According to Figure Figure 16, omitting the data of Mexico and Greece, it becomes clear (green regression curve) that there is no relationship between spending and student achievement. The performance in countries with high education spending is the same on average as in countries with low education expenditures.

Based on the study, increasing the resources can bring an improvement only to the poorest institutions. The simple resource optimisation measures (smaller class sizes, increasing the teacher's salaries, etc.) have minimal impact on student achievement. The results support the idea that the "quality" of the teachers is a key component of student performance (Hanushek & Wößmann, 2007). Only extensive knowledge content and an institutional system that supports development can enable the education system to comply with the challenges of the new era.

Apart from the economic and funding factors, factors included in the topic of sustainable development also affect education and, thus, higher education. While these are obviously not sharply separated from the above-mentioned changes, they are much more causally related.

The importance of education to achieve sustainable development is a fact recognized and accepted at all levels. Thus, in addition to the UN Decade on education in politically important sustainable development (2005-2014) (UNESCO, 2005), the literature also pays special attention to the relationship between sustainability and education (Hopwoo, et al., 2005), (Sterling, 2016).

Figure 17 Sustainability as an integral part of higher education institutions



Source: (Cortese, 2003, p. 18.)

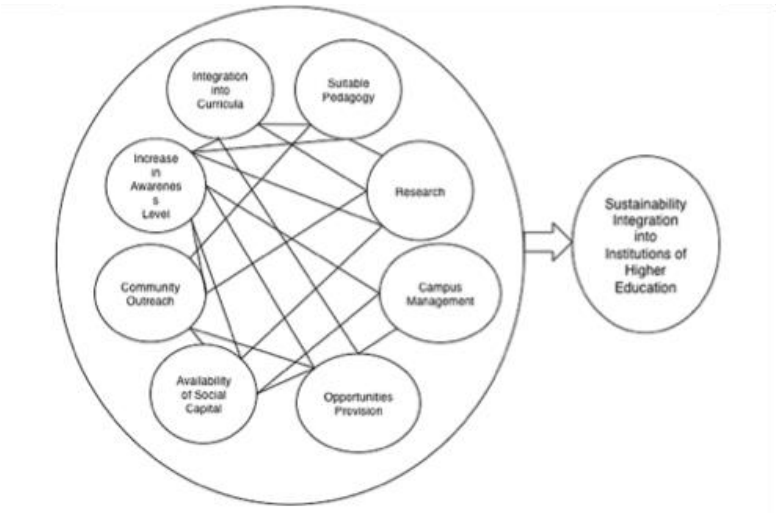
In the case of education, it is a two-way process because the content of teaching can have a positive impact on the realisation of sustainable development (or *vice versa*) while education, as a system of institutions, is transformed by sustainable development. This is a change not only in the content but also in operations. This paper deals precisely with

this dichotomy in the case of higher education institutions. One of the significances of MLP (see Section 2.1.2) lies in the fact that the different levels of changes interact.

Higher education institutions have a number of functions, which and the interactions of which must be examined when you want to interpret the transition to sustainability at the institutional level.

Along with the correlations in Figure Figure 18, the strength (existence), direction and nature of the formation of the relationships (sequence, cause and effect) leads to a pattern characteristic of every institution. This is the structure in which the system transition can be tested. This means that the classical competency transfer roles of traditional universities change and universities with a new structure to serve the demands of the digital era are established, which apply knowledge transfer by means necessary for developing the competencies of the 21st century. This shift, also called transition, can be interpreted in terms of sustainability, and from two directions: first, how the transition serves the achievement of sustainable development and, second, how the shift towards sustainability supports the development of competencies necessary for success in the 21st century.

Figure 18 Factors supporting the sustainability integration of higher education



Source: (Chiong, et al., 2017, p. 919.)

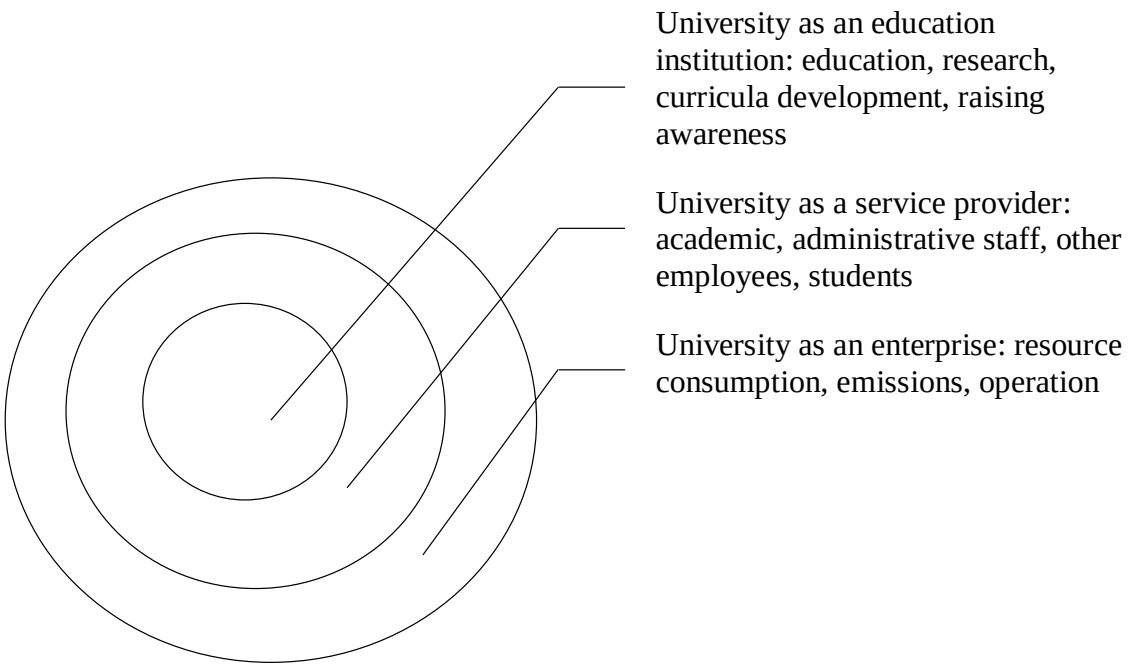
The various dimensions of universities are functioning and interacting embedded into one another and, thus, provide an answer to the challenges posed by sustainable development.

During the subsequent empirical research, I would like to examine first how a university reacts to the challenges from the external environment at the different levels and if these

actions can cause a system-wide change, defining the institution's ability to sustainability transformation.

The nested systems, as well as the main activity and the mission, that is, knowledge (novelty) generation and awareness-raising, as well as the incubation of potential patents, are closely related to each other. The elements constituting parts of the outer two "shells", that is, the physical environment (infrastructural conditions), operational routine (organisation of processes) and human capital (teaching and administrative personnel), as well as the curricula and methodology that form the inner core, may react differently to the sustainability changes. Nesting also means that these responses are interrelated and influence each other.

Figure 19 Nesting of university roles



Source: Edited by the author.

So, I tried to find the answer to:

- What is the role of the universities in the changing socio-economic environment, which is mainly shaped by the fourth industrial revolution and the sustainability challenges;
- What are the most typical initiatives and paths in the sustainability transition of the universities; and
- How these changes affect the university as a whole.

Finally, I intend to examine what unexpected and indirect effects the sustainability transformation of the universities can have, making conscious of which can positively affect the process of changes.

2.3.3 Role of sustainability competencies in a changing world

All dominant sustainability education strategies and programmes give priority to lifelong learning. It is a requirement of the present society, which can increasingly be the key to success and prosperity as a result of the fourth industrial revolution at the individual and social levels alike. (Trilling & Fadel, 2009) During the transformation and automation of workplaces, those have a chance to avoid becoming unemployed who cannot be replaced with robots due to their skills. (Longworth, 2003) These are mostly jobs that require more creativity or are dealing with people (service sector).

More research is currently directed at the competencies we need to obtain to become indispensable in the future as well (WEF, 2016), (Hipkins, et al., 2014)

Learning is not "a prerequisite for life, but an attribute thereof", quoted by (Havas, 2001). In the traditional interpretation, "Citizens have vast new opportunities in terms of communication, travel and employment. Taking advantage of these opportunities, and actively participating in society, is reliant on the ongoing acquisition of knowledge and competences. At the same time, competitive advantage is increasingly dependent on investment in human capital. Knowledge and competences are, therefore, also a powerful engine for economic growth. Given the current uncertain economic climate, investing in people becomes all the more important." (EC, 2002, p. 3.)

Obviously, there are professions, the exercise of which demand continuous development, including learning. The popularisation of life-long learning intends to motivate all adults for continued self-training. "Reducing the social risks of recovering from the economic crisis, increasing economic prosperity and promoting social development lies in the development of human resources in the decade ahead of us." "Hungary has significant problems in integrating school leavers without qualifications and disadvantaged people. Lifelong learning does not get enough attention. There is a significant contradiction between the supply of the education system and the needs of the labour market." (Korm. hat., 2016, p. 7.)

Currently, the theory and methodology of sustainable development appear in higher education and vocational training in ways and degrees different than in public education.

A kind of decline has been observed already in the secondary schools, however, the appearance of the sustainability approach at the horizontal level later is becoming less common because of specialisation. In the bachelor and master system of higher education, most of the degrees include the environmentally conscious approach as degree-specific knowledge. In addition, there are independent bachelor and master degrees in every scientific area and training area, adjusted to the area of environmental sciences (e.g. environmental management in agricultural engineering, conservation engineering, environmental engineering, environmental culture, regional and environmental economics and environmental sciences, as well as visual and environmental culture teacher training, engineer teacher). The number of graduate and PhD programmes on environmental protection and nature conservation has increased in higher education in recent years. Unfortunately, after a short recovery, such diplomas are not very sought after in the market. (NFFT, 2015)

2.3.4 Usefulness of sustainability competencies

After that, the question arises as to what extent do the current academic courses overlap with the competencies required for a successful future?

The transformation of university education is not a short-term process. Nevertheless, it can be performed much faster than the reform of public education and its impact on the labour market will appear much faster, too. Efficiency, that is, the degree of success of the reform, unravels quickly because you need to wait less for having the persons involved in training tested. Perhaps, the only more direct relationship with the market is that of professional further training. Of course, not only the direct impact is taken into account here because, in that case, vocational training and specialized secondary schools can also have a direct relationship with the market, but the time the effects of the reforms introduced in the area of education reach the level of decision-makers.

Educational institutions are largely the products of the technological infrastructure and social conditions of the past. The situation has changed significantly and educational institutions should consider how they can best adapt. One possible strategy, as can be seen, is the development of competency-based training. This means that special emphasis should be placed on the development of skills, such as critical thinking, creativity and analytical skills. (Davies, et al., 2011) However, they can only appear if placed in context by the educational institution in accordance with the specific peculiarities of the

university. This can be done at the level of education and research, through the radical change or widening of the existing curricula and research portfolio. We will see that the first path is less viable, as certain factors (personality of teachers and researchers and rigidity of the system introduced) limit the conversion of the existing curricula and research, the rewriting of which is significantly less efficient than the introduction of new knowledge elements.

The ability to accept and accommodate changes (internalisation) is much better at a younger age. From this follows that in order to keep up with the fourth industrial revolution, we must understand the needs of the growing generation while the institutions concerned prepare them for the labour market of the future. Unfortunately, not all institutions and teachers are capable of such a significant change in approach at the speed the changes themselves happen.

The inflexibility of the education system makes the introduction of the necessary changes complicated, since the academic profile cannot, and is not recommended to, be changed completely within a short period of time.

It can be a life-belt and a kind of bridging strategy in this if the institutions take steps towards transformation by expanding the existing portfolio. As you can see, most of the leading universities, regardless of the profile, handle sustainable development as a priority area, so they usually incorporate it into their portfolio as part of the curricula.

For example, the institutions at the head of the QS ranking have without exception integrated sustainable development and, in some cases, it has grown into a kind of priority task in the life of the institution (e.g. see Annex 23 for Cambridge).

2.4 The process of social transformation

The three major industrial revolutions that have taken place so far and the fourth one, which is now ongoing, have brought changes in the global social space that have resulted in the currently experienced explosive situation. (Hámori, 2013) The inventions and their consequences have turned the former world upside down, especially in (western) Europe and North America. The rest of the world only assisted in the development, which means that they tried to serve the western world's growing hunger for raw materials while they were more and more falling behind. Of course, the "server" countries have experienced progress in many respects, but the gap has constantly widened. (Archibugi & Coco, 2004)

One of the most significant backlogs was experienced in the field of education and training. Or, it can be said that, in addition to the development of health care, the fact that education had become available to all is one of the most important engines of growth. (Grantham-McGregor, et al., 2007) The increasing speed of information flow further intensified and reinterpreted, as well as broadened, the concept of education (Jimoyiannis & Komis, 2007), (Fu, 2013).

Although the possession of information was an important feat in any era, this power can be used much more sophisticated with the spread of the Internet. As the amount of available data and knowledge increases, it becomes more difficult to find genuine and relevant content. In this situation, critical thinking is a skill that helps orientation.

It follows from all this that, in addition to education and the possession of knowledge, a number of new competencies are needed for success. In this research, I do not wish to deal with education as a whole, but only with the level of higher education, including, the realisation of the sustainability transition. I am examining its beginnings, process and effects.

3 Research questions, hypotheses and methods

When speaking of research methodology[12], we are thinking about not just research methods but the logic underlying the methods as well. We explain why we are using a particular method or technique, and not another one, to enable either the researcher himself or others to evaluate the research results. (Kothari, 2004)

The research questions influence (or even determine) the methods (questionnaires, text analysis and interviews) but the methodology and the ultimate answer are clearly that of research.

Basically, the research methods and tools are the following:

- Analysis of literature;
- Empirical data recording: by means of questionnaires (national and international), the Q method and interviews;
- Content analysis.

The research methodology will be presented in this section.

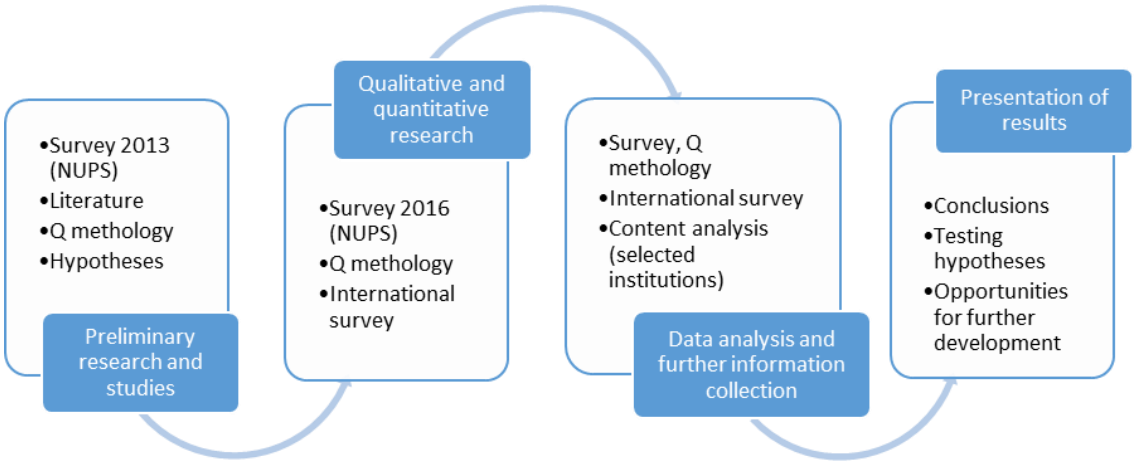
3.1 Theoretical background

The framework for the study is given by a collection of literature, designing the methodology, followed by an analysis, all fitted in the framework of the Multi-Level Perspective–Transition theory. The methodology is an excellent tool for summarizing the process of sustainability transition, which presents the path and the opportunities of the success and the spread (Upscale) of the different pioneering initiatives (Niche experiment) in the light of how the environment (Landscape) changes. The most important question is how the initiatives, which become successful, affect the system (Regime) and if they are able to generate system-wide changes.

The data collection took place in 2016-2017. The reason is that the transition process at the National University of Public Service is still ongoing.

[12] Research methods are the methods and techniques that are used in the research. The research methods and techniques therefore relate to the methods used by the researchers. In other words, all of the methods used by the researchers for studying the research problem are called the research method. In contrast, research methodology is the way the researcher finds answers to the research questions in a systematic way. Methodology = methods and tools + their used according to the research strategy.

Figure 20 The research process



Source: Edited by the author.

And although the process is catalysed by my research, it cannot be slowed down to a speed that my studies and my progress require. In addition, it is important to mention that I, collecting data for my research, I was assisted by colleagues who are familiar particularly with measurement and methodological issues. They helped me develop the tools presented in the next section and recording the data. Since every research raises new questions, in addition to finding the answers, the data collected may also be suitable for studying a variety of other topics.

3.2 Main questions and hypotheses of the research and their study

The following table summarizes the research questions and the hypotheses developed from them, as well as the methods I used to verify the hypothesis in question.

Grouping of the university sustainability initiatives:

I tried to shed a light on the subject from several directions during the research. Based on sustainability, in the sense of compliance with the needs of the stakeholders, I examined where and how the aspects of the external stakeholders (e.g. ratings, rankings, employers, recommendations) and the expectations of the internal stakeholders (teachers, students, staff supporting education and administrative staff) appear more markedly. I tried to find an answer first to that if a university strives for excellence, how sustainability can support this effort.

Table 4. Research questions, hypotheses and methodology

Research questions:	Hypotheses	Methods applied
1. Do higher education leaders understand the importance of sustainable development? 2. Do they understand the importance of their own role and are they willing to take a proactive role in the transformation process?	1. **The existence of a university sustainability strategy reflects the commitment of the leadership.**	Analysis of the NUPS questionnaire Use of the Q method
3. What actions were taken by the universities that were the first to take the road to become sustainable? 4. What are the characteristic patterns of achieving university sustainability?	2. **An essential component of the institutional level integration of sustainability is the conscious integration of the sustainability topic into education.**	Analysis of the NUPS questionnaire Analysis of international questionnaire International recommendations on the sustainability of higher education
5. What are the typical catalysts and obstacles? 6. What drives an institution to devote resources for introducing sustainability?	3. **The sustainability of higher education institutions has become an element of excellence today.**	Analysis of international questionnaire Analysis of international rankings Analysis of the sustainability activities of institutions
7. What can the university win in the long term by integrating sustainability? 8. What can be the social benefit of the sustainability transformation of universities?	4. **A legacy of the integration of sustainability: marketability of the skills that can be acquired**.	Analysis of literature

Source: Edited by the author.

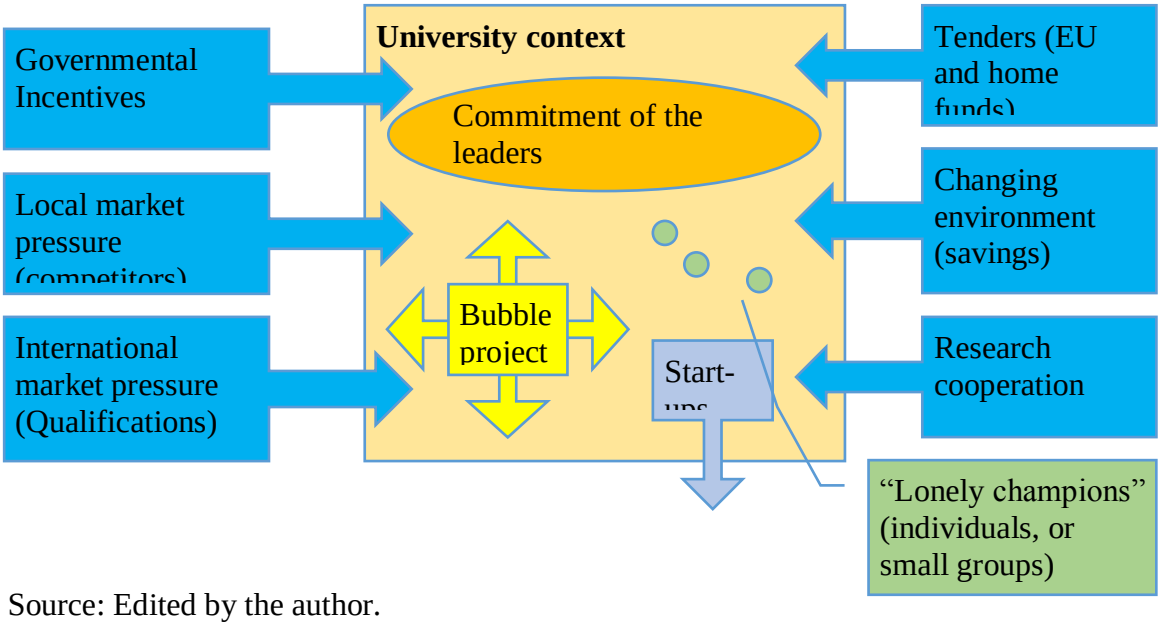
The subject of my research is how sustainability initiatives appear in the different university roles (Figure Figure 19). Then, I group them based on which dimensions of the universities' operations are affected (Table Table 5), respectively, the nature of such an effect. The following are the key aspects: the initiators, what/who are the catalysts and whether this results in an individual or system-wide change.

Figure 21 shows the basic concept of my research. The figure includes the framework for the examination of the hypotheses, which summarizes the reasons and the motivational "focal points" of the initiatives shown.

The different elements in the figure indicate the organisational and structural factors that can have an impact on the process, which, in this case, is the realisation of the sustainability transition.

The **University context** involves all the internal factors (internal stakeholders) whose activities and operation (individuals, units) are linked to the university. There may be components here that include elements outside the university (e.g. external researchers, mandated experts), which (or who) are remunerated (e.g. funded) by the university in some way.

Figure 21 Motivators and catalysts of the university sustainability initiatives and direction of effects



Source: Edited by the author.

I examine the progress of sustainability (initiatives, programmes) in this context during the research. Based on my hypotheses, one of the most important of these is **leadership commitment** (sustainability vision), which is the main component of a successful sustainability transition. The primary impact of the leaders is on their own organisation (but, of course, setting an example through the transformation of the organisation can have an indirect effect on other external organisations as well), while the arrows show the direction of the effect.

The **closed initiatives** launched by small groups are also interpreted in the context of the university. They either die off after a while (which can have be a number of reasons) or manage to survive in the long run and become successful and general (the literature refers to this phenomenon as 'upscaling'), the circumstances and reasons of which I am trying

to answer during the research as one of the possible ways for the university to become sustainable.

Individual actions are also typical during the transition to sustainable development. It means the actions of **champions** or even the collaboration of small communities (informal groups), which is often initiated by a dedicated individual and typically result in limited achievement. Very rarely, there are instances that an individual initiative can spread under favourable conditions and result in a systemic change.

Along with the change (expansion) of the role of universities, **start-ups** have appeared, mostly for the purpose of marketing the research results. These organisational units, which operate more flexibly than the university system (or are independent organisations), are exceptionally suited to be the drivers of change. Or, they can be, based on my assumption, the first followers and the supporters of the transition.

The rectangles in blue indicate the **external factors** (policy environment, domestic market, international trends and opportunities, research collaborations, changes in the operating environment, available resources) that are the external catalysts, initiators or promoters of the university sustainability transition. What makes them remarkable is that they generate changes either intentionally or unwittingly. (For example, an increase of the utility costs can trigger energy saving. Or, the enquiry of a partner about a tender can start processes that activate the students.)

It can be assumed, and I wish to summarize in my analysis, that the catalysts and the actors launch processes at the same time and on several fronts. Many times, it happens that they are "living" side by side independently of each other. A better way is when they are aware of each other's existence and it is ideal if they can work together. But often (especially in the case of larger organisations), such processes start or even function over a long period of time without being aware of each other's existence. This can be assumed especially if the senior leadership is not fully committed to supporting the change and even if they get the information, it will not channel them into a common river bed.

"Co-evolution" also means that the demands appearing on the social level find technological support (information, access to devices) adequate to the change. During the research, I connected the structure described in Figure Figure 21 and MLP, which I analysed earlier and presented as a methodology (see Section 2.1.2). That is, the changes

appearing at different levels of the system are visualized in another dimension in the university framework. While the multi-dimensional approach (MLP) is a theoretical framework, in which the way and manner of the transition can be interpreted, the university's functioning and relationships are dominant from its own perspective. By establishing a transition between the two, I intend to present how the institution-level transition schemes affect the system-wide changes and how they relate to each other by either supporting each other or separately.

Table 5 Dimensions of the operations of universities

Category name	**Category name**	**Category name**
Education	Training on sustainability topics	Bachelor Master PhD Executive (MBA, MPA, etc.)
Research	Research in sustainability topics	Appearance in the research strategy Current research Research results
Institutional operation	Operating areas of universities	Campus operation (operation and maintenance) Policy, strategy and regulatory levels (purchasing policy, etc.) Human factor – Stakeholder management: students, teachers, university staff
Outreach	Community participation/ involvement	Specific social and/or environmental responsibility programmes (participation or initiative)
Financing	Sustainability tenders	Subsidies awarded, the objective of which is some activity related to sustainable development
Image	Regular or non-regular rankings	http://www.bestcolleges.com/features/greenest-universities/ https://www.timeshighereducation.com/news/the-20-greenest-universities-in-the-world/2018495.article
	Communication	Website

Source: Edited by the author.

So, the emerging initiatives can be training or research or they can affect the everyday life of a university as an operating organisation as well.

The emerging initiatives can also be classified according to the operational areas of universities. It is important therefore to consider the type of the measure or strategy and the area it affects during the analysis. On the basis of the above, the individual institutions become classifiable by the areas that have become most pronounced during the transformation or the areas that had the greatest impact on the changes.

My research aims to detect the triggering causes that determine the speed and durability of implementation and the nature of the emerging system. One of the main questions of the research is "why"? That is, what is the impact that drives an institution to the

transformation and what does it do for success (durability). These two are generally, but not necessarily, related.

There are specific initiatives that offer tools for higher education institutions to become more sustainable. One of their greatest merits is community creation. Another important aspect is whether they manage to acquire the support/commitment of a leading university. After all, like in other sectors, there is competition in the university sector as well and, therefore, excellence and the attractiveness increasing through it have a positive effect on the quality of the university.

Comparing all these, I built a table and a matrix that are designed to collect and sum up the results of the surveys, thus making the findings comparable and analysable.

3.3 Placing the aim of the research into context

Below, I present the research topic and the nesting thereof in the broader contexts of research, placing the relevance and validity of the topic and the expected consequences in the focus.

By expounding Figure Figure 2in more detail, I wish the present the arch, along which I walk around the *sustainability-university transition-leadership competencies* research topic. As explained earlier, I set myself the goal to study the triple section of the three thematic areas. To be able to do this, I will make the study first on the macro level, meaning, that I will present the current trends that take place in each thematic area and have an effect on each other, thus shaping the boundaries and the contents of the triple section. Then, I will narrow the investigation to the level of higher education (in general and by analysing the case of some universities and, primarily, the National University of Public Service). The narrowest dimension is the examination of individuals. Here, the competencies and the attitudes are mapped by using qualitative and quantitative methods. This kind of study, carried out on a level-by-level basis, allows for a gradual understanding of the deeper layers of the topic and, then, drawing conclusions in the next phase, moving outwards so to say, in a way that I test the generalizable conclusions of the individual cases at the next level.

3.4 Presentation of the methods and the research framework

In 2013, several tender programmes required the university (NUPS) to draw up a sustainability strategy. For this purpose, it was necessary to assess the baseline. I carried

out the first sustainability-focused screening at the National University of Public Service at that time. (Besenyei, 2013)

The number of responses received during the survey reached a statistically significant size (392), but the total number of employees willing to answer remained fairly low compared to the total headcount. There were 209 completed questionnaires falling on nearly 8,000 students (representing 2.61%), which predicted low activity by the students. Although, at that time, namely during the period following the integration (2012), the adaptation to the changes made it reaching the students and involvement more difficult (Besenyei, 2013).

The 183 responses falling on the 700 public servants showed a better mood for participation (26%).

In designing the structure of the questionnaire, the aim was to get the fullest possible picture of the current status. In addition, it was also important to give proper information to the university citizens about the questionnaire to be filled out and the concepts therein. (Besenyei, 2013)

In addition to the definition of the concept of sustainability and demographic data, the questionnaire also covered the following areas (with the numbers of the questions in parentheses):

- Sustainability skills/experience (1-22) Previous experience with sustainability.
- Obstacles of sustainability efforts (22-31) Own experience regarding the obstacles.
- Sustainability of the University (32-45) Most important tasks of the University related to sustainability.
- Sustainability initiatives in higher education. (46-53) Knowledge of the most important initiatives regarding sustainable development.
- Knowledge relating to sustainability (54-66) Survey of knowledge about sustainability.
- Survey of the feelings about sustainability (67-81) Opinions regarding sustainability.
- Personal habits (82-96)
- Questions regarding teachers/researchers, and sustainability knowledge in the curriculum (97-106)

- Relevance of the knowledge content taught at the NUPS in each of the areas (107-141)

Based on (Kagawa, 2007) and (Ryan & Tilbury, 2011)

- Evaluation of teaching methods (as instructors) in order to introduce sustainability concepts. (142-154) Based on (Kagawa, 2007)
- Obstacles of the integration of sustainability knowledge (155-165) Based on (Dawe, et al., 2003)

The draft evaluation of the questionnaires and the collected operational data can be found in the sustainability strategy. The stakeholder map and the SWOT analysis, prepared at the same time, also form part of the foundation of the strategy. (Besenyei, 2013)

3.4.1 Questionnaire survey (NUPS)

The target group of the online questionnaire survey comprised the teachers, students and administrative staff of NUPS, that is, all university citizens. Using this method, I wanted to map the opinions, attitudes and knowledge of the participants regarding sustainability, sustainable development and sustainable university.

Following a multi-round consultation, I tested the questionnaire both before and after its online programming to understand the length of the questionnaire and the clarity and adequacy of the questions and the possible answers. After the test, I distributed a link to the finalized and programmed questionnaire, accompanied by an explanatory letter. During the time available for filling, I sent two reminder emails to those concerned. The evolution of the number of responses clearly indicated the dates when the reminder e-mails were sent.

The questionnaire, comprising approx. 60-70 questions (which also depended on whether it was filled by teachers, students or and the administrative staff, as different questions related to each topic were asked along the branches), was filled by the NUPS students and employees voluntarily and anonymously. On the other hand, it was also possible to enter personal data, which was provided by less than 10% of the responders.

I recorded the main characteristics of the responders so, for example, the distribution between the faculties can be demonstrated, albeit this does not form a subject of this research.

With regard to the method used, it is important to note that the research cannot be considered representative. It is assumed that those more interested than the average in the

sustainability themes or who are more committed to the organisation were over-represented among the responders. Due to the above, the data can be interpreted with caution, taking into account the relevant number of elements, and should be regarded as high-end and low-end estimates according to the research question.

Examining the three main groups of university citizens, that is, teachers, students and administrative staff, I was looking for answers to the following questions: if they understand (university) sustainability (in particular, the triple optimisation); if they have qualifications in such area; if they know relevant international and domestic documents and enforce the sustainability criteria in their daily lives in their homes and/or the university environment. (See the questions in Annex: 2)

The questionnaire consists of five large blocks (based on the 2013 model):

1. Personal data
2. Knowledge about sustainability
3. Training experience
4. Environmental awareness at home and on the campus
5. Opinion about sustainability

Based on the answers of the responders, the questionnaire contained branches that ensured that everyone answered only the questions adequate to him. It was asked, in the case of the students, if they had sustainability courses and how satisfied they were with them, respectively, in the case of the educators, if they held lectures on such issues, how interested the students were in the lectures and if there was any obstacle to incorporate sustainability topics into the curriculum, etc.

I evaluated the questionnaire by using the SPSS software and cluster analysis was one of the most important tools. Cluster analysis is a process by which the analysed elements, aspects and responders are arranged into homogeneous groups based on some consideration. Cluster analysis is seeking a grouping of individuals, in respect of whom it is true that one individual belongs to one and only one group, and will be similar with the individuals whom he is in the same cluster with, while he differs from the individuals belonging to the other cluster. (Füstös, 2009) The aim of the research is to develop a grouping to find the typical clusters on the basis of the proximity and similarity of the elements. (Szelényi, 2002) The grouping is based on the location of the elements in the N-dimensional space, where each element of the multitude is a point in the space. Since,

in the present case, the responders did not form a homogeneous group while we are looking for the typical opinion groups that are dominant in the institution, cluster analysis is a proper method for putting the multitude into homogeneous classes. Using the appropriate method, we can obtain groups in which the similarity will be high inside the set, respectively, low between the different sets. Getting acquainted with the opinion groups, this will help identify the most characteristic attitudes and, thus, better support the hypotheses.

3.4.2 Use of the Q method

The Q-methodology was developed by the British psychologist William Stephenson (Stephenson, 1993) and is mainly used in psychological research and to determine the various opinion groups. More and more domestic application examples are available, such as (Gulácsi, et al., 2011) in psychology, (Suplicz, 2012) in healthcare, (Hofmeister-Tóth & Simon, 2006) in marketing or (Nemcsicsné Zsóka, 2005) in the research of environmental awareness. The research results of the Q-method are quantified and can be analysed by statistical methods. However, this is fundamentally a qualitative method because it is not intended to formulate universal findings, so it is not necessary that to classify the participants into test groups based on representation criteria, and their cardinality might also be low. Therefore, it is not necessary to have a large number of responders against the number of statements (between 40 and 80) (Watts & Stenner, 2005), (Coogan & Herrington, 2011).

I chose this method to examine the attitudes of the senior colleagues because the sustainability topic is generally difficult to measure by traditional means or can be measured through lengthy interviews only. The reason is that measuring the attitudes becomes more and more difficult in parallel with the spread of information about sustainable development, for example, due to the "learned correct answers". The difference between attitude and the supposed correct answer shows itself, among other things, in that intention and attitude do not finally materialize in action although they are positive things (Vermeir & Verbeke, 2006, p. 171.). In addition, only a few among the test subjects have in-depth knowledge on the subject but, due to their positions, they are reluctant to unveil their inexperience in this "fashionable" subject, especially, if they believe that their areas of science relate to the subject of sustainable development. Therefore, I used the Q method, followed by (additional) short free text questions (Cotton, et al., 2009).

The wording of the statements is a key issue in the Q method. The statements are all the possible opinions, beliefs and positions that may arise in connection with the researched topic. The collection of statements can originate from focus group discussions, interviews, literature and policy documents. Statements are required that properly touch upon certain sensitive points or help subsequently identify and isolate the individual opinion groups. However, since it is not a simple statistical method or sequencing or ranking agreement, but the relationship of an individual statement with another is especially important, the testing and validation of the statements are an important part of the preparation. In this case, the article underlying the questions (Barry & Proops, 1999) was changed in such a way that I took account of the preliminary research results (see Section 3.4.1), as well as personal (informal) data collection and the nature of the university. In addition, the few questions that supplemented the data survey in all cases (see Annex 6) also served sensitisation and the possibility to share additional opinions after the completion of the test.

The Q methodology can be applied in multiple steps. Although personal data collection using the Q method took place in 2014-2015, it has not been evaluated to date. After a long hiatus, the statements, that are not part of my present research, were clarified in 2016. This refinement is based on the experience of the personal data collection and was carried out with the involvement of methodological experts. The goal is a more understandable wording since it was not possible to append comments to the statements in the electronic survey. After this, the digitized version of the Q programme was completed, so the survey was conducted online in this case[13]. Here, the interviews were replaced with a block of open questions, which made it possible to enter comments and additions, and the demographic data were also recorded in this part.

The research section conducted by using the Q methodology is designed to assess the attitudes of the university officials in decision-making positions and how they see their roles. In addition to the general attitudes towards sustainability, I also examined the specific university experience of those asked regarding the subject matter.

The Q method I applied can be well used to reveal personal opinions and differences, as well as to describe various opinion groups. Compared with focus groups, its advantage is

[13] I departed from this in some cases for various reasons but I will present it in detail during the evaluation.

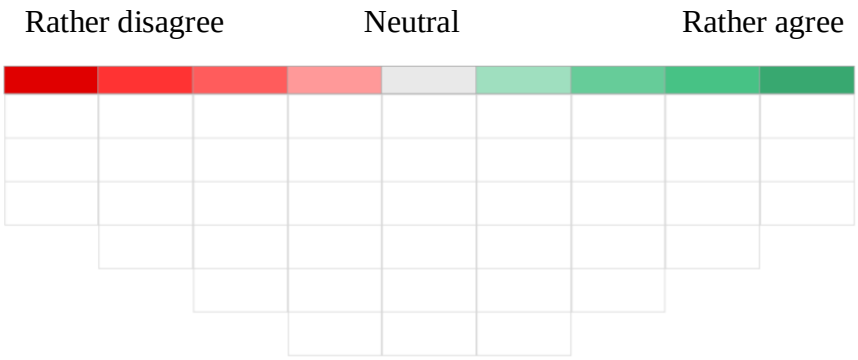
that you come to know the opinion of all interviewed persons independently, so you do not have to worry about that the opinion of the leaders standing lower in the organisational hierarchy does not appear pronounced if it differs from the opinion of the higher ranked leaders. It is also suitable for the in-depth examination of a topic and for quantifying the results.

The survey was conducted among the leaders of the National University of Public Service (mid-level leaders and those in higher positions), based on the list received from HR. The survey was filled online on a specially programmed interface. The participants could reach the interface and fill the survey via a link sent by e-mail. Filling the Q form was voluntary and anonymous (although it was possible to enter personal data). A total of approx. 110 people were addressed by personalized email. Owing to the nature of the research, in developing the scope of the responders, I tried to include people (in leader positions) into the research, from whom I could expect a wide spectrum of opinions, but the representativeness of the resulting sample was not a goal. So, I sent the Q-method questionnaire to people who were not included in the staff records as leaders but (as I am familiar with the operation of the university) I know them to be important opinion leaders and/or have a great insight into the operation of the university as a whole.

Due to the online format, the data are available quickly and in an analysable format. In addition, this form has allowed time and cost efficiency and ensured that the responders could actually share their views anonymously (which was also a disadvantage during the evaluation), as opposed to when the Q-method data recording takes place personally. The advantage of the method is, namely, that the responders fill out the questionnaire when they have time, appears particularly in the case of the leaders as the target group, so we can get to know the views of the university's decision-makers in a way that it is not necessary for all the leaders to be in one place at the same time, which is unavoidable, for example, in a focus group conversation.

The so-called Q-set was the result of the statements selected and tested as described above (Annex 3). The participants were asked to first classify the statements raised into three groups based on whether they tend to agree with a particular statement, tend to disagree with it or are neutral. Then, the responders had to further adjust their opinion by placing the statements in the following grid.

Figure 22 Q-table to be filled with statements



Source: NUPS Q-table (screenshot)

The final positioning of the statements is independent of the triple classification, so the responder can place each statement anywhere, that is, "pre-classification" can be considered as technical assistance only. The essence of the method is that, owing to the grid structure, we can get a response as to how the statements are positioned relative to each other in the individual's order of preference. Unlike in the case of the Likert Scales regarding consensus, which is commonly used in questionnaires considered traditional (e.g. To what extent do you agree or disagree with the statement that ...), it is not the degree of agreement or disagreement that matters but the emphasis is on the position of the statements relative to each other.

The Q-method applies correlations and so-called reverse factor analysis in the analysis. In this method, factors are not created from the statements in the manner established in the socio-statistical procedures but the groups are created from the persons based on the individual Q sequencing (the Q-tables filled by each individual responders). Thus, I also define the correlations pair by pair between the Q-sequences of the individuals. Based on this, a factor, that is, an opinion group will include persons who filled the table above in a similar manner and, thus, are considered to belong to one group opinion.

The individuals who were invited to the Q-method also were among the responders in the questionnaire data recording explained in Section 3.4.1 (like all university citizens), so the opinions of the leaders were potentially included in the questionnaire responses, too.

3.4.3 International survey

In addition to the questionnaire research carried out at NUPS, I also conducted an international survey. The international survey aimed not only to assess foreign universities but also those that operate in Hungary and already have a significant track

record in the implementation of sustainable development. There are universities in Hungary that have a sustainability strategy and domestic institutions appear even in the UI Greenmetric (Section 2.2.4). I contacted them electronically, as well as universities that I knew to have sustainability activity and/or are members of the HuSUN [14] (Hungarian Sustainable University Network) network.

The more detailed analyses aimed to examine the maturation process based on the questionnaire. The results may provide answers to the question of why these institutions achieve outstanding results in the field of sustainable development. (Lozano, et al., 2015). I also tried to answer whether academic excellence is related to how the institution in question handles the issue of sustainable development.

The (English language) international survey asked about the main themes of the research conducted at NUPS, giving priority to the topics that are required to examining a successfully deployable sustainability strategy. (The questionnaire is included in Annex 8.)

The 40 responses received were not suitable for making analysis by using statistical methods, so I used them as an illustration to answer each research question.

3.4.4 Social benefits of sustainability knowledge

In the last phase of the research, I tried to analyse the indirect future effects that can be triggered by a university that is integrating sustainable development into more and more levels of its operation. These effects are also interesting because they occur as a "side effect" of a kind and, taking the global trends into account, I hope to be able to prove that they are indeed very logical consequences and not coincidences only.

Some studies are already dealing with that those capabilities and competencies will benefit in the future and make the labour market outlooks more stable that have an exclusive position in terms of sustainability. It is important to point out here that I interpreted sustainability along the triple optimisation and treated and understood it largely as a societal issue. This means that I do not take the environmental aspects, which

[14] HU SUN (HUngarian Sustainable University Network, in Hungarian: Magyar Fenntartható Felsőoktatási Hálózat) is a forum consisting of students and volunteers, which aims to facilitate cooperation and exchange of experience among the local youth organizations working on making their own communities sustainable. It was established by 4 domestic institutions (BME, CEU, ELTE, SZIE) in October 2014.

are the classic starting point, into consideration in the first place. During my research, I focus more on the human and social factors, such as approaching the benefits and collective benefits of sustainability from the perspective of competencies (Frey & Osborne, 2013).

While analysing the literature, the main areas that I subsequently compared with each other have become distinct. This is nothing else but the competencies that can be developed by the university sustainability initiatives and the skills addressed as the key competencies of the future. For example, according to a study analysing the labour market, the application of collective experience, social intelligence, adaptive thinking, new media literacy, transdisciplinarity, creative thinking and the capacity for virtual collaboration (Davies, et al., 2011) are all important parts of the sets successful future employees will need. However, the competencies that come into the fore of the sustainability transition are the ability for interdisciplinary cooperation, susceptibility to social issues, holistic system approach or creativity. (Wiek, et al., 2011)

I studied, based on a review and comparison of available resources, how much overlap the key competencies of the future show with the competencies that are proven to be improved by the education for sustainable development.

3.5 Comparison of the methods applied

Using the methods presented (see Sections 3.4.1-3.4.4), I start from the general and global changes during the research and the data analysis and then, gradually narrowing the focus, study the responses of the universities to the system-wide changes (sustainability transition initiatives).

Subsequently, I present the "after-effects" of the university initiatives based on the research data. That is to say, whether the changes implemented at the university level have an impact on the system as a whole and, if so, how. Based on the MLP method, this kind of reasoning reflects the concept of sustainability transition.

Table 6 shows the train of thought how I wish to present the correlation between the coupling of the individual areas and their societal level during the planning of the research.

Table 6 Relevance of the different levels of the research topic

Level	Topic	Relevance	Consequences
Macro	Changing world - fourth industrial revolution	Individual and social aspects	Strategic-level planning processes and scientific research - prospects and deprivation
Meso I	Transformation of the education sector - competencies of the future	Response of higher education to the macro trends	Knowledge-based societies - role and responsibility of higher education
Meso II	Topic of sustainable development	Social and economic challenges, exhausting natural resources	Sustainability has/should become part of basic literacy
Meso I+II	Appearance of sustainable development in education	Responsibility of higher education in the transfer of scientific knowledge	Sustainability is placed at the level of higher education both at the level of operation and curricula.
Micro	University-level sustainability transition - institutions, stakeholders, leadership methods	Strategies of some higher education institutions, motivation and success	Increase of knowledge and experience, connection with other areas, utilisation
Meso I	Transformation of leadership and intellectual competencies after the fourth industrial revolution	Matches of the competencies related to sustainable development and the competencies required in the 21st century	Indirect effects of the implementation of sustainable development and the transformation
Meso II	Experience of the transformation strategies and processes	Operation, research foci, educational content and methodology change not only at the institutional level	Spread of "good practice", back-effect on academic quality
Macro	Dynamic development through conscious transition to a knowledge-based economy	Global economic restructuring	Further appreciation of the knowledge worker as a genuine economic resource - also at the forced[15] level.

Source: Edited by the author.

This is one dimension of a multi-dimensional model (starting from the macro level of the society and continuing through the institutional meso level to the individual- or programme- and process-based micro level). This is the dimension that means the triple section[16], that is, taking account of the integration of the *fourth industrial revolution - transforming higher education - sustainable development* into higher education and their nesting with each other. The topic I examine is closely linked to the process of how the economies and societies transform as a result of the challenges of the fourth industrial revolution and sustainable development. The research topic is born and becomes interesting out of this transformation.

[15] Becoming unemployed poses a greater risk for those who are working in easily automated, less complex and, therefore, less knowledge-intensive areas. Not only knowledge is evaluated more, but especially the competencies make the individual concerned indispensable.

[16] Sustainability - Higher education - Leadership competencies

4 Examination of leadership attitude by using the Q methodology

Sustainable development and the environmental, economic and social phenomena appear in everyday life now and play a role not only in strategic decision-making.

Ordinary people can also access information of adequate quantity and quality on the subject if they are open to it. News related to sustainability is found in the quoted journals and the media. There are more and more initiatives also in Hungary (e.g. “Te szedd” (Pick it up!) or “PET Cup”) with the express goal to make the sustainable approach part of everyday life.

The use of Wikipedia is a common method in scientific articles for presenting public awareness and public interest. The following table does not want to throw light on content credibility, rather on that the presence of a heading on the website suggests a general (public) interest. If a heading has more content and is edited by more people, both suggest a bigger interest (Javanmardi & Lopes, 2010), (Niederer & Dijck, 2010).

Table 7 Websites including ‘sustainable development’ in the title in different languages

Language	Displayed title	Length of the site (in bytes)	Number of visits in the last 30 days	Date of creation of the site	Total number of edits	Number of watchers (editors)
English	Sustainable Development	99,485	74,577	08.01.2002	40	438
Hungarian	Fenntartható Fejlődés	17,623	1,374	08.01.2006	202	<30
German	Nachhaltige Entwicklung	31,038	3,380	18.03.2003	976	82
French	Développement durable	156,599	41,011	26.08.2002	4,100	221
Spanish	Desarrollo sostenible	69,675	93,700	15.09.2003	3,629	142
Russian	Устойчивое развитие	60,077	11,952	25.02.2005	295	51
Hindi	सतत विकास	2,180	4,451	31.08.2007	71	<30
Chinese	可持续发展	7,609	5,231	05.03.2004	226	<30

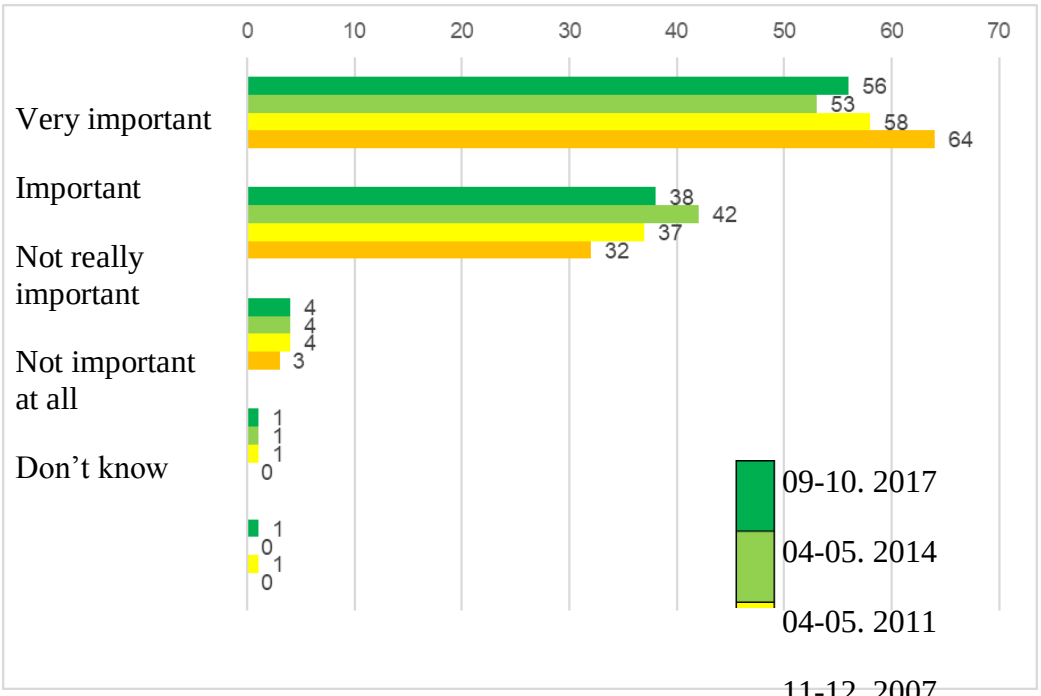
Source: Edited by the author based on (Wikipedia, 2019).

I reviewed what information I could find in the different countries and languages under the ‘sustainable development’ heading related to the Wikipedia site (Table 7). The two oldest entries are the English and French headings. Their length exceeds that of all other sites. The number of editors, edits and watchers also suggests there is much interest in the

subject. And as the article demonstrates, the large number of contributors is a pledge for the accuracy of the article.

Thanks to the wide range of information, certain sustainability issues have become part of the public consciousness. Based on the European Commission's Special Eurobarometer 468 - Attitudes of European citizens towards the environment[17], more than ninety per cent (94%) of those surveyed (27,881 people) responded that environmental protection was personally important to them and, of them, 56% of the responders considered it very important. (EC, 2017)

Figure 23 How much is environmental protection personally important to you? (%)



Source: (EC, 2017, p. 4.)

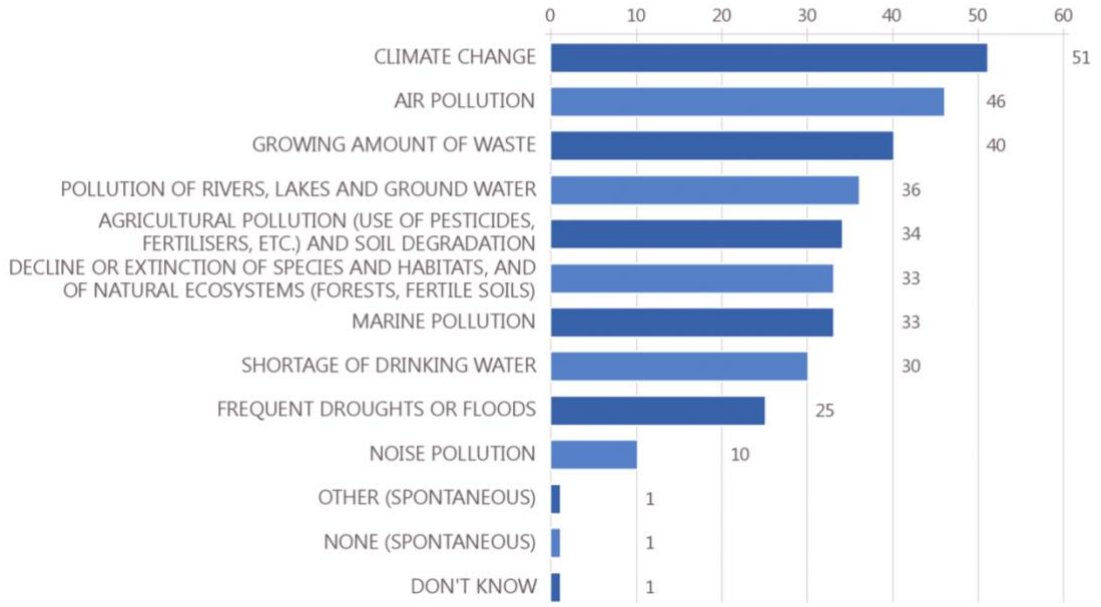
Attention is drawn primarily by climate change, air pollution and the increasing volume of waste.

The importance of the sustainability theme is growing both in the developing and the developed countries although the opinions differ on certain sub-questions. For example, when a question was asked about the root causes of environmental degradation, people from the developing countries typically marked overpopulation, the impotency of the

[17] The Directorate-General for Communication asked 27,881 EU citizens with different social and demographic backgrounds in their homes in their own language by making personal interviews with them.

governments or the lack of education, while the responders from the developed countries primarily marked individual consumption. (Michiko, 2000)

Figure 24 Which environmental issues do you consider the most important? (%)



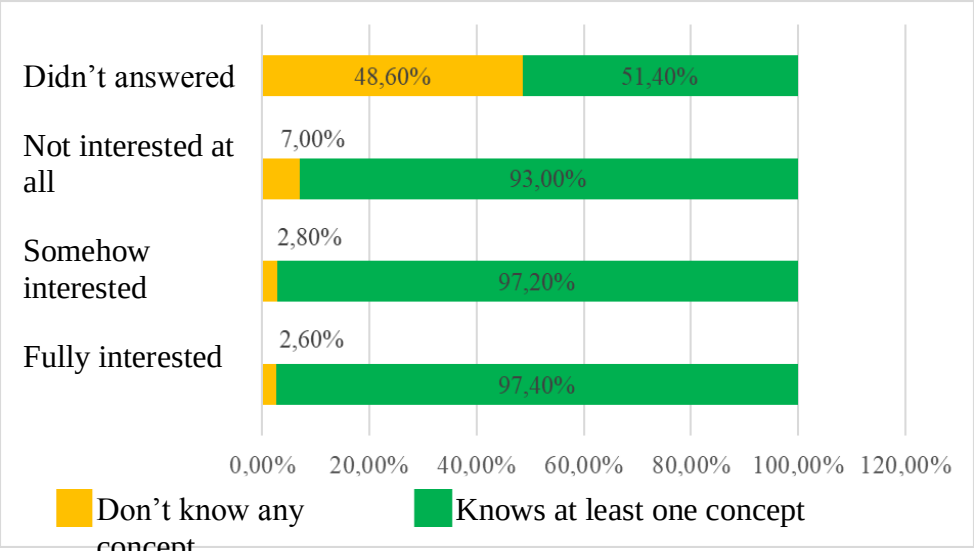
Source: (EC, 2017, p. 5.)

Although transaction costs still seem too high and the potential consequences appear distant and uncertain, the majority of the developed world (commoners, politicians and scientists) have become sensitive to sustainability issues. My own research also shows that more than 90% of the university citizens (National University of Public Service, 2016) said they knew at least one concept from the more abstract theories related to sustainability, such as fairness between generations, precautionary principle, ecological footprint circular economy or life-cycle thinking. On the other hand, the question of how topics related to sustainability were of interest to the responders, 10% replied that they were not at all interested and more than 12% did not answer the question.

It is worth noting that a large percentage of those who did not respond to the question or replied that they were not interested in sustainability, knew at least one sustainability concept. It is assumed that this is not the result of information search led by their own interest, but is due to the increase of the information provided and education.

Contrary to the expectations, people who are not at all interested in sustainability also known sustainability concepts (at least one). Even those who do not take a position with regard to interest in sustainability answered the question about awareness of the concepts.

Figure 25 Crosstable: Awareness of sustainability concepts as a function of interest in sustainability



Source: Own research – NUPS questionnaire 2016

This result is due to that knowledge regarding sustainable development has become part of everyday life. That is to say, it has become part of general consciousness. That is why it is difficult to make research on sustainability attitudes independent of prejudices and prior expectations.

4.1 Justification for using the Q-method

Senior leaders play a key role in shaping organisational culture. Regardless of the type of the organisation, the attitude to change, the attitude of the leaders to the routines of the organisation, the cooperation between them and the dynamics thereof are decisive. Organisational culture is often compared to an iceberg: it has visible forms of appearance and other features they cannot be seen directly and are located beneath the visible surface. The development of organisational culture is influenced by many factors. They can be grouped based on whether they are external factors (natural environment, historical events and culture of the given country), organisation-specific factors (industrial environment, technology), and a deeper layer thereof is the history of the organisation. (Bakacsi, 2010) "Cultures basically spring from three sources: (1) the beliefs, values, and assumptions of founders of organizations; (2) the learning experiences of group members as their

organization evolves; and (3) new beliefs, values, and assumptions brought in by new members and leaders." (Schein, 2004, old.: 225). Organisations, such as universities, must constantly respond to the external effects they face. The role and culture-shaping impact of the leaders are significant in this. As Karácsonyi puts it: "When describing the impact of the leadership the role of leaders in developing a common understanding of reality is highlighted." (Karácsonyi, 2006, p. 72.) So, if we want to explore how an organisation compares to the theme of sustainable development, as one of the key issues of today, we especially have to deal with the attitude of the leaders. As shown by the iceberg model of organisational culture (Hall, 1976), exploring this poses a serious challenge. Caution must be applied with regard to the methods if you want to explore not only the motifs that are on the surface. In order to get to know the hidden unconscious levels, it is desirable to choose a methodology that is suitable for researching more sensitive topics. This is why I chose the Q method. The strength of this method lies precisely in its ability to reveal the preferences, emotional attitudes and motivations that can be tested much harder by other methods. In addition, the Q method does not require large numbers of samples to draw valid conclusions (Exel & Graaf, 2005).

"Q method is not the only research technique that can reveal social perspectives. One way to think about Q is as fitting under the broad umbrella of "discourse analysis techniques." Discourse analysis is a large category of methods to analyze texts in order to find underlying patterns or meanings. Like other methods to explore subjectivity, Q method is self-referential. That is, people doing the Q sort are expected to respond to statements using internal yardsticks. An advantage that Q method has over other forms of discourse analysis is that the participants' responses can be directly compared in a consistent manner, since everyone is reacting to the same set of Q statements. This is not usually the case in other kinds of qualitative discourse analysis." (Webler, et al., 2009, p. 6)

4.2 Mapping of "common talk" (the discourse)

An important step in the preparation of the Q methodology[18] is to have information about the common talk in the given community. This knowledge helps you to be able to focus on the real problems when drafting the statements and to compile a set of statements appropriate for the goals of the research. In this case, different tools were available to me

[18] https://akfi-dl.uni-nke.hu/fftk/q/#/kezdolap

for mapping common talk. First, being an employee of the organisation, I was able to obtain the required content elements through more informal channels and, second, information was also provided by the 2013 survey that preceded this research. The 2013 survey was designed to map the knowledge and attitudes of university citizens in terms of environmental protection and sustainability. It was the first research of this kind at the university, so the results of this survey can be considered as the initial state. I used the image that developed on the basis of the responses to the questionnaire during the data survey conducted in 2016-2017. I repeated the questionnaire survey (with an extended series of questions) and, in applying the Q methodology, I took into consideration the topics that proved to be the characteristic pattern on the basis of more than 300 responders. Another result of the first data survey was that the colleagues turned to me at the university with their sustainability issues. I had a chance to "sample" the topic of common talk on sustainability through courses and curriculum development. This contact-based knowledge sharing proved to be very useful, even if it is not considered scientifically evaluable.

To understand the common talk, I studied secondary sources that are connected with university sustainability, such as the sustainability strategies of other domestic universities (Sustainable Development Strategy of the University of Debrecen, Sustainable Development Strategy 2011 - University of Szeged, Corvinus University Institutional Sustainability Strategy, Sustainable Development Strategy of the University of Pécs, etc.) and the articles and research reports on the subject. (Csutora, 2011) Given that students are the key players in academic life, knowledge about the international "public speaking" should not be ignored during the search. Thanks to the intense and supported international cooperation, novelties that have been successfully introduced by the universities of more distant countries appear soon in the field of sustainable development. Owing partly to the foreign students studying at the university and partly to the Hungarian students returning from the ERASMUS programmes, initiatives that had previously been held unworkable materialize as an actual demand to the students. An example is the development of a community garden within the university campus or the rewarding with credits of voluntary work in the interest of the community. The essay is accompanied by the question of why are not the initiatives that do not require significant financial investment realized, either, despite the demand in place and positive leadership attitude.

4.3 Preparation of the use of the Q-method

"The main purpose of Q-methodology to form types from opinions on a particular topic, using quantitative analysis techniques." (Zsóka, 2005, p. 101)

The initial study I used (Barry & Proops, 1999) applied the Q-method to examine the potential benefits of the Local Employment and Trading Systems in the United Kingdom. The Q-method is a qualitative but statistical approach that allows exploring the common talk in the given community[19], that is, how the individuals interpret their behaviour and understand the social and environmental correlations thereof. In this case, common talk is considered an institutionalized way of thinking in the social sciences meaning, that is, a social borderline that determines what "can" be said about a particular matter. Common talk influences our views, so getting to know it is inescapable for describing the social phenomena. (Virágh, 2014) In this case, exploring the common talk that is dominant on the subject of sustainability in the given institution is essential for the examination of the implementation of university sustainability, including the analysis of leadership approach.

The Q methodology allows researchers to filter out the "idealised" manifestations caused by common talk based on the comparison of the individual answers and the examination of the correlations. (In the context of ecological economics, such discourses were revealed *inter alia* by O'Hara (O'Hara, 1996) by exploring the role of "discourse ethics" in environmental decision-making and environmental assessment.)

4.3.1 Formulation of the Q statements

In drafting the statements, I used the statements in the article by John Barry and John Proops (Barry & Proops, 1999, p. 342) as the basis, which I edited based on prior research and information collection and customized to the conditions of the NUPS. Since that study examined sustainability sensitivity from the viewpoint of a particular topic (Local Employment and Trading System), the use of general statements was relevant. In designing the rest, I kept in mind that I had to be able to draw conclusions about the relationship between the attitude of the senior managers, as a target group, and the performance of the university. I tried to be provocative in some places and formulate

[19] Elsewhere, the term 'discourse' is used for the same concept.

statements that are able to achieve that the effect the persons filling out the test really make a stop and think about how much they agree with the wording.

The statements can be grouped in various ways. One such division examines the questions from the perspective of sustainable development and implementation by the universities.

- They are **general** in nature, that is, ask about a general (common) sustainability topic, such as water or food waste or climate change issues.
- The statements **relate to the organisation** and examine sustainability in the context of university operation. They include the topics of feasibility, as well as scientific advancement, curricula and research.
- The statements regarding **personal responsibility** specifically focus on the "who is responsible and for what" question.

In selecting the statements, I tried to ensure that the statements appear in each of the three topics in appropriate proportions. The reason is that the focus of the research is the approach to general knowledge, the emergence of sustainability at the university level, as well as the role and individual responsibility of the leaders.

I intend to use the Q method to prove the first hypothesis, which is the result of the research question of what are the conditions for the sustainability transformation of a higher education institution. The institution-level appearance of sustainable development and the road to the conversion of the whole organisation are unique in every case, although there are patterns and content elements that are typical of most institutions. Some of these elements have developed on the basis of practical experience, while others reflect the stakeholders' expectations. For example, leadership commitment is an expectation in the case of the environmental management systems, in addition to the presence of strategy, objectives, implementation, monitoring and regular re-planning on the basis of experience. "It is thus essential that top management commitment is achieved and maintained throughout the EMS process for it to be successful." (Zutshi & Sohal, 2004, p. 404.)

"In general, management support is a critical element of adoption and implementation of innovations in an organization" (Hessami, et al., 2012, p. 524.).

So, in the first step, I tested whether or not the existence of a strategy also means commitment by the leaders.

Hypothesis 1: The existence of a university sustainability strategy reflects the commitment of the leadership.

Most of the universities I have studied have a sustainability strategy, which is discussed and approved by the democratic bodies of the university.

Table 8 Set of statements of the Q-method used at the NUPS

No	Statement
1	Sustainability depends on the governments and companies because they hold the power and they can do whatever they want.
2	Sustainability is a hot topic, which is too much dealt with and the term has also become overdone.
3	Research on sustainability is still functioning well at the universities.
4	Teaching the sustainability principles should be included in the curricula of all fields of science at all levels of education, even at the expense of the number of classes currently held.
5	It is sufficient to address the sustainability issues at the level of organisational units only.
6	The damage caused by consumption should be recovered even at the price of an increase in the price of the products/services.
7	The root causes of the economic crisis are greed and, ultimately, money.
8	Students are open and cooperative in respect of the sustainability initiatives.
9	Conservation of drinking water is not the most important task because there is plenty of it in Hungary.
10	A better environment begins with ourselves. If we want to live a more sustainable world, we should first have a look around our own house.
11	The issue of climate change has already slipped out of our hands and we cannot do much.
12	Climate change is a real threat to humanity.
13	The environmental crisis also involves the possibility of a new kind of economy.
14	Environmentally sustainable organisations are more likely to be successful in the long run.
15	Greed is not part of human nature.
16	Multinational companies do not pose a serious threat to environmental sustainability.
17	The working atmosphere and human relationships are more important than the salary.
18	Non-leader colleagues are open to and cooperative in sustainability initiatives.
19	The real problem is caused by the poor institutional background and the regulations in Hungary.
20	The taxes payable for pollution should be increased to make the companies pay the damages caused to the communities and the environment.
21	The problem of the society is that many people are wasting resources just because they can.
22	The fulfilment of the scientometric objectives exhausts my resources so I do not have time for anything else.
23	I choose an environmentally friendly product even if it is more expensive.

24	The sustainability programmes of the universities contribute to the achievement of sustainable development only marginally but, compared to this, are resource-intensive.
25	The university has a high resistance to changes.
26	I do not consider food wasting a problem in Hungary.
27	People are planning on a short term and do not think about the long-term consequences.
28	It is important to promote minimizing energy and water consumption because it is cost-effective.
29	Large-scale livestock breeding is a barbaric thing.
30	This is an immoral consumer society.
31	If you want a stable people-centred economy, the difference between "work" and "leisure" must be reduced.
32	I would be willing to train myself on some of the themes of sustainability in my free time.
33	It would be good if we did not stick to the daily problems and were dealing with the more global cross-border issues of sustainability.
34	Today, a leader must be aware of the correlations of climate change because it is part of the general culture.
35	A developed country is not where the poor travel by car but where the rich use public transport.
36	I do not think university sustainability could be achieved in practice.
37	You cannot concentrate on one area because the environmental issues are interrelated.
38	I do not call myself specifically "green".
39	I do not consider appropriate the top leaders' attitude to issues related to sustainability.
40	I do not have enough influence to support the university's sustainability efforts.
41	I gladly assume a proactive role when it comes to defining the university's sustainability guidelines.
42	I believe there will be a technical/technological solution for most environmental problems.

Source: Edited by the author based on (Barry & Proops, 1999, p. 342.).

Subsequently, during the questionnaire data survey (NUPS questionnaire 2016), I repeated a number of statements that were included in the Q method research in the form of questions, and there are areas that are explained in more detail in the questionnaire, such as appearance in education.

4.3.2 Selecting and inviting the stakeholders

The data survey was conducted among the leaders of the National University of Public Service (mid-level leaders or those in higher positions), in order to explore the attitudes of the local decision-makers on the topic of sustainability. The questionnaire was filled online on a specially programmed interface. The participants could reach the interface and fill the survey via a link sent by e-mail. Fulling the questionnaire was voluntary and

anonymous. This had the disadvantage that I did not have sufficient information on the responders in terms of, for example, their research area, leadership position or even their organisational unit at the university. However, in order to increase the willingness to fill, I decided to take this risk. I addressed a total of 110 leaders by e-mail on the basis of the list received from the Human Resources Department. Owing to the nature of the research, in developing the scope of the responders, I tried to invite people to take part in the research, from whom I could expect a wide spectrum of opinions but the representativeness of the resulting sample was not a goal. I intended to apply the Q method to assess the attitudes of the leaders, so I did not cherry-pick from the address list I received, so the invitation letter was sent to all the leaders in the list I received. Finally, the answers of 27 persons of the 49 replies were selected and analysed. The selection was based on who gave answers to the open text questions supplementing the Q method. Thus, the additional "interviews" could be used to further analyse the results of the Q method.

Due to the online format, the data were available quickly and in an analysable format. In addition, this form allowed for time and cost efficiency and the responders to share their views anonymously. The advantage of the method, namely, that the responders filled out the questionnaire when they had time, manifested particularly in the case of the leaders, as the target group, as it was not necessary for all the leaders to be in one place at the same time to allow us to come to know the views of the university's decision-makers, which is unavoidable, for example, in a focus group conversation.

4.3.3 Placing of the statements

The so-called Q-set was the result of the statements selected and tested as described above. Next to the statements, I present the abbreviated version used during the processing, which is a 60-character form necessary for the software evaluating the methodology.

The Q methodology is based on the "Q-sort technique", in which (if offline) the individuals are required to prioritize the statements shown in the cards (Q-set), which are organized in a pre-arranged shape, on the basis of how much they agree or disagree with the cards compared to each other. This research was done online, so the people invited were informed about the topic of the research in a short introduction. Then, moving ahead, they could read the statements one by one. Using the programme, they first had to divide the statements into three groups according to whether they agreed with the statement,

disagreed with it or it was indifferent to them. Then, the responders had to further adjust their opinions by placing the statements in a certain shape.

“The sorting will result in the individual rank order of each respondent. These rankings are called Q-sorts. In the evaluation process the method compares preference orders in pairs (that is Q-sorts) and determines their correlations. The process results in an inter-correlation matrix, out of which factors, i.e. typical Q- sorts containing the “common denominator” of individual opinions, can be generated by means of principal component or centroid method.” (Zsóka, 2005, p. 102.)

The final positioning was independent of the triple classification. The responders could place each statement in any cell of the shape, that is, “pre-classification” can be considered as technical assistance only.

The essence of the method is that, due to the method (the shape to be filled in), we primarily come to know how the responder expresses an opinion on the given statement in comparison with the relationship system rather than the extent a responder agrees or disagrees with the individual statement. That is, compared with the scales commonly used in traditional questionnaires (for example, the 5-7-10-grade Likert scale: To what extent do you agree or disagree with the statement that ....), the method gives additional information in terms of that the position of the statements relevant to one another is also of importance. Of course, this also results in distortion and the researcher has a great responsibility in formulating the statements, because it forces the responders to take a stand and rank the statements even if they agree with, or reject, both. In this way, the responder can complete the final table through pairwise comparisons, which well reflects a person’s attitude in the ideal case.

The Q method examines the correlations between the opinions of the leaders included in the sample during the analysis and uses factor analysis to facilitate the identification of the main opinion types.

The data survey using the Q method was supplemented with a structured interview, during which I expected answers to questions like “how would the responder formulate what, in his own words, sustainability is?” and “where does he see the position of the university, including his own role, in the realisation of sustainable development?” or “what steps should be taken to begin the transformation in the university and what obstacles should be expected?”.

Questions supplementing the Q method:

1. In your opinion, what does sustainability mean? Please formulate briefly.
2. How does your current job/research relate to sustainability?
3. In your opinion, what do you think the NUPS's role can be in achieving sustainable development?
4. In your opinion, how (using what) should the implementation of sustainability be started at the university level?
5. In your opinion, what are/will be the main obstacles? How can you prepare for and prevent them?

4.4 Factor analysis and implementation of rotations

Factor analysis is a data analysis method for reducing the number of variable dimensions observed. The procedure aims to decrease the number of variables with the least possible loss of information while describing the same phenomenon. Thus, an important criterion is that the same conclusions can be drawn from the transformed data as from the original data. The aim of factor analysis is to find, "behind" the variables describing the phenomenon, the hidden variables that explain the phenomenon under investigation. Their number is smaller than that of the original variables and they are independent of one another. During the rotation of factors, the factors that are difficult to understand can be simplified. The variables resulting from the rotation, which are the same also with respect to the original variables, should have an even greater factor weight. In contrast, the variables that had a lower factor weight will have an even lower factor weight. The factor structure obtained through this process is easier to interpret and can be named based on the most typical variables. (Füstös, 2009)

Transforming both the factor coefficient matrix and the factors with an orthogonal matrix, a new model is created that is fully equivalent to the old one. Rotation aims to allow for the easier interpretability of the factors.

In the case of the Q method, the factors are created other than in an ordinary way. Social statistics generally asks the opinion of 300 to 1000 responders by using questionnaires and creates factors from the answers to the questions. The goal in these cases is to reveal the opinions that are moving together based on the examination of the position of the statements. In the case of a questionnaire survey, the quality of the questionnaire is also important, inasmuch as the responders form a representative sample. In applying the Q

method, the "statements" should reflect the "common talk" with the proper representativeness. The statements are considered good if there are statements concerning all the essential elements of public talk. In the case of the Q method, groups are created from the individuals based on the individual Q sequences (i.e. the tables showing how each responder arranged the statements), so the correlations are also determined as pairs between the persons' Q sequences. Based on the above, persons will be included in a factor, that is, an opinion group, whose Q tables filled with statements are overlapping. This means in practice that persons belonging to each factor largely agree and disagree with the same statements and even the intensity and the ranking of the agreement or "disagreement" are similar as a result of the pairwise comparison of the statements.

The typical opinion groups can be interpreted based on the rotated factor matrix. In the analysis we carried out, the three factors combined, received after the rotation, explain 58% of the variance.

In Table 9, the dominant elements of each factor, that is, the responders represented by the given factor, are marked by X, and colours mark where the preference order of a responder can be unambiguously identified with a factor. Clear identification requires that the responder is characterized by a high factor weight (value close to 1) in one factor, while the values in the other two are close to 0. Such a factor structure is relatively rare in practice. In our case, we found only a few among the 27 persons interviewed who can be clearly characterized by just one factor.

Table 9 Rotated factor matrix

	Identification of responder	**Factor 1**	**Factor 2**	**Factor 3**
1	1. Female-26	**0.5448X**	0.0371	0.4926
2	2. Male-48	0.4282	0.3519	**0.5694X**
3	3. Police PhD	**0.6178X**	0.3447	0.2473
4	4. Engineering PhD	0.1040	0.2502	**0.8475X**
5	6. Police habil	**0.5546X**	0.4924	0.0940
6	8. Security	**0.7013X**	0.4388	0.2299
7	10. Engineering habil	0.1925	**0.6972X**	0.4575
8	12. Pedagogy	**0.5993X**	0.3620	0.5515
9	17. Culture	**0.4369X**	0.4177	0.3661
10	21. Centre, male	0.4322	0.3629	**0.6156X**
11	22. Administrative	**0.6266X**	0.2880	0.3209
12	23. Female-46	0.3658	**0.3554X**	0.2684
13	26. University Student Council	**0.6937X**	0.3941	0.3259
14	29. Soldier-51	**0.5507X**	0.4559	0.3689
15	31. Soldier PhD	-0.0002	0.4897	**0.6316X**
16	32. Humanist	-0.2180	**0.7040X**	0.0906
17	33. Female-41	0.4673	**0.4556X**	0.3053

18	34. Soldier habil	**0.6279X**	-0.0133	0.2929
19	35. Lawyer	0.4500	**0.4458X**	0.4370
20	36. Centre, male 57	0.5597	0.0771	**0.5691X**
21	39. Project manager	**0.9871X**	0.0108	0.0960
22	40. Lawyer, male	0.1257	0.2005	**0.5845X**
23	41. Police, female	0.4921	0.1191	**0.6151X**
24	42. Industrial safety	0.2173	**0.6553X**	0.0895
25	44. KVI (Disaster Prevention Institute)	0.1753	**0.6118X**	0.1394
26	47. Professor	0.3365	**0.5410X**	0.3634
27	48. Geographer	-0.2589	-0.0352	**0.5726X**
	Explained variance in %	22	17	19
	Number of determining variables	11	8	8
	Composite reliability	0.978	0.970	0.966
	Standard error of factor values	0.149	0.174	0.186
	Own values	12.2450	1.8633	1.5194

Source: Own research (Q-method survey)

The methodology requirement of factor analysis can be easily formulated: factors should be tested, whose self-value is higher than 1.0 per factor (Stehle & Huck-Sandhu, 2016).

Based on the scoreboard of the analysis, there are seven factors meeting this criterion. The reason that I examine only three factors is that these factors include 5 to 8 persons each, while the following factors include only 1 or 2. As regards the application criteria of the method, the literature agrees that each factor should be identified based on at least 3 to 8 individual opinions.

4.5 Presentation of the results

Less than usual, I start the evaluation of the factor analysis at the end, that is, with the statements on which the surveyed leaders agreed, i.e., those that appeared in similar positions in the order of priority of the responders in all three factors.

With regard to sustainability research, ‘agreement’ means that either they have no information about the research or they do not want to express an opinion, and there is full agreement also on that it is not sufficient to deal with sustainability at the institutional level.

Table 10 Common statements

No.	Statements	Factors					
		1.		2.		3.	
		Q-SV	Z-SCR	Q-SV	Z-SCR	Q-SV	Z-SCR
3*	Sustainability research is functioning properly at the NUPS now.	0	-0.06	0	0.15	-1	-0.28
5*	It is sufficient to address sustainability at the level of institutes.	-3	-1.36	-2	-1.12	-3	-1.33
9*	Drinking water is plenty in Hungary, its conservation is not a priority.	-4	-1.94	-4	-1.63	-4	-2.00
13*	The environmental crisis is a new kind of economic opportunity.	1	0.58	2	0.66	0	0.22
15*	Greed is not part of human nature.	-2	-0.87	-3	-1.16	-3	-1.32
16*	Multinational companies do not pose a threat to sustainability.	-3	-1.14	-3	-1.47	-3	-1.38
24*	The sustainability of universities is expensive and does not have much effect.	-1	-0.73	-2	-1.03	-2	-0.66
26	Food wasting is not a problem in Hungary.	-4	-1.94	-3	-1.36	-4	-1.71
27	People are planning on the short term.	2	0.78	1	0.52	3	1.07
38*	I do not call myself specifically "green".	-1	-0.37	-1	-0.58	-2	-0.68

Source: Own research (Q-method survey).

Perhaps the successful integration of the Baja campus envisages that the issue of drinking water is considered the most important sustainability issue by all groups.[20]

Interestingly, the responders replied in the questionnaire survey carried out as part of the research (NUPS questionnaire 2016) that the issue of water did not appear sufficiently in the curriculum. The question related to whether the individual topics appeared in the courses with the correct weight (see Figure 36).

Based on the data recorded by using the Q method, all leaders considered food wasting the most important problem. Interestingly, public opinion about food security is that it is not sufficiently addressed in the curriculum.

[20] At the time of the research (2016), we were not aware of the intention that the Water Construction and Water Management and the Water Supply and Environmental Engineering Institutions of József Eötvös College of Baja would be attached to the National University of Public Service as a new (Water Sciences) Faculty in 2018.

The analysis cannot give a clear answer to the rightful question whether the reason for giving a negative answer (-4 in most cases) to the statement 26 (food wasting is not a problem in Hungary) by almost all was that they considered it important but felt that the issue was not sufficiently addressed or because the two things were independent. A clarification answer to the question could be given by means of additional in-depth interviews, but exploring this was not possible within the framework of this research.

There was full agreement among the responders also in that greed is part of human nature and the responders considered the impact of the multinational companies on sustainability clearly unfavourable and problematic.

Following a review of the points of agreement, I will present how the opinions of the colleagues in each factor differ. The factors were named based on these statements (differences).

4.5.1 Factor 1: "Resigned, puzzled"

Those in the first factor agree with at least two fundamental truths. The first of these fundamental truths is that the global issues of sustainability must also be addressed. The other axiom is apparent only. Statement 42 suggests a kind of techno-optimism that accompanies the development of the profession but occasionally lets us down. Interestingly, those in the third factor have significant doubts about this.

The colleagues included in factor 1 are distinguished from the rest by the statements identified in factor 1 marked with an asterisk.

Table 11 Characteristic statements of the "resigned, puzzled"

No.	Statements	Factors					
		1		2		3	
		Q-SV	Z-SCR	Q-SV	Z-SCR	Q-SV	Z-SCR
33	The global issues of sustainability must also be addressed.	4	1.47*	1	0.51	1	0.49
42	There will be a technical solution for the environmental issues.	4	1.44*	2	0.65	-1	-0.62
41	I would undertake a role in university sustainability.	1	0.52*	-1	-0.69	-1	-0.32
17	Working atmosphere is more important than the salary.	1	0.18*	3	1.16	2	0.96
19	The real problem is the poor institutional background and the regulation.	0	0.12*	-1	-0.69	-1	-0.56
23	I choose an environmentally friendly product even if it is more expensive.	0	0.11*	4	1.68	2	1.04

39	The attitude of the leaders towards sustainability is inappropriate.	0	0.02*	-2	-0.76	-3	-1.41
28	Resource-saving aims to reduce costs.	0	-0.10*	1	0.53	-2	-0.83
7	The root causes of the economic crisis are greed and money.	-1	-0.11*	2	0.66	3	1.25
1	Sustainability depends on the governments and companies.	-2	-0.81*	3	1.07	0	-0.01
22	The fulfilment of the scientometric goals takes up time.	-2	-1.08*	0	0.05	-1	-0.37
2	Sustainability is a trendy and overdone topic.	-3	-1.08	-1	-0.13	-4	-1.57

Source: Own research (Q-method survey).

Not too sharply, and even more uncertainly, do the colleagues declare that they would undertake a role in making the university more sustainable. This light revelation is remarkable because those in factors 2 and 3 would not like it as much as it is those in factor 1.

Interestingly, statements 2, 22 and 1 are at the other end of the table, as the colleagues in factor 1 did not really agree with them. The degree of the disagreement in respect of any of the statements is not too high compared to other statements, but at least it shows some consistency in responding as long as they declare that sustainability depends not only on the government and the companies.

It is the **responder No. 39 (a project manager)** who represents **the values of the first factor** most strongly; his factor weight in the other two factors is 0.0. He is a 30-year-old male who works in a senior position in the campus office of the campus being newly built. The answers he gave to the extra questions confirm his belonging to that factor. When he was asked what, in his view, sustainability was, he said that the way forward should be the pursuit of minimum energy and human resources use. In his view, the NUPS's role in achieving sustainable development is that the university citizens learn how to manage carefully the values assigned to them as a responsible owner and that the appropriate staff should be trained on the optimum use of the infrastructure. As regards the relationship between his work and sustainability, he referred back to what he said about sustainability and held that his task was to ensure that buildings that can be operated sustainably are constructed. He believed that, on the road to achieving sustainability at the university level, the most important thing was to make the leaders understand that the future is for intelligent (computer-controlled) building technology and electronics. And he added that persistence, money and the lack of cooperation were the main obstacles.

The first factor, the group of the "resigned" can be regarded (who knows why?) optimistic because they believe in the institutional system and the accumulated knowledge of people. There will be a solution for everything but they do not think they will solve the problems. They do not want to buy environmentally friendly products but would like to do something for the sustainability of the university when someone asked them to do so, but it would be good if it would not cost any extra expense or effort. Interestingly, the statement 17, concerning the workplace atmosphere, is also acceptable to them by default, but it may well be that only their salary is low, so they cannot make a decision about the statement. While those in the other two factors are critical about the institutional background (statement 19), those in the first factor accept, as a quasi-fact, the institutional background as it is.

4.5.2 Factor 2: "Cooperating problem-solvers", "Let's do for it"

The colleagues included in factor 2 are distinguished from the rest by the statements identified in factor 2 marked with an asterisk.

The people in this factor have quite a charismatic opinion regarding the affairs of the institution. Interestingly, while they themselves do not quite want to participate in university sustainability programmes, they are clearly committed to sustainable consumption. They are willing to buy environmentally friendly products and would accept a price increase in the case of eco-friendly products. They underline the role of governments and companies and are looking for more enjoyable work and collaboration with their colleagues.

Table 12 Typical statements of the "cooperating problem-solvers"

No.	Statements	Factors					
		1		2		3	
		Q-SV	Z-SCR	Q-SV	Z-SCR	Q-SV	Z-SCR
23	I choose an environmentally friendly product even if it is more expensive.	0	0.11	4	1.68	2	1.04
6	Paying the damages caused by consumption even at a price increase	0	0.15	3	1.21*	0	0.16
1	Sustainability depends on the governments and companies	-2	-0.81	3	1.07*	0	-0.01
31	More enjoyable work is needed	1	0.41	2	1.07*	1	0.23
18	The colleagues are cooperative on sustainability topics	-1	-0.45	2	0.68*	0	-0.07
7	The root causes of the economic crisis are greed and money.	-1	-0.11	2	0.66	3	1.25
42	There will be a technical solution for the environmental issues.	4	1.44	2	0.65*	-1	-0.62

34	Leaders are expected to have knowledge on climate change.	3	1.38	1	0.57*	4	1.49
28	Resource-saving aims to reduce costs.	0	-0.1	1	0.53*	-2	-0.83
4	Sustainability should be taught even to the debit of other classes.	2	1.08	0	0.37	2	0.9
10	Sustainability begins with a conscious lifestyle.	4	1.9	0	0.05*	4	1.85
2	Sustainability is a trendy and overdone topic.	-3	-1.08	-1	-0.13*	-4	-1.57
39	The attitude of the leaders towards sustainability is inappropriate.	0	0.02	-2	-0.76	-3	-1.41
40	I do not have influence on the sustainability of the university.	-1	-0.23	-2	-0.81	1	0.23
25	The university has a high resistance to changes.	-2	-1.04	-4	-1.84*	-2	-0.86

Source: Own research (Q-method survey)

The persons No. **32 (humanist), 44 (KVI) and 42 (industrial safety)** are considered **typical representatives of the second factor**. In their case, the factor weights in the two other factors are around 0.1. The responder named KVI is a 61-year-old male with a PhD degree, who is a top leader at the Disaster Prevention Institute. Although he did not define his area of research, he disclosed during the additional questions that it was closely related to sustainability. He gave rather short responses to the additional questions. He believed sustainability was a good thing. The NUPS should be a champion in the implementation and the process should be started by providing information. And the biggest obstacle was incuriosity and the lack of "propaganda". Unfortunately, he did not explain what he exactly meant by that the lack of propaganda would become an obstacle.

The person No. 32 (humanist) is a 58-year-old male holding a CSc degree in humanities, who is a mid-level leader at the university. He was also concise in the responses he gave to the additional questions. For him, sustainability means that the planet continues to be liveable. He did not respond to the question regarding the role of the university but, as regards his own work, he could contribute to the process with "awareness-raising". In his view, the implementation of university sustainability should be started in the family and the major obstacles were the lack of professionalism and giving priority to short-term interests.

The person No. 42 (industrial safety) is a 47-year-old mid-level manager who is also an associate of the Disaster Prevention Institute. He holds a PhD degree and his area of research is industrial safety. Instead of putting sustainability into shape, he referred to official statements and a Hungarian professor who has become emblematic in the domain of sustainability ("Rio Declaration, Agenda 21, Prof. Dr. István Láng"). He stated that his

job was partly related to sustainability (protection of environmental elements, prevention and removal of industrial accidents). The duty of the university is to "shape the environment-friendly attitude of the youth", which should be started by introducing a Sustainability Day based on the pattern of the sports day. In his view, there "should be no obstacle".

It is remarkable that this factor is penetrated and kept in one group by positive values: will to act, demand for resolving own issues and a kind of healthy critical approach. Their high- intensity negative answers to (25), (40), (39) and (2) are favourable in terms of the implementation of university-level sustainability even if Hungarian examples show that higher education institutions put up significant resistance to changes. (Chandler, 2013) The fact that there is a group among the university leaders who represent that values that we could identify in factor 2 can give hope for overcoming the obstacles. Although they are critical about the situation, they are ready for a change and even demand a change and more enjoyable work. Depending on their positions in the hierarchy, they can be both leaders or creative executors.

4.5.3 Factor 3: "We are better than the world"

The colleagues included in factor 3 are distinguished from the rest by the statements identified in factor 3 marked with an asterisk.

The third group is very committed in terms of climate change. Their most positive statements (12) (34) are related to this. They are the most optimistic in regard to that climate change is probably a manageable problem. This is also interesting because, in parallel, they are clearly sceptic about the omnipotence of technology (statement 42). They see the root of the economic crisis in greed and consider our society an immoral consumer society. They would be willing to buy environmentally friendly products, even if they were more expensive.

Table 13 Typical statements of "We are better than the world"

No.	Statements	Factors					
		1		2		3	
		Q-SV	Z-SCR	Q-SV	Z-SCR	Q-SV	Z-SCR
12	Climate change is a real threat to humanity.	3	1.23	4	1.4	4	2.18*
7	The root causes of the economic crisis are greed and money.	-1	-0.11	2	0.66	3	1.25
8	Students are collaborative in sustainability issues.	1	0.3	0	0.2	3	1.10*

23	I choose an environmentally friendly product even if it is more expensive.	0	0.11	4	1.68	2	1.04
30	This is an immoral consumer society.	-1	-0.34	-1	-0.02	2	0.54
20	Pollution taxes should be increased.	3	1.19	3	1.36	1	0.39*
1	Sustainability depends on the governments and companies.	-2	-0.81	3	1.07	0	-0.01*
11	The issue of climate change has already slipped out of our hands.	-4	-1.45	-4	-1.82	0	-0.04*
29	Large-scale livestock breeding is a barbaric thing.	-2	-1	-2	-0.95	-1	-0.15*
42	There will be a technical solution for the environmental issues.	4	1.44	2	0.65	-1	-0.62*
36	University sustainability is not feasible in practice.	-3	-1.27	-3	-1.49	-2	-0.65*
28	Resource-saving aims to reduce costs.	0	-0.1	1	0.53	-2	-0.83*
39	The attitude of the leaders towards sustainability is inappropriate.	0	0.02	-2	-0.76	-3	-1.41
2	Sustainability is a trendy and overdone topic.	-3	-1.08	-1	-0.13	-4	-1.57

Source: Own research (Q-method survey).

The **responder No. 4 (police PhD)** can be considered **a typical representative of the third factor.** He is a 53-year-old male filling a mid-level leader's position and holding a PhD degree in the field of engineering. He said that sustainable development was the harmonious development process of the environment, the society and the economy. Of this trio, he highlighted the importance of preserving and improving the environmental conditions. Being a university lecturer, he felt he was responsible for awareness-raising and that he could integrate the necessary knowledge into the subjects he teaches. He believed that, in parallel with the increase of the role of the state, the awareness of the students graduating from the university, who will become public administration workers, could also have a bigger role. With regard to the initial steps, he named the state-level strategy as a priority, to which one can connect at the university level. And the main obstacle is the absence thereof.

The **responder No. 40 (male lawyer)** can be easily identified with the third factor. He is also a 53-year-old man, who has a PhD in the field of law. According to him, the essence of sustainable development is to preserve the living conditions for future generations. He believes his own role connects to the subject in relation to human resource management. The role of the universities in the implementation of sustainability is education, communication and modelling. And the most important first steps are situation analysis and the search for good solutions. As regards the obstacles, he listed the following: deficiencies in attitude and approach, insufficiency of communication, training and leading by example.

This factor is also represented by **responder No. 48 (geographer)**, who is also a man. He is 62 years old and has an academic degree in the field of earth sciences (habil. PhD). In his view, sustainability means ensuring the conditions for the long-term operation of some system. His subject and areas of interest and research are closely related to sustainability. He is dealing with the visualisation on maps of the effects of the various processes in his research. He thinks that the university's mission is to promote that knowledge related to sustainability becomes part of the basic literacy. To do this, it should be achieved that courses including the relevant knowledge are made compulsory subjects within special administration. And course materials (notes, books) should be developed that are not only good and scientific but also affect young people. In his view, internal organisational resistance (the introduction of new courses can be at the expense of the existing ones, which can be hindered with passive resistance for personal reasons) and the established status quo may be the biggest obstacles.

While the persons in this factor view globalisation and the overall value system of the world with criticism, they have a very positive correlation with university sustainability and consider it feasible. This is also the group that is most satisfied with the attitude of the leaders. An interesting question is what can give rise to this duality. They are critical to the world and appear to be satisfied with the local environment. Strange, but they are the ones who condemned the idea in statement 29 ("Large-scale livestock breeding is a barbaric thing.") the least.

4.6 Summary of the characteristics of the factors and evaluation of the results of the Q method research

Having reviewed the self-values of the statements, two groups can be created in each factor: one contains the statements whose self-value was similar in the case of the different factors (agreement) and the other contains those that showed a difference (disagreement). Of these, I selected the statements with content relevant to the university.

Table 14 Values of the factors regarding the statements based on the agreements[21]

No.	Statements	Factor 1	Factor 2	Factor 3
5	It is sufficient to address the sustainability issues at the level of organisational units only.	-3	-2	-3
12	Climate change is a real threat to humanity.	3	4	4
24	The sustainability programmes of the universities contribute only marginally to the achievement of sustainable development but, compared to this, are resource-intensive.	-1	-2	-2
25	The university has a high resistance to changes.	-2	-4	-2
36	I do not think university sustainability could be achieved in practice.	-3	-3	-2
37	You cannot concentrate on one area because the environmental issues are interrelated.	2	4	3

Source: Own research (Q-method survey).

The biggest disagreement appeared with regard to the responsibility for sustainability. While factor 2 typically accepts responsibility of the governments and companies, those in factor 3 are uncertain regarding the statement and those in factor 1 strongly reject it.

Table 15 Values of the factors regarding the statements based on the disagreements[22]

No.	Statements	Factor 1	Factor 2	Factor 3
1	Sustainability depends on the governments and companies because they hold the power and they can do whatever they want.	-2	3	0
4	Teaching the sustainability principles should be included in the curricula of all fields of science at all levels of education, even at the expense of the number of classes currently held.	2	0	2
8	Students are open and cooperative in respect of the sustainability initiatives.	1	0	3
10	A better environment begins with ourselves. If we want to live a more sustainable world, we should first have a look around our own house.	4	0	4
39	I do not consider appropriate the top leaders' attitude to issues related to sustainability.	0	-2	-3
40	I do not have enough influence to support the university's sustainability efforts.	-1	-2	1

Source: Own research (Q-method survey).

Below, I summarize the statements characteristic of each factor. I present the number of people included in each factor, the typical statements and attitudes, the characteristics of the responders in the given factor and what can be said of the responder who is the most typical representative of the factor. I demonstrate how those involved in the given factor feel about the university's role in the implementation of sustainable development and how they see their own role in this process. In addition, I present the statements, with which they agreed and disagreed the most and the least.

[21] Z-value variances
[22] Z-value variances

Table16 Summary of the characteristics of factors

	1. "Resigned, puzzled"	2. "Cooperating problem-solvers", "Let's do for it"	3. "We are better than the world"
Number of persons in the factor:	**11**	**8**	**8**
Typical statements	They believe there will be a technical solution to the environmental problems and that sustainability begins with a conscious lifestyle. The agree that pollution taxes should be increased. They do not think that sustainability is a clichéd topic, nor that it is sufficient to address sustainability at the level of institutes.	They agree that climate change is a real threat and choose environment-friendly products even if they are more expensive. They consider the working atmosphere more important than the salary. They reject that the issue of climate change has already slipped out of our hands and that the university's resistance to change is great. They also believe that greed is part of human nature.	They believe that the students are open to and cooperative in the sustainability initiatives and that the knowledge about climate change is a fundamental requirement of the leaders. They do not believe that sustainability is a clichéd topic or that it is important to promote minimizing energy and water consumption only because it is cost-effective.
Typical attitude	Not too firmly they admit that they would also take a role in making the university more sustainable. In line with this, they think that sustainability depends not only on governments and companies.	Although they do not quite want to participate in university sustainability programmes, they are committed to sustainable consumption. They are willing to buy environmentally friendly products even if they are more expensive. They are looking for more enjoyable work and cooperative colleagues.	They are optimistic but critical-minded. They are optimistic regarding the outcome of climate change. They have a positive attitude toward the implementation of university sustainability.
Characteristics of the responders	Very mixed profile of responders. The youngest responders, as well as those without a university degree and teachers, are found in this factor.	This factor includes only people with a degree. Typically, they are middle-aged (40-60) leaders who mostly responded to the questions briefly.	Typically, men and women mixed, who do not have a degree or have a PhD degree at most and are aged between 50 and 60.
Most pronounced representative	39 project manager	32 humanist, 42 industrial safety, 44 KVI staff	4 technical PhD, 40 male lawyer, 48 geographer
Role of universities in the implementation of sustainable development	They mainly emphasize the importance of implementation within the university. This could benefit the institution through education and research. Although many of them do not see their own connection to the subject, everyone has an opinion about how the university's activities are linked to sustainable development.	They would assign a very wide range of roles to the university: from direction and leading by example to establishing the scientific and legal background. In fact, the "champion" role also appears.	They consider education and research the most important tools and the university's mission in the field of sustainability.

Own role in the process	There are people who feel their work has nothing to do with sustainability but most of them identify possible links from operation through leading by example to education.	Those who responded to this question feel their jobs are linked to sustainability partly through education and partly through research.	Those who responded to this question picture themselves primarily as lecturers in the process.
-4	9. Drinking water is plenty in Hungary, its conservation is not a priority. 11. The issue of climate change has already slipped out of our hands. 26. Food wasting is not a problem in Hungary.	9. Drinking water is plenty in Hungary, its conservation is not a priority. 25. The university has high resistance to changes. 11. The issue of climate change has already slipped out of our hands.	2. Sustainability is a trendy and overdone topic. 9. Drinking water is plenty in Hungary, its conservation is not a priority. 26. Food wasting is not a problem in Hungary.
-3	16. Multinational companies do not pose a threat to sustainability. 36. University sustainability is not feasible in practice. 5. It is sufficient to address sustainability at the level of institutes. 2. Sustainability is a trendy and overdone topic.	26. Food wasting is not a problem in Hungary. 15. Greed is not part of human nature. 16. Multinational companies do not pose a threat to sustainability. 36. University sustainability is not feasible in practice.	5. It is sufficient to address sustainability at the level of institutes. 15. Greed is not part of human nature. 16. Multinational companies do not pose a threat to sustainability. 39. The attitude of the leaders towards sustainability is inappropriate.
3	14. Sustainable organisations can be more successful. 34. Leaders are expected to have knowledge on climate change. 20. Pollution taxes should be increased. 12. Climate change is a real threat to humanity.	1. Sustainability depends on governments and companies. 6. Paying the damages caused by consumption even at a price increase 20. Pollution taxes should be increased. 17. The working atmosphere is more important than the salary.	7. The root causes of the economic crisis are greed and money. 8. Students are collaborative in sustainability issues. 27. People are planning in the short term. 37. Environmental issues are interrelated.
4	10. Sustainability begins with a conscious lifestyle. 33. The global issues of sustainability must also be addressed. 42. There will be a technical solution to environmental issues.	23. I choose an environmentally friendly product even if it is more expensive. 37. Environmental issues are interrelated. 12. Climate change is a real threat to humanity.	10. Sustainability begins with a conscious lifestyle. 12. Climate change is a real threat to humanity. 34. Leaders are expected to have knowledge on climate change.

Source: Own research (Q-method survey).

As is clear from the analysis, the vast majority of the respondents belong to the camp of the unsure (factor 1) and there is another bigger group that would not take a proactive role although it is open to changes (factor 2). It is typical that all groups agreed with the statement 41 "I gladly assume a proactive role when it comes to defining the university's sustainability guidelines" to a lesser degree. (1, -1, -1). Given that those asked are leaders and that leadership commitment is a fundamental condition for the implementation of organisational sustainability, the lack of initiative can be a major barrier. Meanwhile, the responders also expressed that they could have an impact on the changes, as only those in factor 3 agreed, uncertainly, with the statement "I do not have enough influence to support the university's sustainability efforts" (40). A positive attitude is there, as they clearly rejected the statement "It is sufficient to address the sustainability issues at the level of organisational units only" (statement 5) or "The university has a high resistance to changes" (statement 25). They definitely declared that sustainability was an important issue: "Today, a leader must be aware of the correlations of climate change because it is part of the general culture." (statement 34) The results of the research carried out by using the Q method are underpinned by the questionnaire survey (NUPS questionnaire 2016), which also confirms that the NUPS has to deal with the topic of sustainability. 90% of the respondents[23] are interested in sustainability. 76% of the responders agreed with the statement "The NUPS should give priority to the topic of sustainability". Nearly 70% of the respondents believe that "All students of the NUPS should complete courses where aspects, values and skills needed for enforcing sustainability in future careers can be acquired." 67% of them believe that "Teaching the sustainability principles should be included in the curricula of all fields of science within the framework of stand-alone courses at all levels of education."

It is interesting to note that the uncertain responders (factor 1) believe the approach of the university's leadership is less appropriate or cannot be judged. They placed the statement "I do not consider appropriate the top leaders' attitude to issues related to sustainability." to a neutral area compared to the others, while the two other factors clearly rejected it. This is reflected once again in the answers to the questions in the questionnaire. It draws attention to the fact that university sustainability efforts are

[23] Based on 540 responses. 614 complete responses to the questionnaire were received.

either non-existent or not adequately communicated. Nearly 50% of the respondents stated that they did not have enough information to assess whether "the operating practices of the NUPS fully enforce the sustainability criteria." The only more surprising thing is that there are people (over 6%) who stated in the questionnaire survey that they thought the university's operation fully applied the sustainability aspects.

As to the question about the sustainability of the university, the leaders uniformly agreed that they considered it feasible because all factors rejected the statement "I do not think university sustainability could be achieved in practice." (36) At the individual level, it was marked only by some responders in the uncertain meso zone, but no one placed it higher than 1 on a scale ranging up to 4.

They universally considered that the university's efforts to achieve the common goals of sustainable development were useful. The statement "The sustainability programmes of the universities contribute only marginally to the achievement of sustainable development but, compared to this, are resource-intensive" (24) was not placed in the positive range by anybody, so it has a negative value in all factors. Having obtained the result, the question may arise why the university does not rank high in the green rankings despite so much positive attitude and support. The respondents also believe that the organisation's resistance to change is not significant. The statement "The university has a high resistance to changes" (25) was rejected by all the factors and 50% of the responders even positioned it on the very edge of the scale (-4 or -3).

The opinions are divided in respect of implementation and receptiveness.

The leaders the factors 1 and 3 believe that "Students are open and cooperative in respect of the sustainability initiatives" (8) and "Teaching the sustainability principles should be included in the curricula of all fields of science at all levels of education, even at the expense of the number of classes currently held". They agree with these statements more than the others. In the meantime, those in factor 2 are very uncertain and some responders placed these statements towards the negative end of the scale (-2, -3). Although the statement 10 "A better environment begins with ourselves" and the statement "If we want to live a more sustainable world, we should first have a look around our own house" could have been understood as relating to themselves, the responders, as leaders, could understand it as relating the university as a whole. Here,

too, the positive attitude of the factors 1 and 3 (typically, they placed the statements in the field indicating the maximum agreement) and the "uncertainty" of factor 2, are reflected. On the other hand, there were responders in factor 2 as well, who strongly disagreed with the statement.

Finally, summing up the examination of the hypothesis, it can be stated that the leadership considered the topic of sustainable development important at the university under review, but the opinions are divided as to whether it is feasible or how significant it is. The persons involved in the research are mostly not aware of how their current work is related to sustainability or did not reply to the question. This uncertainty is particularly important, as one of the priority tasks of introducing a strategy is to make the internal stakeholders know their own roles and the possible linkage thereof with the strategy and, thus, feasibility. It may be subject to further investigation if the uncertainty is caused by the lack of knowledge or, rather, the lack of communication.

4.7 Result of the examination of hypothesis 1

I examined if a sustainability strategy at hand means that the leadership of the university concerned is committed to the sustainability transformation.

The hypothesis 1, namely, that the existence of a university sustainability strategy reflects the commitment of the leadership, is not confirmed by the results.

The research conducted at the NUPS refuted the hypothesis 1, namely, that the existence of a strategy reflected the commitment of the leaders inasmuch as commitment involves assuming a leadership role by the university citizens in this area as well.

It can be declared based on the Q-method analysis of NUPS that although the leaders consider the topic of sustainability important and have the relevant knowledge, they do not intend to take the initiative.

The sustainability "transformation" at the university manifested in sporadic actions. It can be told based on the research that leadership commitment is not sufficient to ensure that an incidentally existing strategy and sporadic initiatives make a real difference.

5 Method of the integration of sustainable development

The need to integrate the aspects of sustainable development is now accepted in all sectors, including higher education. The pace of the transition and the manner of implementation are considered as more timely issues. In my research, I tried to find the answer to what measures, in the case of higher education, cause the least amount of resistance among the stakeholders, respectively, support the institution-level transformation the most.

The vast majority of the universities agree that one of the most important measures of the success of an educational institution is the success of its graduates (amount of knowledge and its applicability in a given age and society) in the labour market, so the level at which it supports the expansion of the students' useful knowledge is an important element of the impact of any initiative.

The quality of university education can be measured in the added value. (Bennett, 2001) Changing the students' attitude in a positive direction should be an important goal of sustainability initiatives. In planning and analysing the expected impacts, it is important to examine which tools can be used to expand the knowledge of the students in a way that it is not trapped at the subconscious level, but is transformed into attitudes and, later, habits and skills. The sustainability knowledge and the ability to apply them move, more and more, to the fore in the economy, so it is an important aspect for the employers when selecting the employees and, even more, the leaders.

During my research, I also asked the question, in the survey conducted among the leaders by using the Q method, what the colleagues directing the university were thinking about this subject. I was looking for the answer to the question of what, in their opinion, should the sustainability transition be started with at the National University of Public Service. I asked them to formulate the answer to the question in their own words.

Having reviewed the opinions, awareness was put in the first place. Given that education is an effective way of raising awareness, also adding the answers that regarded education as the most important initial step, a significant proportion of the leaders consider this topic the most important for a successful start. Considering that some of the respondents do not attend to teaching tasks and many of them do not have a scientific degree, this result is definitely impressive.

It is also worth noting that while all of those approached answered to the questions about the initial steps, nearly a third did not answer to the question of how their own work was linked to sustainability or was unable to name the link. The uncertainty regarding the link between their own work and sustainability confirms the importance of awareness-raising, which was marked by most of them.

5.1 Traces of the transformation of higher education

Currently, we are in a phase of the transformation of higher education where the front-ranker institutions have already deployed the system and have overcome the initial difficulties that hindered the introduction of sustainable development through many years of operational experience. The main proof thereof, that is, of the integration of sustainability and, thus, "normal operation" is that they no longer allocate particular energies to advertising it as news and a wide range of courses and programmes related to sustainability are available to the students. They live a vibrant social media life (Facebook, Twitter, Instagram), where the stakeholders discuss the daily issues with each other. These institutions have a functioning and informative website and try to better visualize their sustainability efforts by regularly participating in prestigious rankings or qualification.

Meanwhile, the institutions that have just entered, or are planning to enter, the transition to sustainability, are looking for the best and most effective solutions. Their advantage is that they can choose from a number of proven methods, so they can start building along the lines of the international champions.

Hungarian higher education institutions mostly fall into the latter group. A significant part of them is only in the phase of formulating the strategic goals. According to the relevant recommendation of the sustainability pedagogy section, headed by András Victor, of the scientific conference organized with the participation of the Hungarian Academy of Sciences, the UNESCO Hungarian National Committee and the Human Ecology master's degree of Loránd Eötvös University on 19 November 2018, "higher education institutions should define their own sustainability goals. The document on this should not be limited to listing information and attitudes, but should cover all areas of the institution's operation: teaching and research, working with local communities, shaping institutional environment and management, etc. The leaders of institutions should support and encourage the sustainability initiatives of university citizens." And:

higher education institutions "should support initiatives to renew education ... to include the topics of sustainability into the curriculum of each degree program." (Lányi & Kajner, 2019, p. 91, 97)

I studied during my research the aspects considered important by the universities that have already institutionalized sustainability and have been actively working on the introduction of the strategy for several years.

As I have shown, and as can be read in the sustainability rating systems, education and research activities, institutional operation and social relations are the topics that, together with their sub-areas, are within the scope of the integration of sustainability into a university.

Of these areas, I chose educational activity as the subject of the study because this is the topic that is most "sector-specific" (it is one of the main tasks of the university's activities) and this is where most stakeholders encounter with the theme of sustainability, particularly when education is considered in a broad sense (training, courses and intra-course contents, as well as awareness-raising).

Hypothesis 2: An essential component of the institutional level integration of sustainability is the conscious integration of the topic of sustainability into education.

For the purposes of this thesis, I define conscious integration in education as follows: sustainability appears in the knowledge content of all degrees, also as a separate course and it is integrated into the content of other courses. It also means the existence of methodological and content elements. In addition, the goals defined in the sustainability strategy are achieved through thematic programmes and student initiatives (special college courses). The most important (output) indicator (target to be achieved) is that there should be no graduate student who does not know the general aspects of sustainability and the aspects of sustainability relevant to his profession, that is, who does not have suitable sustainability literacy. (Sibbel, 2009), (Winter & Cotton, 2012)

To test the hypothesis, I use the recommendations of the university sustainability declarations and the university (campus) sustainability systems (ratings, rankings) (UI GreenMetric, AASHE-STARS), as well as the expectations of the external stakeholders. I review the recommendations and requirements for sustainability

education and examine the specifications they contain. I analyse the expectations formulated by the internal stakeholders on the basis of the questionnaire survey (NUPS survey 2016). I examine how the responders feel about the appearance of the sustainability transformation and the subject in education (NUPS survey 2016). I also present the conclusions that can be drawn based on the responses to the international higher education sustainability questionnaire (own research).

5.2 Educational relevance of sustainability statements

The article by Lozano et al. (Lozano, Lukman, Lozano, Huisingh, & Lambrechts, 2013) compare the key sustainability declarations based on different criteria. Using that article as the basis, which perfectly summarizes the main characteristics of the individual declarations, I studied what is common to the various documents and what declaration they make in regards to the integration of sustainability into education. I completed the aforementioned articles by adding the UN Sustainable Development Goals (SDG) to the list, which have been published since then and become a cornerstone by today.

Most of the declarations give priority to both the integration of the sustainability (environmental) knowledge and that the educators should be able to transfer the existing knowledge. This aspect was not a subject of my research but can be an important step forward in any case.

“Education with the objective of achieving sustainability varies from previous approaches to environmental education in that it focuses sharply on developing closer links among environmental quality, human equality, human rights and peace and their underlying political threads.” (Fien & Tilbury, 2002, p. 9)

According to Lozano’s article, education appears in every document and it is the fourth sustainable development goal (among the UN Goals, which is a document that Lonzano et al. did not study). I do not analyse how certain declarations address this matter but only review the target areas of the recommendations that are considered to be relevant in terms of my paper. According to the documents, there are four main areas within education and awareness-raising, in respect of which recommendations are formulated.

The four areas are:

1. Training of the university staff – awareness raising, further training

2. Appearance of sustainability courses/programmes in the curriculum
3. Inter- and multidisciplinary approach – integration independent of degrees
4. Wider dissemination of knowledge – social responsibility

Of these, the second aspect is more important in terms of my hypothesis. Awareness-raising is, of course, a necessary part of the institutional level integration of sustainability in a wider scope.

Table 17 Recommendations concerning education in the international higher education sustainability declarations

Title of declaration	Date of issue:	Recommendations concerning education
Talloires Declaration	1990	Development of training material Expansion of teaching capacity Interdisciplinary approach
Halifax Declaration	1991	Development of training material Expansion of teaching capacity
Kyoto Declaration	1993	Development of training material Expansion of teaching capacity Interdisciplinary approach
Swansea Declaration	1993	Development of training material Expansion of teaching capacity
COPERNICUS Charter	1994	Development of training material Expansion of teaching capacity Interdisciplinary approach
COPERNICUS CHARTA 2.0	2011	Development of training material
Lüneburg Declaration	2001	Expansion of teaching capacity
Declaration of Barcelona	2004	Statement about the importance of higher education in general
Graz Declaration	2005	Intersectoral collaboration, practice-oriented
Principles for Responsible Management Education (PRME)	2007	Development of training material
Sapporo Sustainability Declaration	2008	Development of training material
Turin Declaration	2009	Development of training material Interdisciplinary approach
SDG 4	2016	Development of training material Expansion of teaching capacity Integrated thinking

Source: Edited by the author based on (Lozano, Lukman, Lozano, Huisingh, & Lambrechts, 2013). *For more details (in the original language), see Annex 9.*

My view is that training the students and the university staff is the key in terms of the schedule. It should be worth concentrating on the involvement of external stakeholders only thereafter. Ultimately, both activities can run parallel as a result of full integration.

All higher education sustainability declarations address the issue of education in a prominent place, even though there are small differences. The oldest document of this kind is the Talloires Declaration, which is one of the most comprehensive documents from the educational aspect, was signed only by the predecessor of CUB in Hungary. As regards the additional declarations, I examined the three main motifs found here, namely, if the expectations for integration into the curriculum, for the development of the lecturers and for an attitude spanning sciences, appear. In their article, Grindsted and Holm (Grindsted & Holm, 2012, p. 33) gave this topic, comprehensively, the name 'moral commitment to sustainable education' when they reviewed the sustainability declarations, as Lozano did.

The result of the study shows that, based on international recommendations, education is one of the pillars of integration of sustainability in higher education. It should be remembered also that the transformation of higher education is one of the most important tools to achieve socio-level changes. Thus, the ultimate goal is the spread of sustainability literacy and the transformation of universities is a tool thereto.

5.3 Educational relevance of sustainability rankings (ratings)

A more detailed presentation of the rankings is given in Section 6.1. In this Section, I discuss the educational aspects of the rankings. There are currently two internationally recognized rankings that have a sufficiently comprehensive evaluation system and can mobilize masses for sustainability internationally. While their criteria are similar, they still differ in that one is actually a ranking (with "competitive" results year after year), while the other is more a rating. Even though opportunities for comparison based on the scores arise in the latter case as well, it does not have a competitive feature in the sense that the organisation using the method does not publish a "ranking" but, instead, the entities who have a valid platinum, gold or silver rating or have not yet reached any level of qualification but are already "reporting" can only be viewed on the website.

UI GreenMetric is one such system, which was initially created specifically for the sustainability ranking of campuses and, later, broadened its criteria in accordance with the stakeholder needs. Education was added to the criteria only afterwards, which confirms that it is difficult to expect permanent results without developing curricula

and transforming the education strategy, as well as that even campus "greening" cannot function without them.

The UI GreenMetric ranking takes the results related to education and research into account at 18%. In particular, it examines the following aspects:

1. Proportion of sustainability courses from all courses.
2. Funding ratio of sustainability research compared to all research.
3. Number of scientific publications on sustainability.
4. Number of scientific events related to sustainability.
5. Number of student organisations related to sustainability.
6. Existence of a sustainability website maintained by the university.
7. Existence of a published sustainability report.

The second system, which is more a rating system, is of American origin, and the vast majority of the institutions included in the list are US-based.

In the AASHE-STARS (The Sustainability Tracking, Assessment & Rating System) evaluation, the curriculum is worth 40 points within the scientific performance, which represents more than 20% of all obtainable points (194).

In particular, points can be collected on the following topics:

- University sustainability courses.
- Effectiveness of education.
- Student programmes.
- Degrees/programmes.
- Experience-education programmes.
- Measuring sustainability knowledge.
- Course development aid.
- Campus as a living laboratory.

The conclusion, in this case, is clearly that both systems prioritize the integration of sustainability into education by not separating it from research and broader awareness-raising.

5.4 Educational relevance of the integration of sustainability – an international outlook

One of the first questions that arise is why an institution decides to devote resources to implement sustainable development at the institutional level. Designing and implementing the strategy will also require a long-term view even if it becomes a profitable investment.

It is a clear expectation now that higher education institutions have the moral obligation to take the lead in a change that is crucial for the future of humanity; a number of the recommendations and research are dealing with the topic. (Cortese, 2003), (Stephens, és mtsai., 2008) The underlying factors of the sustainability transformation can be grouped according to whether they represent a "push" or a "pull" for implementing the change. The first type is a compelling factor that is used to answer the question "why cannot you not deal with the subject". This primarily includes stakeholder expectations, respectively, controls, ratings and environmental conditions. And the second group includes the ones that make the sustainability transition attractive, such as cost reduction, better image or greater loyalty. These two groups are not sharply separated from each other and different patterns may arise in every institution. In addition to the factors triggering the sustainability transformation, the process itself is multi-dimensional, so it can be described and realized along with its many features.

So, the sustainability transition:

- Is a technical issue that relates to infrastructure and resource use.
- Is an environmental issue.
- Is a new reformative approach.
- Is a new aspect that is easy to integrate.
- Has clear objectives and is measurable.
- Is important to the operation and goals of higher education institutions.
- Includes social relationships, justice, ethics, etc. economic viability.
- Requires a holistic and transformative approach.
- Is interdisciplinary.
- Is a global challenge, relying on the existing policy and practice.
- Involves organisational changes.

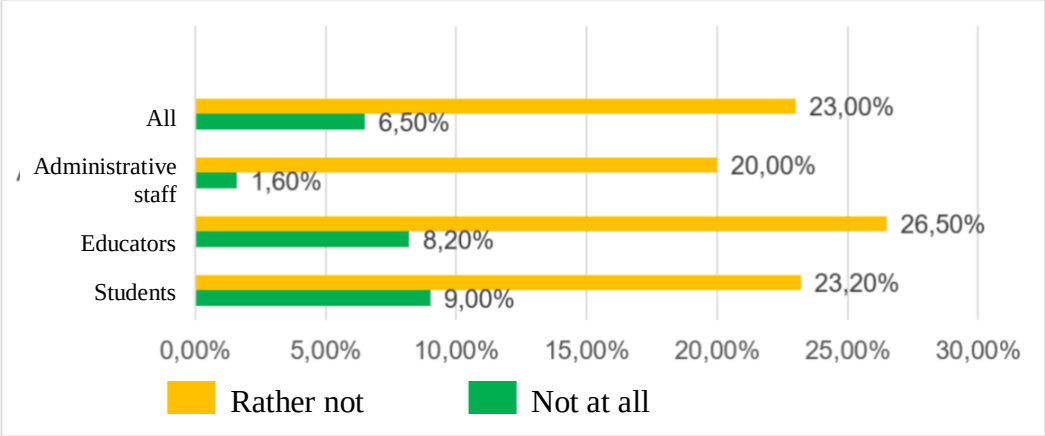
- Is a comparison criterion coming to the force. (Sadler, 2008)

The reasons that can start the change process in a particular institution and are able to keep it alive in the long run along with the above factors can be motivated by stakeholder, regulatory or institutional interests. These factors can be:

- Student interest: it is increasingly a part of the criteria for choosing the institution.
- Research funding: increasing funds are available for sustainability research.
- Quality assurance: it contributes to the fulfilment of quality objectives.
- Information to the community: developing an active relationship with the "local" communities.
- Employability: employers are seeking graduates with sustainability competencies.
- Accountability: responsibility for sustainability performance.
- Moral obligation: in its historical role, higher education has the moral obligation to lead the society towards sustainability. (Waas, et al., 2012)

Based on the above, the question arises as to which factors support the launch of the transformation process and which factors appear as an obstacle. The article by Portela-Blanco et al. clearly show that the obstacles and the driving forces are attached to different features of the very same factors.

Figure 26 Number of articles, in which the specific factor is marked as an obstacle or a driving force



Source: (Blanco-Portela, Benayas, Pertierra, & Lozano, 2017, p. 13)

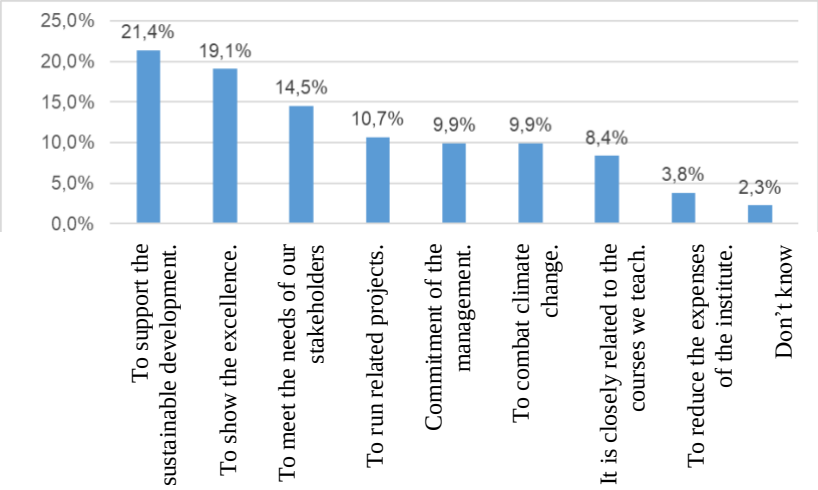
I received 40 responses to the (English) questionnaire of my international research. Due to the low number of responses, the results are presented as an illustration only.

The results cannot be considered representative even if responses arrived from all the continents and the institutions were positioned in the widest possible scale in terms of their nature, educational portfolio, reputation (position in rankings), age and size.

The questions related to the introduction and operation of sustainability (see the Questions Annex **Error! Reference source not found.**). Based on the analysis of the responses received, we can get an idea of the typical patterns of introduction in these institutions and the challenges they are now struggling with.

When asked about the motivation to introduce sustainability, the most common responses were, over and above the support for the realisation of sustainable development, the demonstration of excellence and meeting the needs of stakeholders. The respondents could mark more than one answer, so I received 131 responses to this question from the 40 institutions.

Figure 27 Motivations for the integration of sustainability



Source: Results of own research (international survey).

On the question of who was the initiator, most responders marked the academic and administrative staff and the leadership. These two groups together account for nearly 80% of the responses. Less typical is that students or a project are the catalysts in launching the process.

If we take a look at, based on the answers, how the initiator's person and motivation relate, we will notice that where the initiator is a leader, it is typically linked to the motivation to improve the image of the institution. If the initiator is an employee, it is typical that more abstract goals and, thus, more personal commitment are in the background.

Table 18 Crosstable: Comparison of the initiator of the process with the motivations

		What was the motivation?						
		To prove excellence	To reduce spending	Stakeholders' demand	Legacy of a project	To promote sustainable development	Other	All the listed
Who was the initiator	Leaders	7	0	1	1	0	2	1
	Teacher or administrative staff	2	2	2	1	8	0	0
	Students	0	0	2	0	0	0	1
	Project result	0	1	0	0	3	0	0
Total**:**		9	3	5	2	11	2	2

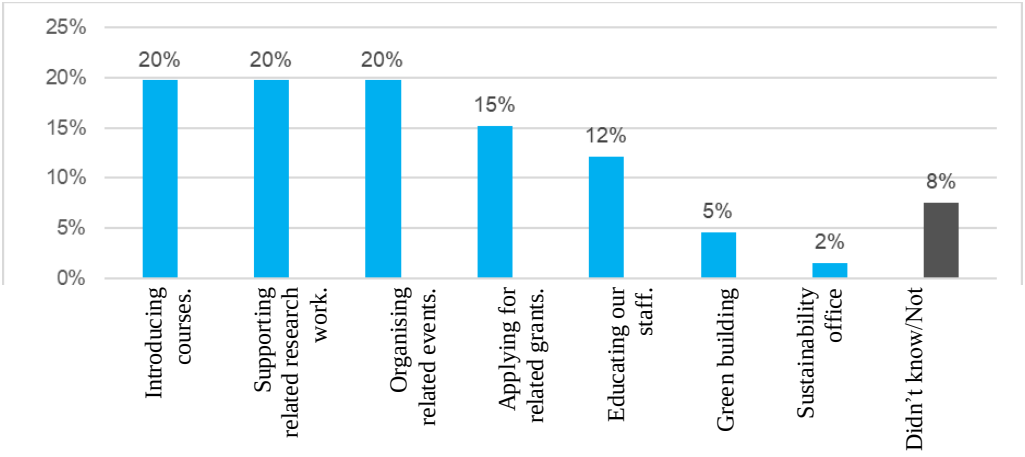
Source: Results of own research (international survey).

For the purposes of this hypothesis, the most relevant question is related to the manner in which sustainability was introduced, that is, what were the first steps in the process in the opinion of the responders in the international survey.

Since it was also possible to mark multiple responses, 66 responses were received from 40 institutions. Given that five institutions did not mark any measures (either they did not know or the process has not started yet), the 61 measures are distributed among 35 respondents.

In terms of the initial measures, there is a triple dead heat for first place (with 13 nominations each) between the introduction of courses, support for research and the organisation of events. *This is entirely consistent with expectations based on my personal experience.*

Figure 28 What were the first steps in the integration of sustainability? (N=66)



Source: Results of own research (international survey).

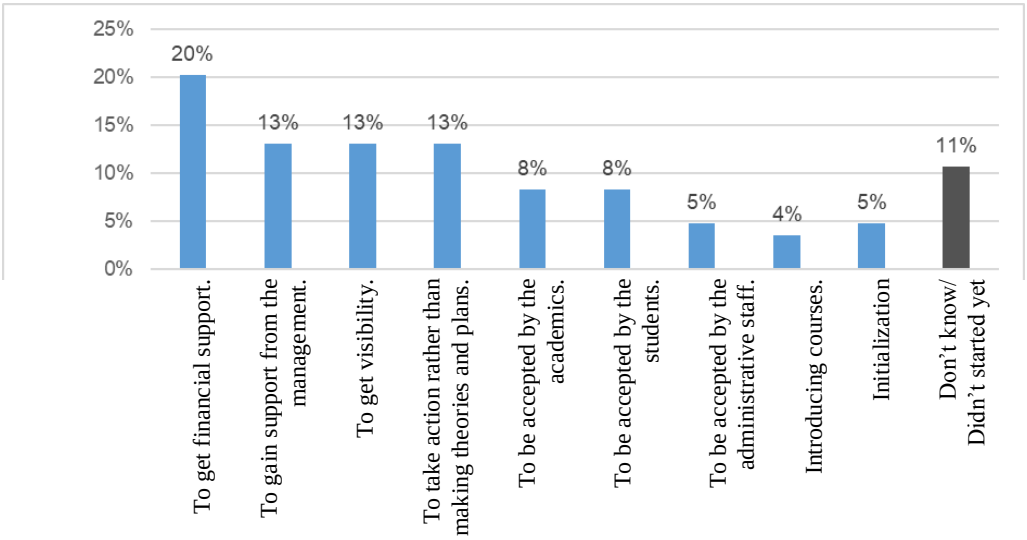
I also examined the main obstacles during the introduction. This question was also included in the other research carried out (interview questions supplementing the Q system research among the leaders and questionnaire survey). The constraints resulting from the low number of international experiences should be considered when drawing the conclusions.

Contrary to my expectations, the first place was still taken by the financial constraints on the basis of the answers received to the international questionnaire. It is followed by three other obstacles that pose a challenge of similar magnitude based on the opinion of the institutions. They are the following: winning the leaders, achieving visibility and proceeding from strategy-building to the level of implementation.

An interesting and important result is that the respondents considered the introduction of courses as the smallest obstacle. This result confirms that the introduction of courses is one of the most accepted and supported ways to make a higher education institution sustainable.

The results also show that the initiatives are generally welcome and that persuading the colleagues and the lecturers do not present a challenge.

Figure 29 Major challenges in the introduction of sustainability (based on 84 indications)



Source: Edited by the author (international questionnaire).

Overall, "dimension" jump seems to be the biggest challenge, that is, when the process and the results should be visualized at the university level in order to ensure that the implementation of the plans (strategy) can be started with the support of the leaders.

5.5 Presentation of the results of the questionnaire survey in regard to the educational aspects of the integration of sustainability

The status at the time I carried out the research at the National University of Public Service can be considered as the default status of the institution. Although a survey was already conducted on the subject in 2013 (which was also initiated and designed by me), the results thereof were sufficient only for a written sustainability strategy. Due to the repute of the topic and because of the related subjects, there was (is) some precedent for the transfer of the sustainability knowledge, but it can be considered sporadic only. This means that the integration of sustainability at the institutional level has not yet begun.

From the perspective of the organisation, the default status upon the start of my research was the following:

1. The institution (NUPS) had a written sustainability strategy.
2. A sustainability website was operated for a short time. (http://fenntarthato.uni-nke.hu/nyitolap)
3. The research was preceded by leadership commitment (I conducted the research with the senior leaders' approval, involving the peer departments).
4. There were sporadic (mostly voluntary) courses related to sustainability, and sustainability was sometimes integrated into the curriculum in the relevant fields (e.g. environmental safety).
5. The institution had a history with respect to the project related to sustainability as well[24]. Although this was not in the focus of the projects, it touched the topic of sustainability and there was relevant commitment therein.

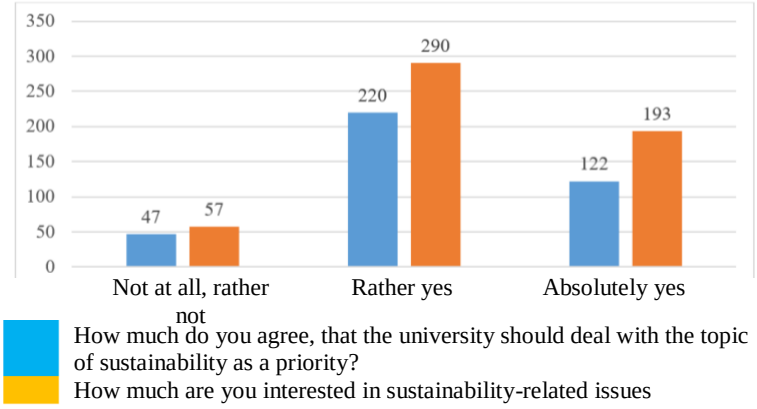
In order to place the subject in context, it is important to start the analysis with a result that is positive and relevant in terms of the subsequent results. It is important to clarify this because if the general attitude regarding sustainability was rejection from the outset, the additional questions would be difficult to interpret and the data would be hardly suitable for analysis.

[24] KOVÁSZ project (TAMOP-4.2.2/B-10/1-2010-0001 Risks and responses in talent care) - enforcement of environmental sustainability.

Based on the responses, we can see that nearly 80% of the respondents believe that the university should deal with the topic of sustainability as a priority. Given the number of responders (445), the result can be considered representative of the university's point of view. This also means that the management of the university can meet the expectations of the internal stakeholders if it focuses on the method of integration of sustainable development and endeavours to support its introduction.

In addition to that the integration of sustainability is considered important by the university citizens, the interest in the topic is also considered significant. Only less than 10% of the responders said they were not interested at all in sustainability-related issues.

Figure 30 Interest in sustainability at the NUPS



Source: Edited by the author (NUPS questionnaire).

On the other hand, it is important to note that 27.5% of the responders did not answer the question. This is a very high figure, given the fact that the answer "Not enough information to judge the question" was among the possible answers. The proportion of those who did not answer was the half in the case of the students, 30% in the case of the administrative staff and 20% in the case of the teacher colleagues.

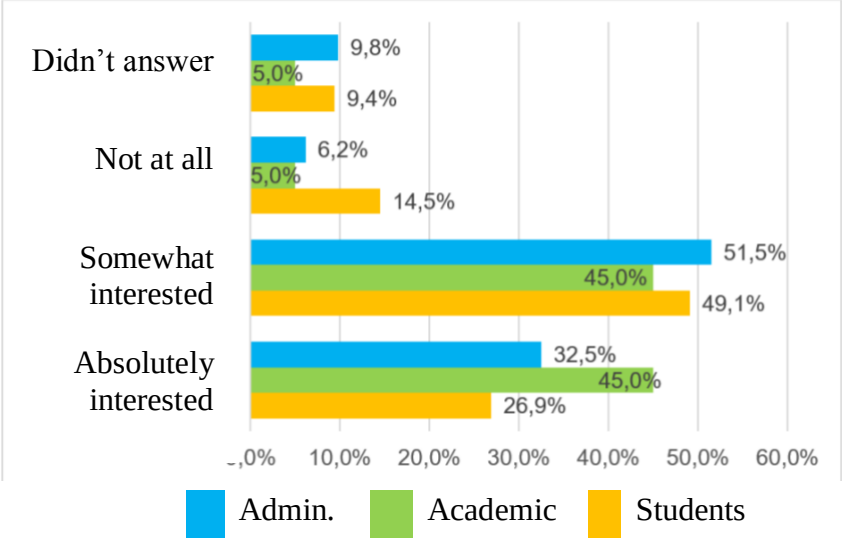
Table 19 Crosstable: Based on the legal relationship, judgement of whether the NUPS should give the sustainability topic a priority

	Absolutely not interested.	**Rather not**	**Rather yes**	**Absolutely yes**	**Not enough information to judge the question.**
Students	2.9%	12.6%	47.1%	22.4%	14.9%
Teachers	1.0%	10.4%	51.0%	28.1%	9.4%
Administrative	0.0%	5.5%	48.8%	34.6%	11.0%
Total:	1.5%	9.8%	48.6%	27.7%	12.3%

Source: Edited by the author (NUPS questionnaire).

Based on the Chi-squared test, the correlation is significant (P=0.002). Students assess the topic as less important, while a major part of the lecturers and the administrative staff believe that the NUPS should treat the issue of sustainability as a priority. Here too, the students indicated in a higher proportion that they did not have sufficient information to judge the issue. This response could be acceptable only if they did not have the opportunity to gain insight into the operation of the university, the courses offered and the contents of the courses taught. The other possibility is that they were unable to judge the topic due to lack of interest.

Figure 31 Based on crosstable: Correlations of relationship and interest in sustainability



Source: Edited by the author (NUPS questionnaire).

To examine this, I checked what can be said about the interest of the responders regarding sustainability on the basis of the legal relationship. Here, the rate of non-responders was much lower, as only 12.1% of the responders did not answer this question.

Based on the Chi-squared test, the correlation is significant (P=0.002). The significant discrepancy is due to that a higher proportion of the lecturers marked that they were fully interested in the topic while a high percentage of the students were not at all interested in the subject or did not answer the question.

Then, I examined whether the degree of interest is related to how much the responder feels that it was the NUPS's duty to undertake the theme of sustainability.

Table 20 Crosstable: Depending on how much you are interested in the sustainability theme, to what extent do you believe that the NUPS should deal with the issue as a priority

		To what extent do you agree with that the NUPS should give the theme of sustainability a priority?				
		Absolutely not interested.	Rather not	Rather yes	Absolutely yes	Not enough information to judge the question.
To what extent are you interested in topics regarding sustainability?	Absolutely interested.	0.0%	4.6%	44.4%	46.4%	4.6%
	Somewhat interested.	2.1%	10.6%	51.9%	19.6%	15.7%
	Absolutely not interested.	5.3%	13.2%	44.7%	10.5%	26.3%
	Did not answer.	0.0%	15.8%	68.4%	5.3%	10.5%
Total		1.6%	9.0%	49.4%	27.4%	12.6%

Source: Edited by the author (NUPS questionnaire).

Based on the Chi-squared test, the correlation is significant (P=0.000).

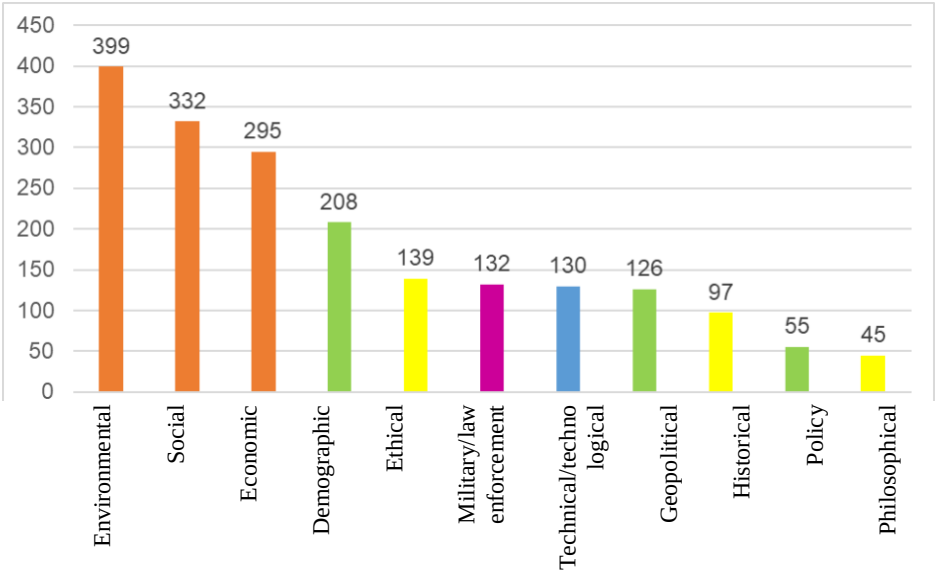
It appears on the basis of the data that those interested in the topic support that the NUPS deal with it in a significantly more. While those who are less or not at all interested in sustainability topics are opposed stronger to the appearance of such topics at the NUPS.

5.5.1 Judgement of certain sustainability topics at the NUPS

In addition to mapping the general interest, I also examined the subtopics the respondents were open to. The responders could select the topics they were most interested in from the 11 areas provided. And they were allowed to enter a free text opinion if they did not find an appropriate topic in the list.

Figure 32 clearly shows that the greatest interest was in the three topics mentioned as the pillars of sustainability, that is, environment, society and economy. And the slightest interest (which is hardly palpable) was shown towards the policy and philosophical implications. The colouring of the diagram already leads us to the next point of analysis.

Figure 32 Distribution of interest in sustainability topics



Source: Edited by the author (NUPS questionnaire).

I carried out a factor analysis in order to group the scopes of interests and facilitate further analyses. Based on the component matrix resulting after the rotation, 5 factors could be separated, which accounts for more than 66% of the variables. (With 4 factors, only 57% of the variables could be explained.)

Based on the responders' scopes of interest, the factors that were created outline the NUPS's sustainability awareness map. Based on this, the classical triple optimisation (society, economy and environment), which receives public awareness, is followed by groups of topics that are very typical of the university's profile as well, that is, humanities subjects and groups of socio-political issues, while a separate cluster is formed independently by the technical, military and law enforcement topics. These areas of interest are very strongly expressed, although in respect to a smaller number of respondents only.

This reflects well the interest of the university as a whole because these are two topics that appear but represent a sub-area of public service, which does is not really provide interoperability from/to other disciplines. And the reason for that is the different scientific background, rather than the lack of opportunities.

It is interesting to note that the strongest rejection of certain other topic can be best observed in the case of those interested in military/law enforcement topics. The lack of interest in ethical issues is the strongest of all factors' lack of interest.

Table 21 Factor analysis of interests (principal component analysis)

Rotated (Varimax, Kaiser Normalized) component matrix KMO: 0.823, Bartlet test value: 1115.340					
	Component				
	1. Triple optimisation	**2. Humanities topics**	**3. Socio-political topics**	**4. Technical topics**	**5. Military and law enforcement topics**
Social	**.764**	.165	.154	-.033	.027
Economic	**.726**	.009	-.034	.324	.121
Environmental	**.712**	.055	.124	.118	.077
Philosophical	.013	**.806**	.108	.091	.055
Historical	.121	**.738**	.053	.028	.213
Ethical	.474	**.496**	.236	-.087	***-.268***
Geopolitical	.147	.088	**.778**	.072	.209
Policy	-.016	.231	**.624**	.339	-.083
Demographic	.504	-.012	**.582**	-.096	.065
Technical/ technological	.192	.062	.168	**.870**	.072
Military/law enforcement	.134	.198	.154	.064	**.888**

Source: Edited by the author (based on the NUPS questionnaire).

Then, I examined the clusters created from the responders by applying the factors formed based on the scopes of interest, that is, the typical groups formed by the university citizens.

Table 22 Result of the cluster analysis carried out after the factor analysis of the scopes of interests

	Cluster 1 Socio-political topics	**Cluster 2 Humanities, classical, military and law enforcement topics**
Triple optimisation	-.05833	.30713
Humanities topics	-.36760	1.93550
Socio-political topics	.01203	-.06335
Technical/technological	-.01465	.07712
Military and law enforcement topics	-.05993	.31556
Number of elements	**516**	**98**

Source: Edited by the author (based on the NUPS questionnaire).

Based on the ANOVA test, the main components are significant in the clusters.

A minority of the respondents (98 people) is definitely interested in the humanities topics and is quite open to the triple optimisation and also military and law enforcement themes. However, the socio-political themes lightly do not interest them. (Cluster 2)

The other group is resolutely not interested in the humanities topics, while the other topics lightly do not interest them. They show a slight interest in the socio-political

themes only. (Cluster 1) This group includes a significant proportion of the respondents: 516 persons.

Having examined the correlation between the cluster analysis carried out in respect of the interests and legal relationship, we find that there is no correlation between the pattern of the respondents' sustainability interest and their relationship with the university. Most of them are lightly interested in the socio-political topics, and they are slightly disinterested in the other topics.

Table 23 Crosstable: Interests as the function of the legal relationship

	Socio-political topics	Humanities, classical, military and law enforcement topics	Total
Students	83.8%	16.2%	234 persons
Teachers	85.0%	15.0%	120 persons
Administration	84.7%	15.3%	163 persons
Total	436 persons	81 persons	517 persons
	84.3%	15.7%	100.0%

Source: Edited by the author (based on the NUPS questionnaire).

Based on the Chi-squared test, the correlation is not significant (P=0.946).

This result also underlines that the role of education and awareness-raising is particularly important because the issue is clearly not that, in the great majority of the cases, those having the appropriate knowledge refuse the topic of sustainability but, rather, that the data reflect uncertainty.

The existence of leadership support is important in terms of the realisation of the sustainability transformation. In the case of the NUPS, the existence of a strategy approved by the management suggests that there is no considerable resistance to the subject. However, the actual transition can be successful only if the commitment is more explicit. The topics in which the greatest interest is shown can be important information in swaying the leaders.

Table 24 Crosstable: Interests as the function of position

	Socio-political topics	Humanities, classical, military and law enforcement topics	Total
Reports	84.4%	15.6%	558 persons
Leaders	80.4%	19.6%	56 persons
Total	516	98	614 persons
	84.0%	16.0%	100.0%

Source: Edited by the author (based on the NUPS questionnaire).

Based on the Chi-squared test, there is a minimum correlation between position and interest (P= 0.43). Somewhat more of the leaders are interested in the group of

humanities, classical and military and law enforcement topics, but they mostly are included in the cluster 1 (those minimally interested in socio-political topics).

There is no significant correlation either between interest and legal relationship or in respect of position. This means that the interest is partly due to the profile of the institution. On the other hand, prior knowledge or studies may be relevant, however, they cannot be tied to the NUPS. Neither interest nor the opposite is too strong in either group, which also confirms that the responders are not rejective regarding the subject, so the role of awareness-raising, including education, can be important.

5.5.2 Integrating the theme of sustainability into the curriculum

The appearance of sustainability topics in education (curriculum) is supported in a high proportion by the university citizens regardless of the position, scope of interest or the degree of environmental consciousness.

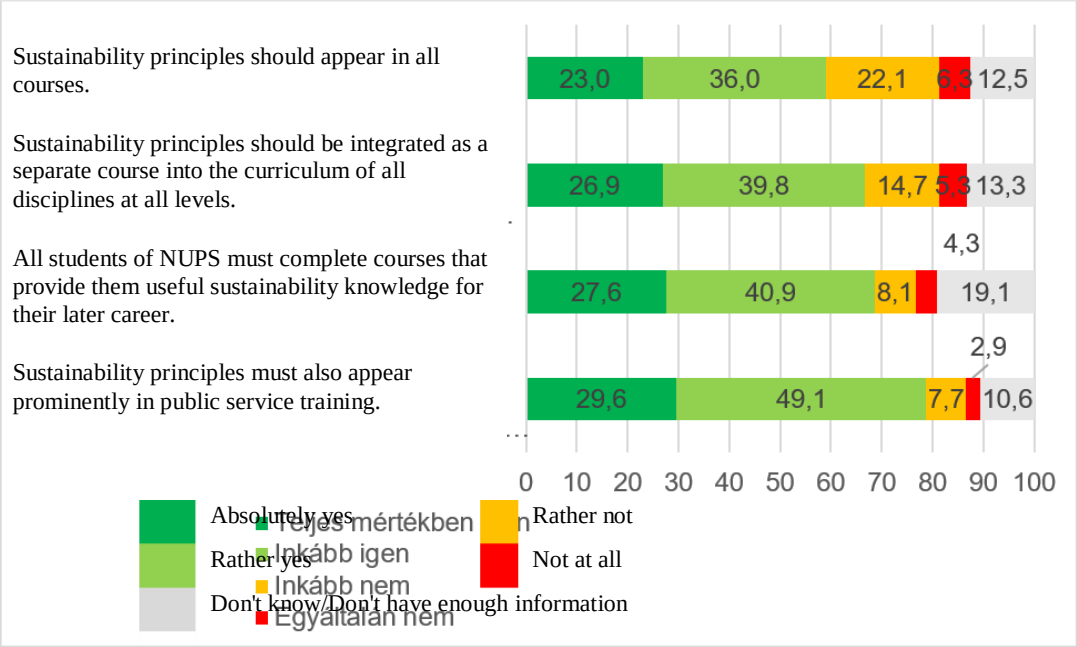
The support for the topic of sustainability and the fact that the responders agree with its appearance in education, as well as that international experience also confirms that the introduction of courses encounters the slightest opposition, would already be insufficient grounds for considering this hypothesis justified. But I believe it is worth digging a little deeper into the subject. The reason for this is that there has been no breakthrough at the NUPS, even in respect of the courses, despite the strategy and the efforts that are in place since 2013.

I asked about the appearance of sustainability in education in three steps in the questionnaire. First, I asked about the importance of its appearance in education in general, then if it should appear in the knowledge content of all degrees and, finally, if they should be integrated into the courses.

The respondents were visibly less and less supportive as more concrete steps were addressed. A pattern emerges that the respondents are willing to agree more if the subject sets a less immediate task to the university citizens or cannot be closely related to the principal business of the university.

The appearance of sustainability in all courses obviously imposes a task on everyone (lowest level of agreement). In contrast, there is hardly anyone who would oppose to integration into further training and even the ratio of those who believe they do not have sufficient information to judge the question is the lowest in this group.

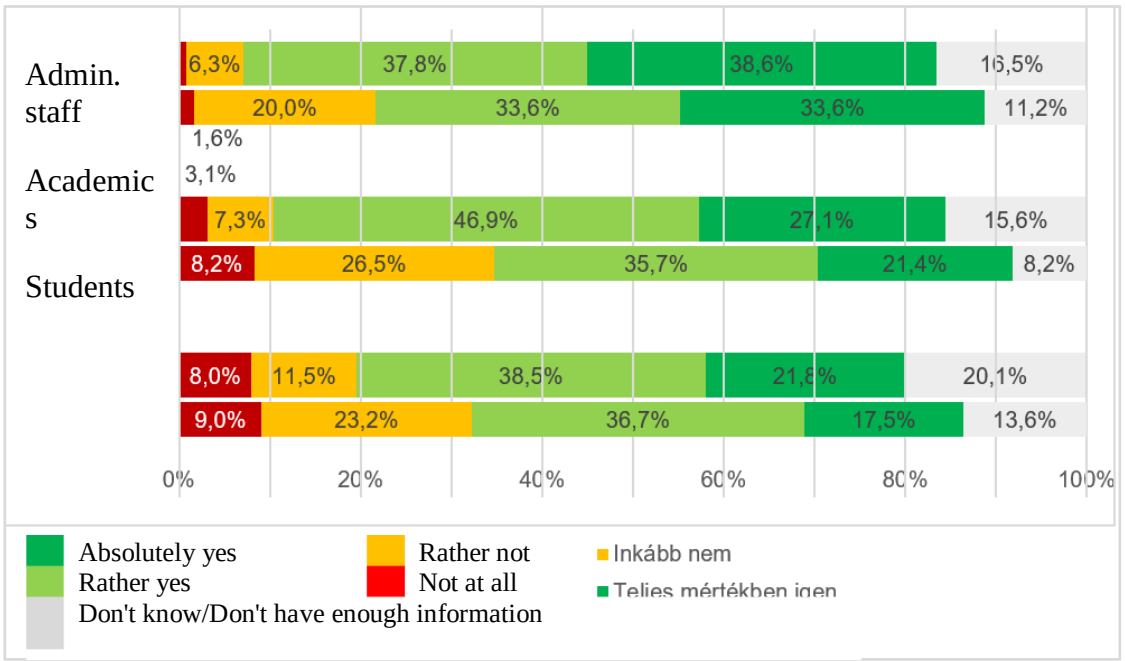
Figure 33 To what extent do you agree with the following statements?



Source: Edited by the author (based on the NUPS questionnaire).

If we examine the two extreme cases (appearance of sustainability in every course and incorporation in further training), significant differences can be seen in the distribution of the responders (students, teachers, administrative staff).

Figure 34 Based on crosstable: support, as a function of the legal relationship, of that all students should complete a sustainability course (top) and that the topic of sustainability should be integrated into all courses (bottom)



Source: Edited by the author (based on the NUPS questionnaire).

Both the students and the educators support the restructuring of the courses much less than the general principle, namely, that students should attend to sustainability-themed courses. Based on the Chi-squared test, the correlation is significant in both cases (P=0.007 and P=0.002).

The data and figures clearly show that the contents in the courses do not provoke unanimous consensus. Of the instructors, 74% agreed that students should complete sustainability courses related to their profession during the university studies but only 57% believe that these courses should be integrated into the curriculum and even fewer think that developing content within the courses should be addressed. It raises the question of how the teachers see the feasibility of the transfer of sustainability knowledge.

At this point, I had to broaden the scope of my research with another aspect. Seeing the opposition of the teachers, as one of the most important stakeholder group, a new criterion had to be taken into account when integrating sustainability into education. And this aspect is whether further training or the sensitisation of the teachers is necessary to start the sustainability transition. Further analysis of this issue goes beyond the scope of this paper.

The significance thereof is highlighted in the article by Barth and Rieckmann (Barth & Rieckmann, 2012). Their results showed that training the academic staff could effectively improve the educational capacity, by which they contributed to the university sustainability transition.

It is worth addressing the attitude of the staff separately, as the quality of the teachers is one of the most important determinants of the quality of the university. Winning an excellent teaching staff and researchers is an important task of university management. It is also important that the university motivates the existing teaching staff to maintain the standard. They should be able to spend quality time for their own development, publishing and research in addition to their teaching duties.

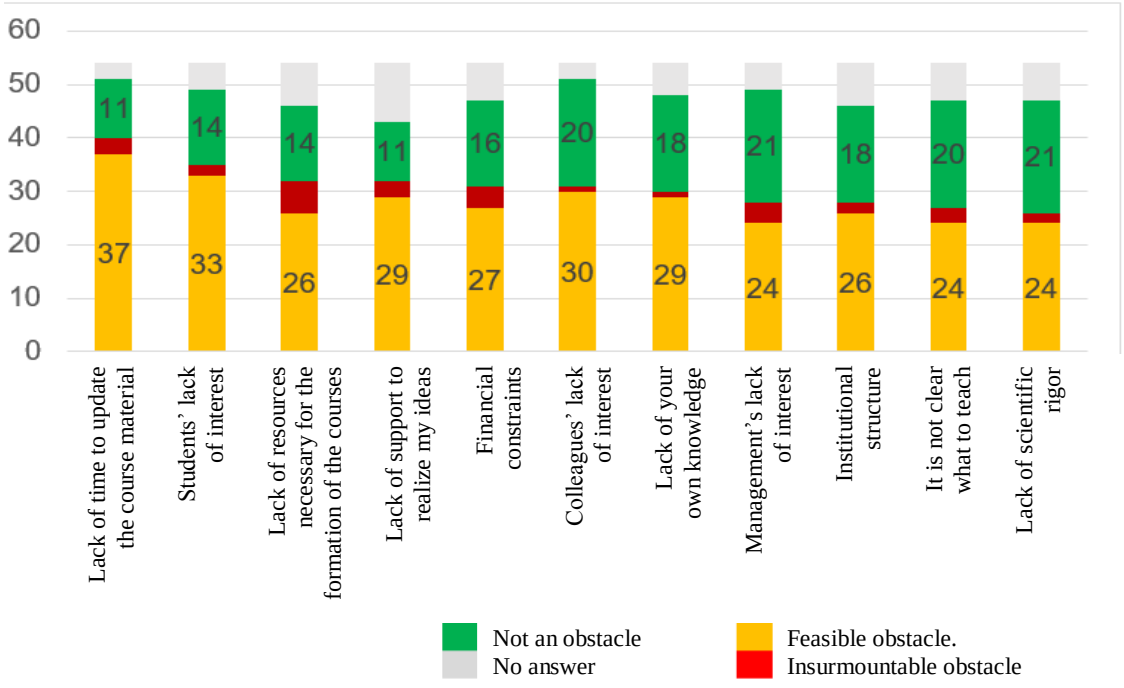
As a continuation of the above reasoning, I also tried to get an answer in the (NUPS) questionnaire to how the teachers feel about the obstacles to the integration of sustainability into the curriculum. I asked the teachers, on the one hand, why they did not plan to integrate knowledge and aspects related to sustainability into the courses they held and, on the other hand, if they did, what prevented them from achieving it.

As to the first question, most of them said the topic was not related to the subject they taught. And some believed that the topic of sustainability was already sufficiently represented or there was no room for adding it to the existing topics. Opinions in a very small number were received, which indicated that the topic of sustainability was not considered that important or they would rather engage qualified instructors to transfer the knowledge.

As to the second question, which concerned the obstacles, very few are kept back, based on the responses of the lecturers, from integrating the sustainability knowledge into their courses by the disinterest of the leaders and the colleagues, the lack of scientific rigour or that it was not obvious to them what they should teach.

They identified the lack of time, the students' lack of interest and the lack of resources as the biggest obstacles.

Figure 35 To what extent do the barriers listed below present an obstacle for you in the integration of sustainability knowledge? [Number of respondents]



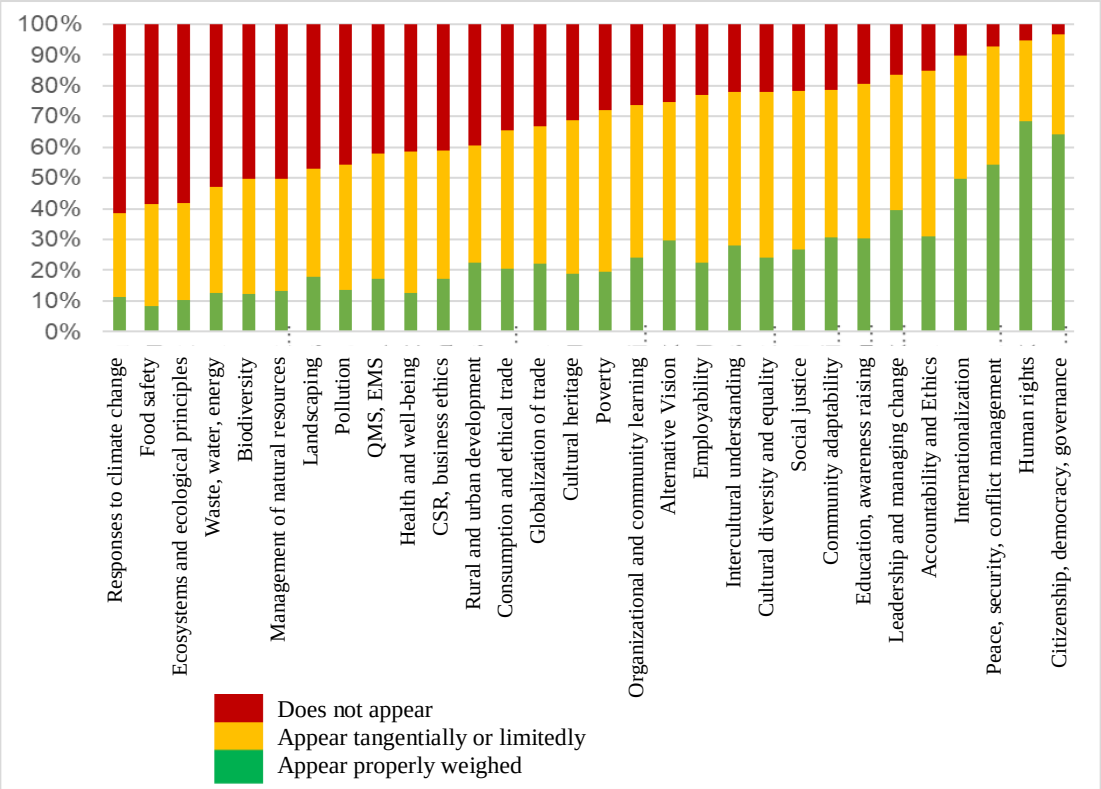
Source: Edited by the author (based on the NUPS questionnaire).

The importance of the continued training of lecturers is highlighted by this result because a more thorough investigation and understanding of the sustainability topics shed light on a number of aspects that may induce other colleagues to integrate the relevant knowledge into their subjects.

5.5.3 Current status of education for sustainability

Currently, there are courses at the university that affect some aspects of sustainability or specifically deal with sustainability. And many students have already encountered sustainable development in their previous studies, possibly within the framework of another training or institution, so they can have preliminary studies in terms of sustainability knowledge. Obviously, this applies to university citizens other than in student status. We also tried to find the answer in the questionnaire to topics the responders have encountered during previous studies and how satisfactory they perceived the amount of the knowledge transferred. This questions understandably reflects interest as well, as we must see whether certain knowledge appears "properly weighed" as a subjective element in any event. This can mean that either a subject did not really appear or that the respondent wanted to hear more about the topic.

Figure 36 In your view, do the contents below appear properly weighed in the course(s) you also participate in?



Source: Edited by the author (based on the NUPS questionnaire).

Ass regards the question of whether a topic appears properly weighed, the respondents could decide in the case of 30 possible answers how satisfied they were with the

knowledge received. The summary table shows that the responders would chiefly like to learn more about climate change, food safety and ecological principles.

In contrast, the respondents were of the opinion that topics related to governance, human rights and conflict management were properly weighed.

I carried out the factor analysis also on topics related to sustainability, in respect of which we asked the respondents if these topics were properly weighed in the curriculum. Since it is assumed that there is no objective standard for deciding what weight a subject should be given, the responses reflect a kind of subjective preference. This means that deficit is also personal because if someone is interested in a certain topic, he is happy to hear more about it for obvious reasons, but can also mean that it is not represented in the curriculum at all or with sufficient weight.

Figure 25 Cluster analysis - proper weighing of the contents in the course(s)

Rotated (Varimax, Kaiser Normalized) component matrix						
	Components					
	1	2	3	4	5	6
Responses to climate change	**.804**	.241	.075	.080	.038	.139
Pollution	**.784**	.205	-.029	.188	-.019	.283
Management of natural resources	**.765**	.145	.152	.105	.209	.233
Food safety	**.748**	.080	.082	.142	.300	.132
Waste, water, energy	**.713**	.280	.008	.159	.064	.258
Health & welfare	**.608**	.146	.250	.221	.205	-.062
Ecosystems and ecological principles	**.576**	.385	-.213	.237	.233	.164
Globalisation of commerce	**.564**	.145	.325	.412	.232	-.210
Biodiversity	**.503**	.457	-.052	.295	.089	.059
Cultural heritage	.290	**.677**	.151	.029	.218	.042
Cultural diversity and equality	.139	**.674**	.246	.185	.177	-.008
Understanding between cultures	.307	**.627**	.427	-.046	-.107	.108
Community adaptability	.277	**.532**	.099	.426	-.011	.117
Social justice	.150	**.526**	.370	.084	.133	.386
Employability	.259	**.526**	.189	.383	.263	.121
Poverty	.388	**.420**	.137	.122	.065	.374
Human rights	-.069	.150	**.755**	.054	.115	.187
Internationalisation	.212	.290	**.672**	.075	.129	-.006
Citizenship, democracy, governance	-.084	.119	**.664**	.232	.286	.096
Peace, security, conflict management	.223	.157	**.604**	.166	-.063	.415
Corporate social responsibility, business ethics	.289	.186	.127	**.642**	.349	.056
Alternative visions	.275	.383	.141	**.629**	-.153	.252
Accountability and ethics	.244	-.138	.292	**.613**	-.143	.263
Consumption and ethical trade	.242	.292	.134	**.604**	.453	-.034
Education and awareness-raising	.055	.411	.001	**.478**	.030	.414
Landscaping	.264	.144	.214	.050	**.819**	.205
Rural and urban development	.218	.132	.171	.030	**.815**	.176
Organisational and community learning	.222	.127	.217	.047	.142	**.736**
Leadership and change management	.194	.009	.408	.175	.254	**.599**
Quality management systems, environmental management systems	.361	.094	.001	.284	.298	**.504**

Source: Edited by the author (based on the NUPS questionnaire).

Similarly, the appearance of specific content with the proper weight can mean that the respondent has actually received a wealth of information on that subject, but also that he is not really interested in the subject, so the knowledge received is considered sufficient.

The 6 factors resulting from the factor analysis explain the 65.634% variance of the 30 variables. The naming of the factors was obvious based on the topics listed in the same group.

1. factor – **Global issues**: It contains popular topics, such as climate change, pollution, natural resources, food safety, water, energy, health and welfare, ecological principles, globalisation and biodiversity
2. factor – **Social justice, well-being**: Cultural issues, diversity, equality, justice, understanding, adaptability, work and poverty
3. factor – **Law and governance**: Human rights, internationalisation, citizenship, democracy, governance, peace, security and conflict management
4. factor – **Economy**: CSR, alternative solutions, accountability, ethics, consumption, trade, awareness-raising
5. factor – **Local issues**: Rural development and urban development
6. factor – **Organisation and control**: Organisational and social learning, leadership, change management, QMS, EMS

I carried out a cluster analysis of these factors. The attention of those in the same cluster was directed at the same topic groups, meaning, they perceived the weight of these topics similarly. Thus, I classified 145 respondents into clusters. According to the resulting two clusters, a major part of the respondents was susceptible to organisation and control and, more moderately, law and governance issues. There are 111 of them. The members of the smaller group pay more attention to social justice and well-being, local and global issues, as well as economic issues. Although they are fewer (counting 34), their view is more categorical.

Table 26: Pronounced topics based on cluster analysis

	Cluster 1 Well-being, local and global issues, economy	Cluster 2 Organisation, control, law and governance
Global issues	.22372	-.06853
Social justice, well-being	**.61008**	-.18687
Law and governance	-.27865	**.08535**
Economy	**.21882**	-.06703
Local issues	**.51487**	-.15771
Organisation and control	-1.18063	**.36163**
Number of elements	**111**	**34**

Source: Edited by the author (based on the NUPS questionnaire).

Using the clusters, I tried to find an answer to whether there is any correlation between the appearance of sustainability topics in the course contents and the legal relationship.

Table 27 Crosstable: Weight of legal relationships* based on sustainability topics

	Well-being, local and global issues, economy	Organisation, control, law and governance
Students	21.0%	79.0%
Academics	27.3%	72.7%
Administration	0.0%	100.0%
Total	29 persons	109 persons
	21.0%	79.0%

Source: Edited by the author (based on the NUPS questionnaire).

Based on the Chi-squared test (P=0.589), there is no significant correlation between the weight of sustainability themes in the courses and the legal relationship (students, teachers, administrative staff). Somewhat more of the instructors are sensitive to the topics in cluster 1, while all administrative employees who answered these questions, belonged to factor 2.

It follows from all this and a similar analysis performed on interest towards the sustainability topics that interest and the types of course contents that help the university satisfy the individuals' needs are not decided at the level of the individuals but it is an institutional feature. A separate survey can easily demonstrate that the educational profile of the institution is critical. It affects both the interest of the students and the teachers and may affect the interest of the administrative staff as well.

5.6 Conclusions and testing of hypothesis 2

More than 75% of the respondents agree that the NUPS give priority to the theme of sustainability, while the ratio of those who believe the university should not at all deal with this topic as a priority is less than 2%. This result is a starting point that not only

makes this research legitimate but also that the theme of sustainable development should be an integral part of higher education.

So, the opinions regarding this topic are supportive, as expected. However, the picture is more nuanced in respect of how the integration of the theme can be achieved. Special attention should be paid to which motivation factors can be used in respect of the various stakeholder groups.

In this chapter, I am looking for the answer to the question to what extent the integration of sustainable development themes into education can be regarded as a fundamental factor in the sustainability transition. I examined the recommendations and aspects of the external stakeholder organisations regarding the training of sustainability. I collected the deductible conclusions based on the responses given by foreign institutions. I analysed in detail the results of the research carried out among the citizens of the National University of Public Service.

We can see, based on the data analysed, that the appearance of sustainability in education (both vertically and horizontally) reflects the stakeholders' expectations. The institutions that have already started working on the transformation have implemented the integration of the topic of sustainability into education, mostly as one of the first steps.

So, it can be stated that the second hypothesis was confirmed and that integrating the topic of sustainability into education is an essential component of the institutional level integration of sustainability.

This does not mean that integration into education does not run into difficulties. As seen from the results of the research conducted at the NUPS, although the instructor and student colleagues support the principle of integrating sustainability, a bigger share of them are opposed to its appearance in the courses. According to the teachers, the reason for this is mainly the lack of time for updating the course materials, the students' lack of interest and the lack of resources.

6 Relationship of university excellence and sustainability

A recurring question and dilemma are what constitutes excellence in higher education. (Green, 1994), (Matei & Iwinska, 2016) It is the interest of every institution to ensure quality control and the continuous improvement of quality. But it is also a task that should be regulated both at the national and international levels. Regulations are pivots and institutional accreditation aspects at the same time. The regulation of quality control mainly serves the purpose, at all education levels, that the value of the diplomas issued should be comparable. This, of course, will never mean that all university diplomas are equivalent in value, as neither the underlying knowledge nor the institutional support provided to obtain knowledge is of the same quality. In addition, the reputation of the institution issuing the diploma must also be taken into account, which of course is related to the circumstances, the quality of education and, ultimately, the value of the diploma. This is information for prospective employers during the hiring process, on the basis of which they can decide if a candidate should at all be called for an interview.

In addition to releasing graduate students, another important mission of the higher education institutions is the conduct of research activities. They are searching for answers to the challenges of the given era, develop the technology, innovate and/or carry out basic research, also in collaboration with other non-university research institutes.

Green puts it in a way that the two major missions of universities are "Producing graduates to meet the human resource needs of organizations in the business, industrial and service sectors (including public services). Pushing forward the frontiers of knowledge via research." (Green, 1994, p. 18.).

Although quality is not easy to define, according to one of the most sympathetic approaches for me, excellence is the result of interaction between teachers, students and institutional conditions. (ENQA, 2015, p. 7.) Universities must provide an environment in which research, the implementation of programmes and educational conditions meet the goal. A criterion of academic excellence is that it is operating a system capable of generating, in cooperation with the stakeholders, values useful for the given era and society.

In order to asses excellence, I use rankings as the basis, which are currently the most popular and have the largest database and recognition. University rankings operate by applying a precise measurement system developed based on the above-mentioned aspects and ideas. They calculate the ranking of the institutions reaching the best results in the given year(s) in a transparent and traceable way.

Hypothesis 3: The sustainability of higher education institutions has become an element of excellence by today.

The subject of the study is the analysis of the most excellent institutions in the 2015-2019 period (top 10 in the overall rankings) based on the QS, Times and ARWU rankings (the best-known international university rankings). I am looking for the answer to the question of whether the institutions have:

7. A sustainability (corporate social responsibility, environmental) strategy (or when is the first strategy planned to be released).
8. Any traces for the implementation of the strategy: availability of indicators, progress reports and reports. (The content of the strategy or the analysis of the implementation results does not constitute a subject of the study.)
9. Sustainability programmes: is there reference to such activity in the available resources?
10. Sustainability research: is there reference to sustainability-focused research in the available resources?
11. Implemented sustainability education: are there degrees, programmes or courses based on the available information?
12. A website and efforts to involve the stakeholders: is there a sign of internal and external communication, including with the tools of social media, beyond the existence of a website.
13. Participated in sustainability rankings (STARS, UI Greenmetric) as well as reporting (GRI).

My study also relates to the content elements of higher education rating systems. I am searching for answers to how expectations regarding the sustainability theme appear in these documents.

I completed the research with an analysis of the responses given in the international survey.

6.1 University excellence rankings

To examine the correlations between excellence and the institution-level integration of sustainability, I called to help the three best-known international rankings. All three rankings have a long history and examine university excellence not only in the aggregate but data can be retrieved also thematically, by regions and countries.

6.1.1 ARWU - Academic Ranking of World Universities

The Academic Ranking of World Universities (ARWU[25]) was first published in 2003 by the Centre for Higher Education (CWCU) of Jiao Tong University (China) and has been updated annually since then. Since 2009, the ARWU is quoted by ShanghaiRanking Consultancy.

The main criticism of ARWU is that the methodology focuses on natural science and English language scientific journals, and is almost exclusively based on research indicators. So, it does not measure the quality of teaching or human sciences and gives too much weight as regards the fact that a faculty or a graduate is awarded the Nobel Prize. (Adina-Petruta, 2015)

The ranking is compiled based on the following indicators:

Table 28 Evaluation criteria of the ARWU ranking and weighting of the criteria

Criterion	Indicator	Weight
Quality of training	Number of Nobel Prize-winners and Fields Medal-winners among the graduates	10%
Quality of staff	Nobel Prize-winner and Fields Medal-winner	20%
	Often cited researchers, in 21 areas[26]	20%
Research output	Articles published in Nature and Science	20%
	Indexed articles in the extended Science Citation Index (SCIE) and Social Science Citation Index (SSCI)	20%
Per capita output	Per capita academic performance of the institution	10%

Source: (ARWU, 2018)

[25] http://www.shanghairanking.com

[26] https://www.isi-science.com/ alapján, 21 main scientific areas

6.1.2 QS World University ranking, Quacquarelli Symond

The QS[27] World University Rankings is prepared and published by the British Quacquarelli Symonds every year since 2004. It currently contains more than 3,000 institutions and ranks over 800 of them. Between 2004 and 2009, the QS rankings were published in collaboration with Times Higher Education (THE) and became known as Times Higher Education-QS World University Rankings.

The ranking and the associated information portal primarily seek to assist prospective students in making their choice. The institutions and the ranking can be filtered and selected based on several criteria. (Adina-Petruta, 2015)

Table 29 Evaluation criteria of the QS ranking and weighting of the criteria

Indicator	Explanation	Weight
Academic reputation survey	Online selection of 9,000 out of the answers of 180,000 university students over the previous three years.	40%
Employer reputation survey	Based on data collected from job placement firms	10%
Instructor/student ratio	%, current	20%
Citation index	Total number of quotes in the previous five years (Scopus) / Number of university teachers	20%
Foreign employees	(FTE[28]) persons, current	5%
Foreign students	(FTE) persons, current	5%

Source: (QS Rankings, 2018)

6.1.3 Times Higher Education (THE)

After the THE[29] demerged from the QS in 2009, it signed a cooperation agreement with Thomson Reuters and published a ranking made based on its own methodology first in 2011. The methodology includes 13 output indicators, which cover 5 key areas: education (30%), research (30%), citations (30%), industry income (2.5%) and international outlook (7.5%).

[27] https://www.topuniversities.com

[28] Full-time equivalent

[29] https://www.timeshighereducation.com/world-university-rankings

The THE also contains a number of rankings in addition to the basic aggregated university ranking. Thus, the list is searchable by theme and region and thematic rankings are also made, such as European education rankings, Wall Street Journal/Times Higher Education college or Japanese Universities rankings. (Adina-Petruta, 2015)

It is worth mentioning here the recent news that the university rankings are also starting to recognize the international trends. The Times has reported that they are already working on compiling a ranking that measures the performance of the institutions on the basis of the extent they manage to integrate the UN Sustainable Development Goals. (Bothwell, 2018) No information available yet as to when this will be implemented.

By comparing the three rankings, it can be established that citations and the quality of the scientific staff (lecturers and researchers) are pronounced in all of them. It can also be stated that none of the rankings contains any single aspect of sustainable development explicitly.

Table 30 Evaluation criteria of the THE ranking and weighting of the criteria

Indicator	Explanation	Weight
Educational/learning environment	Reputational survey – education (15%)	30%
	Proportion of PhD / scientific staff (6%)	
	All students / scientific staff (4.5%)	
	Proportion of institutional income / scientific staff (2.25%)	
	PhD degrees / bachelor degrees (2.25%)	
Citation index: Research impact	Based on the Web of Science database quoted by Thomson Reuters	30%
Research: Volume, income and reputation	Reputational survey (research) (18%)	30%
	Research income / scientific staff (6%)	
	Scientific articles / scientific staff (6%)	
International outlook	Proportion of foreign/domestic staff (2.5%) Proportion of foreign/domestic students (2.5%) International cooperation (2.5%)	7.5%
Industrial income: Innovation	Income from market activities	2.5%

Source: (THE, 2018)

It follows that, at present, there is no need for a university to integrate sustainable development or deal with it even tangentially in order to become one of the best. I examine in connection with the hypothesis whether sustainable development is still an integral part of the life and educational portfolio of the best universities, although it is not an expectation.

6.2 Quality management of universities

The basic level of academic quality assurance is when a university continuously monitors its operation in an appropriate way in accordance with the institutional accreditation standards valid in the given country. This is called an internal audit and is necessary to allow the institution to provide adequate performance in external validation. In Hungary, the HAB audits and qualifies the institutions based on the standards and guidelines of the European Higher Education Area[30] [31]. At the European level, the majority of the policy work of the EUA (European University Association) on quality assurance is carried out in collaboration with the E4 group (EUA, ENQA (European Association for Quality Assurance in Higher Education), ESU (European Students' Union) and EURA-SHE (European Association of Institutions in Higher Education)).

Institutional ratings are highly important for any university. At a basic level, they create the possibility for higher education institutions to operate in the legal framework. At a higher level, the individual international ratings mean that an institution meets the requirements that enable it to be one of the flagship universities. One of the benefits of these external ratings is visibility and the possibility for expanding international relations. All universities try to best exploit this. These ratings involve a strict set of criteria and, in general, a systematic due diligence system, so acquiring them demands significant resources.

6.3 International accreditation as a benchmark of excellence

Most universities proudly publish the ratings awarded to them, which certify their compliance with certain internationally recognized accreditation systems[32]. For business schools, the three most well-known and recognized ratings are AACSB, EQUIS and AMBA. This also means that not even the most prestigious business schools (e.g. Harvard Business School: AACSB; Stanford Graduate School of Business: AACSB) can ignore the acquisition of such certifications. In Europe, only

[30] https://enqa.eu/index.php/home/esg/

[31] Section 67 (4a) of Act CCIV of 2011 on National Higher Education

[32] https://www.f1gmat.com/top-mba-accreditation

96 institutions are EQUIS certified, of which only one Hungarian university managed to obtain it, that is, the Business School of Corvinus University of Budapest, in 2018.

Although these rating systems are competitive, each has a specialty, which is absent in the other system.

6.3.1 EQUIS – EFMD Quality Improvement System

The triple framework of context, control and strategy development is based on international nesting and the enforcement of ethics, responsibility and **sustainability**.

EQUIS[33] (EFMD[34]) defines the following key areas, the existence of which is examined at the level of strategy, documents and operation during the accreditation process: environment, institutional status, governance, mission, vision and values, strategic positioning, strategic directions and goals, strategic planning, quality assurance, international nesting, ethics, responsibility and **sustainability,** corporate relations.[35]

6.3.2 AACSB International – The Association to Advance Collegiate Schools of Business

Based on the most recently (2018) published AACSB[36] guidelines, three guiding principles are considered as essential criteria for accreditation. They are:

- **Ethical behaviour:** Schools should encourage and support the ethical behaviour of students, teachers and the administrative and support staff.
- **Collegial environment:** Schools create a supportive environment in which students, teachers and the administrative and support staff are working supporting each other for the successful implementation of the educational and other university functions.
- **Commitment to corporate and social responsibility:** Schools must prove their commitment to social responsibility issues (e.g. diversity, **sustainable**

[33] https://efmdglobal.org/accreditations/business-schools/equis/

[34] European Foundation for Management Development (EFMD)

[35] https://efmdglobal.org/wp-content/uploads/EFMD_Global-EQUIS_Standards_and_Criteria.pdf

[36] https://www.aacsb.edu/-/media/aacsb/docs/accreditation/business/standards-and-tables/2018-business-standards-track-changes.ashx?la=en&hash=9C191B7B3A3A2E3E1DDC51A5C5275457092DADBB

development, environmental sustainability and intercultural economic globalisation) through both control, processes and integration into education, research and other activities.

6.3.3 AMBA - Association of MBAs

AMBA[37] is a system suitable for the accreditation of MBA (Master of Business Administration), MBM (Master of Business Management) and DBA (Doctor of Business Administration) programmes. There is no Hungarian business school with this kind of accreditation.

AMBA represents the most traditional business approach. Few traces of the integration of sustainable development can be found, and even those are present only at the level of references. The term 'sustainability' is increasingly used in the "commercially viable" sense.

But one place, AMBA is also dealing with sustainable development based on the guidance information. Namely, in the instructions concerning the knowledge material to be transferred in the programmes in Part XI, Section 7.3 of the Accreditation Conditions. Here, it requires the graduates to know and interpret their company's operating environment, including its impact on sustainability, ethics, corporate output and corporate social performance and the society as a whole.[38]

Here, sustainability appears more as a knowledge element, rather than a standard applicable to the whole institution. This is important progress, especially, when we consider the festive speech of the chief executive officer of AMBA, in which he repeatedly stressed that they supported programmes where the students were committed to ethical business practices and sustainable practices. (Walker, 2018)

Summarizing the above, we see that EQUIS and AACSB assign strategic emphasis to sustainable development, while it appears only as a required knowledge element in the AMBA's system. However, attention should also be paid to the education of sustainability, in such a way that the students should be aware, beyond the basics, of its impact on the business.

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[37] https://www.mbaworld.com/accreditation/become-an-accredited-business-school

[38] https://www.mbaworld.com/-/media/Files/Accreditation/MBA-criteria-for-accreditation.ashx?la=en

Considering the conditions of the different rating systems, we can state that sustainable development plays a role in all of them. It is a clear expectation in all three systems in the area of education while, in terms of the other areas, the two accreditation systems (other than AMBA) contain strict requirements.

6.4 Examination of top-ranking universities

In selecting the "best" universities, I used the 2015-2019 results of QS, Times and ARWU as the basis. Since ARWU has not published its 2019 rankings yet, I used the data of the four years of 2015-2018 there.

I made a list of the institutions ranked top 10 in each year. Thus, with few exceptions (when the 10th place was tied), 10 university names were added to the list every year. So, the list contains (5+5+4)*10=140 names, assigned to numbers ranging from 1 to 10. It is worth noting that there are only 17 universities in total, which were included in the list of 140 names. The scoring was based on the positions obtained in each ranking. Every first place was worth 10 points and every 10th place was worth 1 point.

The scores were aggregated without weighting to create the final order. The difference in the scores of the institutions in the 1st and 10th places is significant (more than fivefold), while the scores of those ranking high are closer to one another. It can be seen that the group of the first four is a little separated from the other six. However, the handicap of the seven institutions that dropped away from the list is only a few points.

Table 31 Aggregate ranking based on QS, Times and ARWU

Rank	THE + QS + ARWU	Total score
1	Harvard University	116
2	University of Cambridge	110
3	Stanford University	104
4	University of Oxford	101
5	Massachusetts Institute of Technology (MIT)	68
6	California Institute of Technology (CalTech)	60
7	University of California, Berkeley	57
8	Princeton University	51
9	Yale University	28
10	Columbia University	21

Source: Edited by the author.

I carried out a detailed study of the 10 institutions shown in the above table. A detailed table of the evaluation criteria and the results are available in the annex. Below, I present the data that are important for testing the hypothesis.

I want to test the assumption, namely, that the integration of sustainable development correlates to academic excellence, in a way that I examine the practice of the universities that proved to be the most excellent OTHER THAN based on sustainability considerations in recent years. They are seen as a kind of representative group of university excellence because sustainability was not part of the selection criteria. So, if excellence and sustainability are not correlated, we should not expect significant sustainability activity. I extended my study to review several areas of the universities' operations. Its purpose was to examine institutional integration, rather than cases where the theme of sustainable development occurs occasionally only.

There are major differences in the size and the date of foundation of the universities reviewed. On the basis of university data publications (Facts & Figures), CalTech is the smallest (less than 2,500 students) and, at the same time, the youngest university (established in 1891). The largest, with more than 42,500 students, is UC Berkeley, while the University of Oxford is the longest-established[39] (1096).

Although not strictly part of the topic, the institutions also differ in terms of whether their bachelor or master training is stronger. The number of students involved in bachelor training is higher in some institutions while that of students involved in master training is higher in others. The biggest similarity in terms of the institutional structure is that all the ten selected institutions are either British (2) or American (8).[40]

The tested sample can be considered representative with respect to the highest rated universities.

During the investigation, I could especially rely on secondary sources available electronically. So, the test is based on the collection of data published through the universities' communication channels and in scientific publications.

[39] https://www.ox.ac.uk/about/organisation/history?wssl=1

[40] The common traits in the higher education systems of the two countries, which can have a positive impact in terms of sustainability, can be the subject of further research.

The result of the study shows that the universities considered best from the scientific point of view are dealing with the issue of sustainability consciously and integrated at the institutional level. All the institutions are characterized by that they treat sustainable development as a priority both in operation and in the areas of education and research. Each institution has a valid strategy and monitoring system on the topic, and the results of the latter are disclosed to the public. Each institution has a responsible organisational unit, which is a separate sustainability office in the case of seven universities, respectively, in three universities, a dedicated team that is, however, not organized as a separate unit.

Each university has its own sustainability website (some even have more based on the topic) and active social media presence (Twitter, Facebook, Instagram). I started to analyse this latter point only later, after I realized that these were the most effective communication channels in terms of social relations and students (as one of the most important stakeholder groups). Unlike the 'static' nature of websites, social media is dynamic and interactive. Appearance on these interfaces is a clear sign of that an organisation is open to dialogue.

The 'living lab' aspect was added to the comparison at a later stage, too. This is a similarity discovered during the research that was not included in the scope of the original survey. The campus, as a 'living lab', appears in relation to sustainability in the case of all the universities. The essence of the exercise is that students are encouraged to innovate and test the innovations on-site.

All the 8 US-based universities have STARS registration (see the *International sustainability rankings and ratings* section): 1 of them is rated platinum and 4 are rated gold or silver. One of the two British universities chose the UI GreenMetric contest, where it is the 4th according to the latest ranking. Furthermore, half of the universities have a sustainability report in the GRI database. These are voluntary undertakings that are usually resource-consuming and even the less "spectacular" show that the level of integration is high in the external evaluator's view as well.

At this stage, I was not looking for an answer to what was the motivation of the individual institutions to launch the sustainability transition, however, I presumed they did not want to prove their excellence in this way. Based on the results of the international survey (there is an overlap between the two tested groups in one respect

only), it is more likely that pressure by the stakeholders and commitment to the subject have played a greater role than the intention of the institution to gain reputation or other advantages thereby.

6.5 Presentation of the relevant results of the international survey

During the research, I wanted to ask as many institutions as possible about their experience associated with the sustainability transition. The questionnaire I composed was filled by 40 institutions from around the world, with a number of institutions among them being at the forefront of science. Unfortunately, the sample size does not allow making generally deductible conclusions. And it should also be considered that the willingness to respond relates to the attitudes concerning sustainability. I presented the survey in more detail in the analysis of the second hypothesis. Now, I just want to present data on the motivation to introduce sustainability. The respondents were asked to state what inspired them to start dealing with the topic of sustainability. Apart from that they want to support sustainable development (which is increasingly seen as a goal), the second cause marked most was to prove the excellence of the institutions.

From this, it can be concluded that the subject of sustainable development is sort of a sign of excellence for the universities over and above commitment. It can be assumed that, because it is self-evident that the finest universities are addressing the matter of sustainability (which I will prove in Section 7), universities that have recognized the importance of sustainability also want to join the best ones on this subject. In the 21st century, a higher education institution cannot afford not to address global issues such as sustainability. It can also be assumed that this theme lends itself well to build relationships regardless of science areas, so true interdisciplinarity in science can be achieved here.

6.6 International sustainability rankings and ratings

Higher education institutions that feel this need can join sustainability-focused ranking or ratings. There are national or regional initiatives, while others are focusing on specific areas (office, campus, buildings, etc). Some are not sector specific (EMS systems), respectively, there are comprehensive sustainability ratings/rankings that have been specifically designed for (higher) education institutions.

A distinction must be made between rating (when absolute performance is to be achieved) and ranking (when the order among the applicants in the given year matters). In the first case, performance can be considered more objective, as excellence does not depend on other institutions, but only the fulfilment of the qualification criteria. As regards rankings, much depends on the performance of the other candidates in the given year.

6.6.1 UI Greenmetric

The University of Indonesia launched the so-called "UI Green Metric Ranking[41] of World Universities 2010", that is, the UI ranking of the universities of the world based on green metrics in the summer of 2010. Currently, 719 institutions are included in the 2018 ranking.

One can participate in the rankings for free. After registration, participants receive access to the online interface[42] where the data are entered.

Table 32 Evaluation criteria of the UI GreenMetric and their weights

Criteria	Scoring share
Location and infrastructure	15%
Energy and climate change	21%
Waste	18%
Water	10%
Transport	18%
Education and research	18%

Source: (GreenMetric Criteria, 2018)

A number of Hungarian universities have been included in this ranking for years. Although the best (University of Szeged) is ranked "only" 77th, the Hungarian universities can still compete with the leading universities in some aspects (see Annex 16). It is worth noting that the only aspect in which there is obviously a backlog, is the area of education and research.

This area was added to the questionnaire later, in 2012. This criterion accounts for 18% of the total score (Table Table 29). The integration of the new criterion resulted from the recognition that universities play an important role in shaping the awareness

[41] http://greenmetric.ui.ac.id/criterian-indicator/

[42] https://questionnaire.greenmetric.ui.ac.id/

of the new generations regarding sustainability. New indicators have been included in the system, such as the

- proportion of sustainability courses,
- funding ratio of sustainability research,
- number of relevant scientific publications,
- number of scientific events related to sustainability,
- number of related student organisations,
- existence of a sustainability website maintained by the university,
- existence of a published sustainability report.

6.6.2 STARS (Sustainability Tracking, Assessment & Rating System)

Developed by the Philadelphia-based Association for the Advancement of Sustainability in Higher Education (AASHE), the Sustainability Tracking, Analysis and Rating System (STARS[43]) is a voluntary reporting system, which has been developed for educational institutions, primarily, for universities. The idea and the need to prepare the system occurred in 2006, and AASHE released a trial version of STARS 0.4 in 2007.

Examining all aspects of university operations, the rating is based on the documents on the commitment to sustainability and the realized evidence thereof. To reach a level, the total score and the minimum score expected in each thematic area are taken into account. This is to ensure that there is no area where an institution that received Platinum rating has significantly weaker indicators.

All STARS reports and certifications are valid for three years from the filing date, but it is possible to upload an updated report annually.

Using the STARS framework is not tied to the payment of a registration fee, only login to a free user account is required. Any higher education institution can apply, and it is open to secondary education institutions as well. This is also a good opportunity for any higher education institution to access a free toolbar that may be a pivot for preparing a comprehensive sustainability strategy. Free access allows managing and

[43] https://www.aashe.org/wp-content/uploads/2017/07/STARS-2.1-Technical-Manual-Administrative-Update-Three.pdf

tracking one's data and offers the possibility to become a public STARS rapporteur. To be able to track the prior scores of the university and apply for the bronze, silver, gold or platinum rating of START, a subscription is required (amounting to between USD 500-1500). (AASHE)

In Hungary, only the National University of Public Service has a free registration but the university has not yet reached the rapporteur level, which is also free.

Table 33 STARS rating thresholds and number of participating institutions (2018)

Rating	Minimum required score	Number of institutions
Bronze	25	42
Silver	45	138
Gold	65	107
Platinum	85	5
Rapporteur		11
Total		306

Source: (STARS, 2019)

STARS ask for the following topics, weighted in the attached manner (by using scores) for the purpose of assessing the institutions' sustainability efforts.

In contrast to the UI GreenMetric ranking, published annually, STARS is a constantly updated rating. It means that it is not a comparison-based ranking but an evaluation in itself, which is based only on the performance of the given institution.

Achieving the Platinum level does not depend on the indicators of other universities but acquiring it requires a very high degree of dedication based on the scores and the system.

University rankings and the various ratings aim to ensure excellence by means of an independent body periodically reviewing the functioning of the institution. Voluntary tools play an important role in addition to the obligatory (accreditation) certifications required by law, which aim to ensure the quality of higher education in a country and internationally alike.

Table 34 Educational aspects of the STARS rating

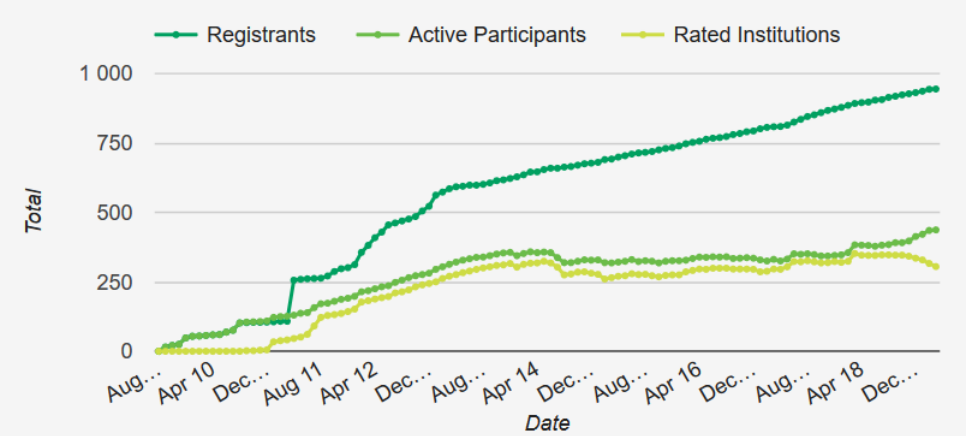
Topic	Description	Score
Academics (AC)	Curriculum	40
	Research	18
Engagement (EN)	Involvement of the campus	21
	Involvement of the public	20
Operations (OP)	Air and climate	11
	Buildings	8
	Energy	10
	Food and dining	8
	(Land) areas	4
	Waste	10
	Water	8
Planning & Administration (PA)	Coordination and planning	8
	Diversity and affordability	10
	Investments and finances	7
	Welfare and work	7
Leadership & Innovation (IN)	Bonus points	4
Total:		194

Source: (STARS, Technical Manual, 2019)

The increase in the popularity of green rankings and ratings is a good indicator of the institutions for a need to show their commitment to sustainability, thus giving further confirmation and additional impetus to the process of transformation.

During the nearly 10 years that passed since the introduction of international "green rankings" (STARS: August 2009, UI: 2010), the number of participants reached 944 and 719 institutions, respectively, of which there are, in the case of STARS, 437 active members and 305 rated members.

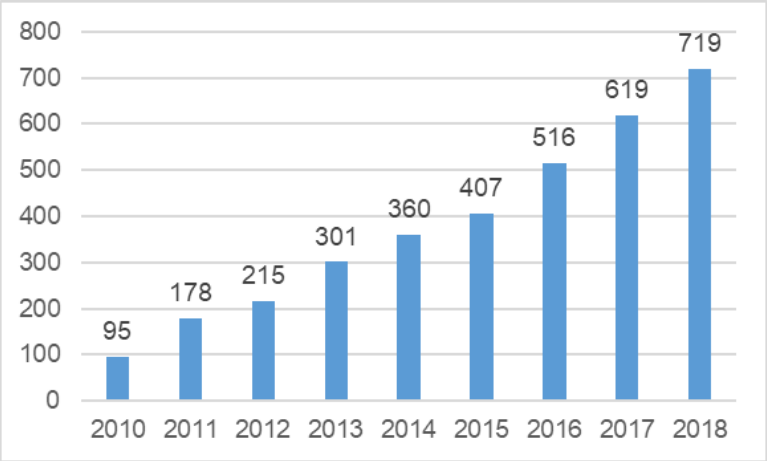
Figure 37 Change in the number of entities registering to STARS (2009-2019)



Source: (STARS, 2019)

The increase in interest is due to the fact that, in the case of STARS, registered institutions can start planning and implementing their sustainability programmes without any obligation while the UI GreenMetric's requirement system can be easier fulfilled and there are no minimum standards for ranking. A number of Hungarian universities have been engaged in the annual contest for years.

Figure 38 Number of institutions participating in UI GreenMetric (2010-2018)[44]



Source: (GreenMetric, 2018)

Unfortunately, I got stuck on the examination of the integration of sustainability by the domestic universities already at the point that I did not get an answer to the questionnaire and could not analyse sustainability strategies (due to the fact that even where such a strategy exists, it is either outdated or non-public). So, for the purpose of testing the hypothesis, I could only rely on the UI GreenMetric participation and the position in the ranking of the national journal HVG. Of the top ten institutions in the higher education ranking of HVG (2018), six were included in the list of UI that year. They were the same universities that have got into the QS and Times rankings (at 500+ places). **I do not consider this result as the most important argument to prove the hypothesis, but it is important from the standpoint that it did not refute it, either.**

6.7 Investigation of the fulfilment of the third hypothesis

The institutions at the top of the university scientific (quality) rankings have integrated the sustainable development issues at a strategic level. The transformation process reaches back several years and sustainable development has been treated as a priority

[44] https://www.uv.es/uvweb/analysis-programming-service/en/statistics-indicators/ranking/-greenmetric-ranking-world-universities-1285868425880.html

in these institutions from the beginning of the 2000s. Currently, there are both initiatives functioning on the campuses and bustling sustainability life in the communication and the social media in all universities under examination.

The major higher education ratings have also responded to the global challenges by now and lay a strong emphasis on the issue of integrating sustainability at the institutional level. Being one of the most important external stakeholders, they can thereby exert pressure on the institutions striving for excellence. Commitment can be strengthened by this external pressure as well.

As the sustainability efforts of the prominent international institutions date from earlier that the incorporation of these requirements into the rating system, we can say that the transformation in these institutions was triggered by other reasons. But it is also clear that the intentions of those striving for excellence are confirmed today by the integration of the sustainability topics into the certification criteria of the university (non-sustainability) ratings.

So, in terms of the hypothesis, we can state that excellence is associated with the institutional integration of sustainable development (as we have seen in the example of the best universities). **At the same time, those striving for excellence are also confirmed by that the criteria of the independent assessors also transform.**

So, we can state that the third hypothesis, namely, that the sustainability of higher education institutions has become an element of excellence by today, is proven.

7 Usefulness of the institution-level integration of sustainable development

The question as to what extent certain knowledge, skill or competency is useful is decided especially by the era, culture and social context. Even now, in the 21st century, knowledge that is useful in one part of the world may be completely useless in other parts of the world or other social classes. 'Employability' is a concept closely related to the subject of the present study. It is defined by the career centre of the University of Leeds as follows: „A set of attributes, skills and knowledge that all labour market participants should possess to ensure they have the capability of being effective in the workplace - to the benefit of themselves, their employer, and the wider community" (CBI/NUS, 2011, p. 14.) (CBI/NUS, 2011)

It is obvious that other skills are needed in the labour markets of developing countries than in a developed country.[45] So, depending on the geographic location (culture, country) and the position in which you want to succeed, that is, the kind of tasks you want to attend to (entrepreneur, manager or subordinate, white-collar or blue-collar worker), the required competencies may vary and, thus, the concept of employability has a different meaning. So, we can establish that employability is context-dependent.

Due to the context-dependent nature of competencies, it is important to clarify that, in the course of this research, I examine the competencies in the context of the developed countries.

Sustainability is very similar to the theme of employability. „Although developing countries and developed countries share the general increase of concern on environment, their attitude differs on more specific environmental issues" The developing countries stated that the cause of the environmental crisis was, especially, overpopulation (India (74%), Mexico (64%)), the impotence of the government (Russia (55%), Turkey (50%)), the lack of education (Turkey (75%), Chile (66%)) and technological problems. In contrast, the developed countries put individual consumption in the first place (USA (73%), Canada, Germany (68%), the United

[45] Obviously, in the digitized world created by globalisation, the competencies interpreted in developed countries apply to the workers in developing countries who are the intellectual suppliers of multinational companies (e.g. programmers, developers).

Kingdom (60%)). (Michiko, 2000, p. 13.) The countries and regions can differ in both the triggering factors, the emerging effects and the potential solutions.

The importance of sustainability is now unquestionable. Nevertheless, I tried to examine, from another point of view, why it may be useful for universities to integrate sustainable development at the institutional level, in addition to that understanding the global issues of the subject should not be missing from the knowledge of an educated man in the 21st century.[46]

7.1 Assessment of higher education institutions

I demonstrate that a university can address differently the question of why it can be important for it to integrate sustainable development at the institutional level. At the same time, I acknowledge that already the utmost importance of the topic and the responsibility of higher education arising from its role in the society justify the need for transformation.

In the previous chapters, we examined:

- What is needed for the sustainability transformation process to begin (leadership commitment (H1), strategy, projects, stakeholder pressure).
- What areas should be dealt with in any case to ensure that the transition does not remain superficial (education (H2), research, operation, social relations).
- What is needed in order not to stop at the beginning (excellence indicator (H3), tangible results, stakeholder demands, commitment, feedback).

We examined all these setting out from the fact that higher education is an economic sector by itself that is also directly responsible for certain environmental problems (pollution, raw material consumption, emissions, etc.), so the search for solutions should also be part of its tasks. In addition, it is also indirectly responsible for the promotion of sustainable development by transferring knowledge, awareness-raising and setting an example, as well as the generation of knowledge related to the topic, research and innovation. The role of higher education is also outstanding because, owing to its direct contact with the market (companies and public sector), the universities offer the fastest and most effective option for acquiring knowledge and

[46] Which does not mean that he proceeds from the level of knowledge to the level of attitudes or habits.

utilizing the research results in the fastest and most effective way. It is a kind of living laboratory and a credible source of information for the society.

I will examine in this chapter why it is worth making the theory and practice of sustainable development an integral part of the operation of universities in terms of the results (output), regardless of whether the education and research profile of the institution concerned is linked to any scientific field of sustainability. Thus, apart from the very important position, namely, that the implementation of sustainable development is the only way to our survival[47], which is now questioned only by a few, what profit can a university make "from sustainability"?

I called this research question and the hypothesis deduced from it an "opportunistic" explanation. I presumed that if a university leader is not dedicated to the topic and does not share common views about the social responsibilities of higher education, yet he considers the success of the institution important, then how can he be convinced about the importance of sustainability transformation. Is it sufficient that he is aware of the fact that the fourth industrial revolution brings new challenges to the whole economy, including its actors? The age of technological unemployment has started, when the robotization makes "skilled workers" increasingly obsolete (MacCarthy, 2014), which puts education as a whole in a different context. It also follows that changes both in terms of the methods and the contents are required in the field of higher education.

7.2 What is a good university like?

To place this aspect into context, we have to assume that all universities (higher education institutions) aim for excellence, that is, they want to achieve constantly better performance as an educational institution. To answer the question of what a good university is like, we must clarify when a higher education institution is considered successful. So, how can success be measured and what indicators can be used to determine it? Success criteria that are not obvious should also be taken into account.

In deciding what makes a university good, we need to consider what is the use of higher education. The question of utility can be divided into several parts. The question can be examined at the individual and social levels. These dimensions can be well

[47] Opinions vary as to the manner in which we should realize it.

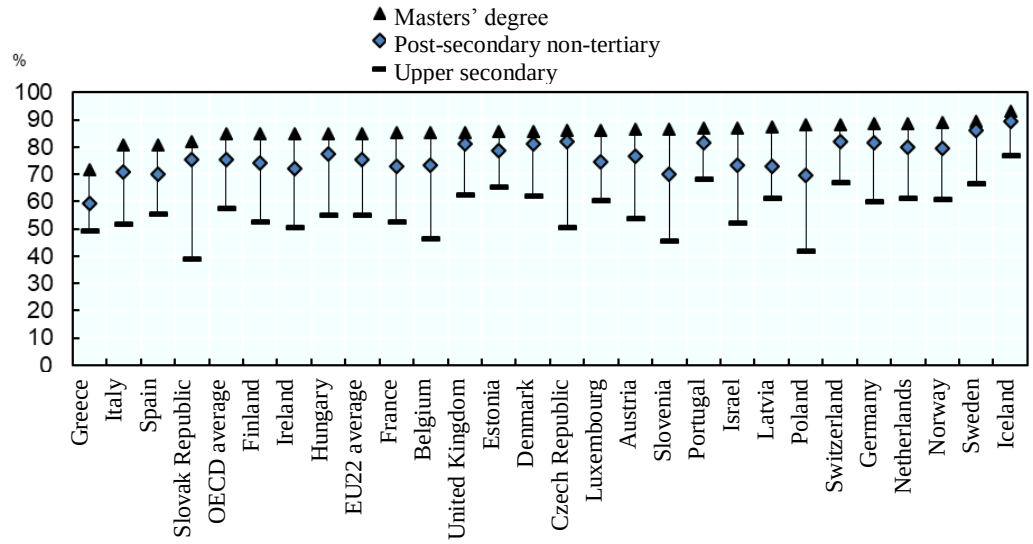
identified, as the costs in relation to higher education also arise at the individual and societal levels. (King & Ritchie, 2013), (Brennan, Durazzi, & Séné, 2013),

As regards the selection of the degree and the institution, the level of expected income excels from the individual advantages (Tozer, 2017). It means that those applying to a university expect that their investment into the training will pay off and then be a further advantage in terms of revenue in their lives.

This yield can be calculated relatively precisely based on the invested resources and the benefits projected on the life expectancy. When performing the calculation in the simplest case, the methodology takes into account the difference appearing in the income.

The first important question is what are the employment prospects of the graduates and how they relate to the average and/or the income of those without a diploma.

Figure 39 Employment rate of the 25-64 age group by educational level (2017)

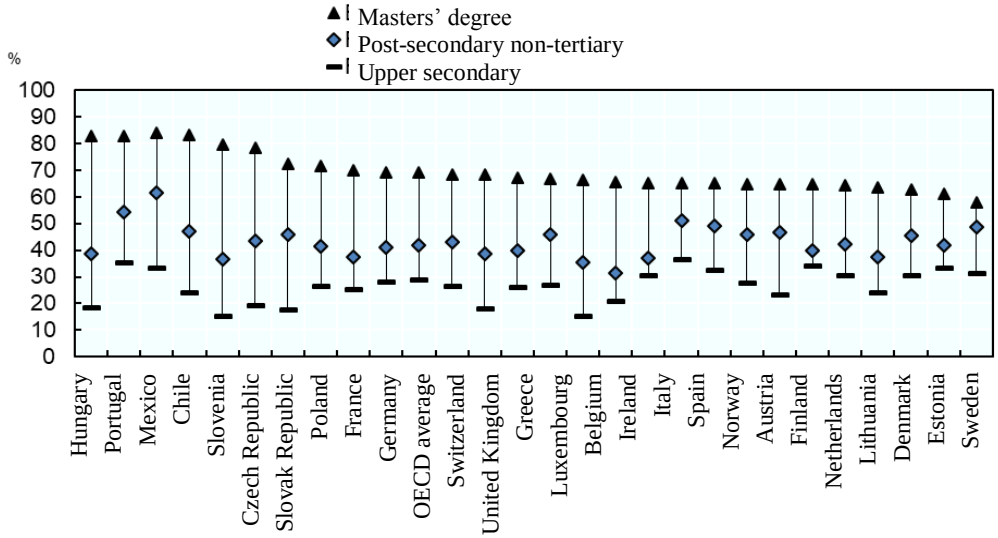


Source: (OECD, Education at a Glance, 2018)

Another aspect worthy of consideration is the return on the invested resources. That is, how much benefit it offers in terms of the diploma and the earnings prospects, if at all.

As we will see, the answer to both questions (Figure Figure 39 and Figure Figure 40) is a definite 'yes'. Although the difference is not significant in every country but, precisely in the case of Hungary, the differences in the earnings outlook are dramatically bigger and the chances for employment are also more favourable. True, that the value of a diploma is much higher in Poland in the latter respect.

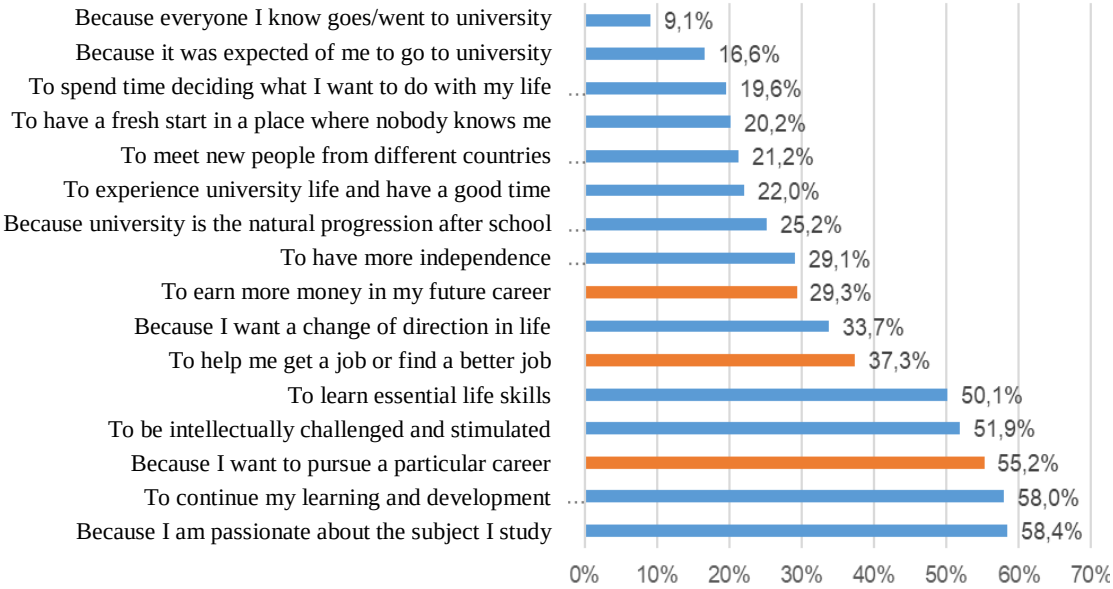
Figure 40 Percentage of adults earning more than the median, by the level of education (2016)



Source: (OECD, Education at a Glance, 2018)

The two aspects presented are so pronounced because, according to most research (Csuka & Banász, 2014), (Bhardwa, 2017), (Huntington-Klein, 2017), career planning, that is, the employment and earnings prospects after graduating from the given degree of the given institution, is a priority aspect among the individual preferences when selecting the university.

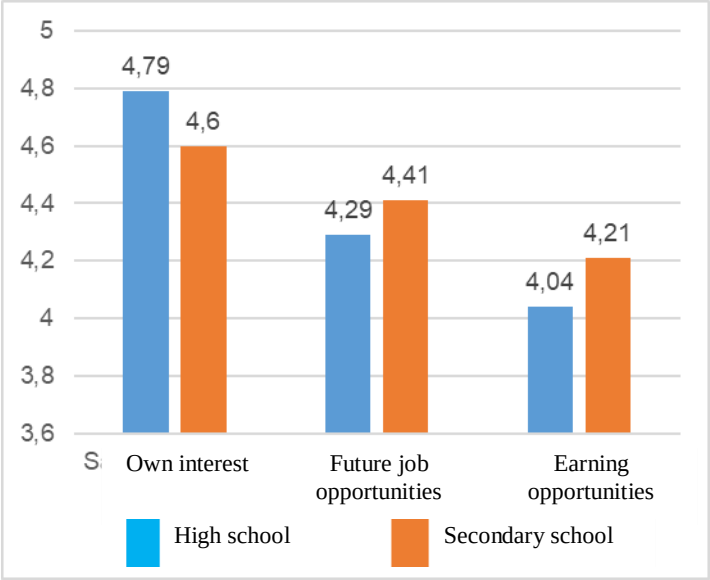
Figure 41 What were your main reasons for going to university?



Source: (Hobsons, 2017, p. 10.)

Among the few Hungarian data available on the subject, a scientifically credible source surveyed the opinion of secondary school students in Szeged.

Figure 42 Average of the criteria affecting the students' decisions upon application (on a scale from 1 to 5)



Source: (Lengyel & Török, 2012)

The decisions of secondary school students are primarily affected by their interest and career prospects. The chance for future employment and higher income prospects are even more pronounced in the case of vocational secondary school students.

Social benefit is more complicated to calculate and social costs are more difficult to be aggregated than the individual costs and benefits. In general, the major benefits are the growth of human capital, the reduction of disparities, longer life and lower crime rates (Attwood, 2010). It is also obvious that the extra tax paid (more tax paid follows from higher income) and the increase in purchasing power are clear economic benefits.

In his article on social utility, Hout quotes Downey: "Education makes life better. People who pursue more education and achieve it make more money, live healthier lives, divorce less often, and contribute more to the functioning and civility of their communities than less educated people do. Most recent evidence supports the proposition that education improves people in ways that matter later in life. Some of those are skills that they could, in principle, pick up at home, on the job, or elsewhere. For example, most people learn to read in school. The fact that some learn at home suggests that others could, too. But education works for these kinds of widespread, general skills because the results are surer and the process is more efficient in the

school setting. It is also more egalitarian; acquiring the skill does not depend on parents and siblings mastering it and passing on their mastery." (Hout, 2012, p. 394.)

7.3 How do prospective students choose an institution?

On the question of how to decide which university is "good", the rankings, among others, give an objective answer. I used the data of the three best-known international rankings (QS, Times, ARWU) in my thesis. These rankings provide data retroactively for several years to assess the quality of universities.

Rankings are an important tool for being tested, but the real test of higher education institutions is the success in the competition for students. First of all, the number and the "quality" of applicants are the two most important aspects for a university to attract the most promising students.[48] The student preference surveys revealed that the quality of education is one important consideration when choosing the institution (Kádár, 2018), (Csuka & Banász, 2014), (Hobsons, 2017). How can a prospective student judge the level of education of a particular institution until he has no personal experience about it? Interestingly, the rankings are not the primary source of information in this regard. According to the prospective students, the best indicators are the proportion of highly qualified lecturers (70%), favourable placement rate after graduation (52%), as well as good facilities and modern teaching environment (49%). The result achieved in the international rankings follows only after this. (Hobsons, 2017, p. 31)

In assessing the quality of universities, the ratings of the international and regional accreditation organisations can also be regarded as an objective indicator. For the European universities, mainly the guidelines of the ENQA (European Association for Quality Assurance in Higher Education) are relevant, which are applied in Hungary based on the Quality Assurance Standards and Guidelines of the European Higher Education Area of (ESG 20151).[49]

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[48] When the admission results are published, the number of applicants (to the first institution marked) (over-application ratio) and the admission score thresholds are followed by the greatest interest.

[49] It is interesting and worth noting that the competencies (skills) play a significant role in the current directives as well. It is difficult to measure the competencies because the real merit of education/teaching at the university level is the long-term success and the ability to prove fit in the changing environment. One of the internationally accepted indicators is the ratio of graduates who get employed within one year of completing their studies (DPR).

Obtaining a certification is binding, on the one hand, in order to be able to issue state-recognized diplomas and, on the other hand, to acquiring certain (higher-level) qualifications is a hallmark of excellence. These ratings, as I explained in Section 6.3, require additional resources, the existence of which already indicates the quality of the institution in some ways.

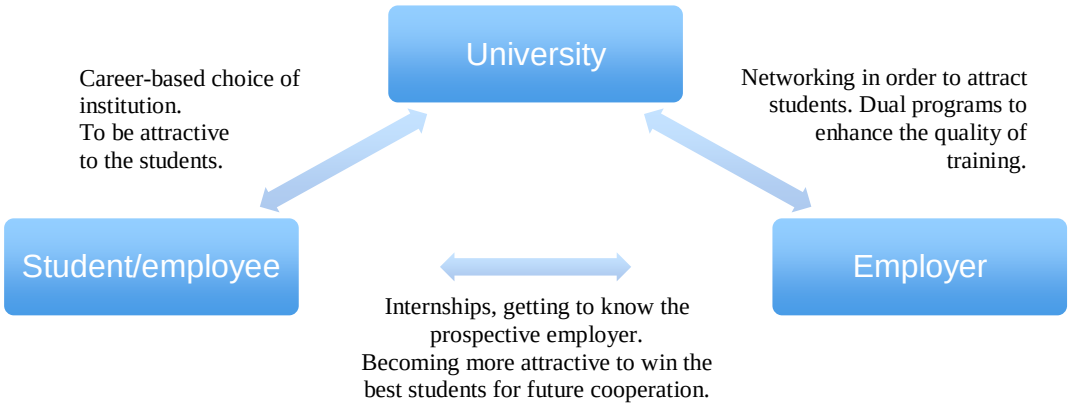
It can be stated that the usefulness and excellence of the institutions can be measured well, but with some limitations. Appropriate feedback is provided not only by the rankings but also the employers' preferences. These are closely related to the students' decisions, so the better students apply to and are admitted by the superior institutions, which will further enhance their excellence. This is a kind of self-inducing process where the ascent and decline are greatly affected by both the internal and external perception of the institution.

7.4 Knowledge, skills, competency

Usable knowledge, up-to-date (special) competence at the level of skills and flexibility are criteria that constitute the primary considerations of prospective employers when selecting employees.

As we have seen, one of the aspects of the students in choosing the institution is laying the foundation for their future career. Meanwhile, employers are also monitoring the best universities, so that they can be the first to offer employment to the best students. Ideally, they are able to employ them already as students, so the risk of a trial period can be mitigated as well. And this is a win-win situation for all.

Figure 43 Career-oriented relations of higher education actors



Source: Edited by the author.

The development of professional competence is an important task of universities. Transferring up-to-date knowledge in a modern setting is a necessary part of the preparation for a profession. However, the digital era has brought changes in this area as well in terms of that the value of static knowledge (lexical knowledge) has decreased while the demand for creativity, flexibility and the ability to acquire new skills has rapidly increased. The possibility to automate professions that require little creativity and flexibility also increased the risk of becoming unemployed by those who choose such a profession. According to the study of Carl Benedikt Frey and Michael Osborn (Frey & Osborne, 2013), it means that any activity that, for example, does not require creative or social intelligence can be robotized with much higher odds that those where such skills are necessary. One of the end conclusions of their study is that "educational attainment exhibit a strong negative relationship with the probability of computerisation." (Frey & Osborne, 2013, p. 48).

The widening use of computers is not only important in terms of that it squeezes out live labour from certain occupations, but also in the sense that lexical knowledge is devalued because of available information. Knowledge of data available via the Internet is no longer an advantage for anyone. In contrast, complex vision and experience in the use of huge amounts of data require totally different skills.

Identifying and developing the required competencies are also particularly important as the employers more and more frequently define the ideal candidates along them. Over and above the fulfilment of these and professional knowledge, competencies typical of entrepreneurs, such as innovation skills, risk-taking and a proactive approach are also required to cover the road to success. (Szegedi, Fülöp, & Bereczk, 2016)

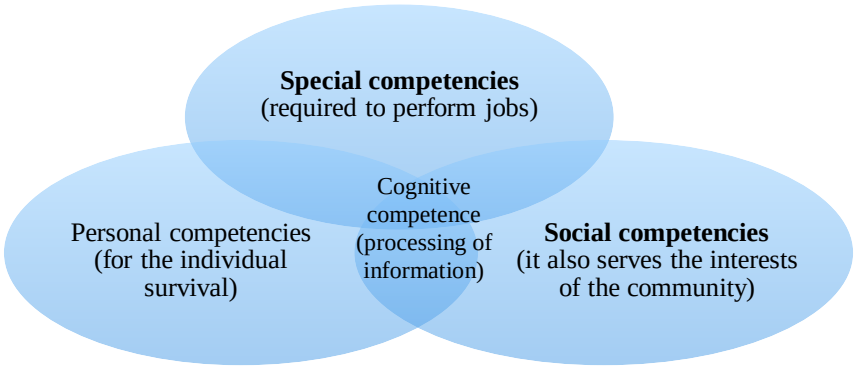
Obtaining competencies that meet the challenges of the age is becoming an increasingly important part of education. The principle of competency-based education has conquered the entire developed world by the 21st century. Studies that analysed this methodology were published already in the 1970s. (Burns & Klingstedt, 1973), (Houston, 1974), (Grant, 1979)

'Competency' is a word of Latin origin and means aptitude or skill. Educational literature understands competency as fitness for certain functions, routines, abilities, skills, knowledge and motivation. In Hungarian, the word 'ability' is often used as a synonym. Competence means the ability to perform a function. This competence is

manifested in making decisions and implementing and execution according to the decisions." (Tóth, 2010, p. 5.)

It is clear based on the definition that although knowledge and skills are important, they are only one component of competency. Without the ability to apply the knowledge and motivation, knowledge does not become skills, nor will the latter benefit either at the individual or the society.

Figure 44 Functional model of personality



Source: (Nagy, 2000, p. 6.)

The essence of competency-based education is to enable the students to acquire the necessary skills taking into account their individual abilities. This method can be a path to more efficient results that take account of the different learning abilities. The result is the acquisition of skills that can be applied regardless of the circumstances. (Nagy, 2000)

7.5 Development of competencies using sustainability

The research question was created by connecting two trains of thought. On the one hand, an important mission of the universities is to assist the development of competencies that support graduate students in their career building. So, its methods must be developed with a future-oriented approach. On the other hand, sustainable development should be implemented globally for a viable future. And scientists, researchers, leaders and future leaders, who learn the knowledge and skills necessary for their professions among the walls of universities, are precisely the key participants in this. So, the question arises how the competencies necessary to the achievement of sustainable development and to become successful in the fourth industrial revolution (4IR - Fourth Industrial Revolution) overlap?

Hypothesis 4: A legacy of the integration of sustainability: marketability of the skills that can be acquired.

In studying the relevant literature, I was searching the answer to the question of which competencies can be matched with the 4IR requirements and sustainable development, respectively. Sustainability-related research has a history of several decades. However, the fourth industrial revolution happens today. „We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another." (Schwab, 2015) This means that digitisation/computerisation/robotics have probably not reached their peak of development yet, so the end of the process and the consequences thereof are yet to be seen in many ways. Certain activities that could not be digitized recently have already passed the testing period. A number of professions that did not exist a few decades ago have become an attractive future alternative to young people by now. One such example is the burst of autonomous cars or caregiver robots into the market. So, only probabilities can be associated with the skills addressed as future competencies. The direction of the development, however, suggests which competencies will almost certainly be needed for success and which skills will be needed less because such activities will be automated with ease in the near future. As we will see in the reviewed literature, most of the research couple future competencies with education. Of these examples, the Finnish government's education strategy (Vitikka, 2014) is outstanding, which has integrated, based on research, the skills required for future success at the content and methodological levels by means of policy instruments.

Based on the literature reviewed (Leishman, 2017), (Armstrong, Parmelee, Santifort, Burley, & Fleet, 2018), (Bach, 2017), (IFTF, 2011), (Vitikka, 2014), (PWC, 2018), (OECD, Education 2030, 2018), (Gray, 2016), (Leopold, Ratcheva, & Zahidi, 2018), (Jones, 2017), (Zobrist & Brandes, 2017), (Gustein & Sviokla, 2018), I identified the competencies that are listed as the skills of the "future" and "sustainability". Then, I grouped the list and filtered out the duplicates, as the frequency of occurrence was not the subject of the investigation. Annex 20 contains all the results of the literature collection.

The grouping was made by creating units based on the similarity of competencies. Transparency and helping analysability were the goal. I created the names on the basis of the interpretation of the content of the competencies in the groups.

It is clear that certain groups include much more concepts than others. I did not try to equalise the number of elements in the groups. Applying an iterative process, I organized similar concepts in a group and then gave a name to each group. After that, I tried to further reduce the number of groups. Then, I used the grouping of the competencies made by using this method to categorise the sustainability competencies as well. The competencies collected based on the literature (Wiek, 2016), (Anderson, 2015), (Wiek, Withycombe, & Redman, 2011), (Wiek, és mtsai., 2016), (Weinreb, 2015), (Strandberg, 2015), (Knight, 2018), (Meza, Herremans, Wallace, & Althouse, 2018), (Redman & Larson, 2011), (Rieckmann, 2010) were also arranged in a table. They are available both in Hungarian and the original language in Annex 21.

7.6 Comparison of the competencies of sustainability and of the 'future'

Comparing the two lists, we find that future competencies are a little broader. That is, they include more elements. It is also apparent, however, that a number of competencies are interrelated or can be associated with very similar literacy. When matching the two lists, I chose the simple solution that, next to the broader (future) competencies, I added the competencies listed among the sustainability criteria.

After that, I compared the two lists to examine the differences. That is, to see if there are sustainability competencies that do not overlap with any future competency and *vice versa*. I put the "non-matching" skills under further investigation.

Table 35 Matching of future competencies and sustainability competencies

Competency group	Future competencies	Sustainability competencies
Creative spirit	Creativity and innovation	Change agent
	Innovative and adaptive thinking	
	"Design" mindset	
	Creating new value	Social innovations
		Results-orientation
	Originality and initiative	Readiness to act
		Action-orientation
	Logical and creative skills	Strategic approach
EQ, Social intelligence	Social intelligence	Empathy
		Physiologic tolerance
	Critical thinking	Critical thinking
	Service-orientation	Value-based or normative approach
	Sensemaking	Normative approach
	Ethical considerations	Active values
		Ethics

	Emotional intelligence	Interpersonal skills (emotional intelligence)
Complex vision, system approach	Complex problem solving	Management of complexities
	Reasoning, problem-solving and brainstorming	Decision-making skills in complex situations, *"Change Agent"*
	System analysis, understanding, evaluation	Thinking in systems
	Placing into context	Understanding the interconnections
Flexibility, openness	Cognitive flexibility	Decision-making skills in complex situations, Understanding the interconnections
	Perception of the outside world	Change agent
	Active learning	Active values, Understanding the interconnections
	Adaptability	
	Flexible finishing	
	Learning to learn	
	Curiosity-driven discoverer	
Contact capability	Communication	Stakeholder involvement
	Interaction and expression skills	
	Negotiating skills	
	Personal presence and participation	
	Virtual collaboration	Cooperation in (heterogeneous) and external groups
	Cross-cultural competency	
	Cooperation skills	Cooperation skill
	Networking	
	Internal and external team-building skills	Inclusion, pursuit for consensus
	Building relations and trust	
	Coordination of conflicts and dilemmas	
	Cultural competency	
	New media literacy	
Leadership skills	Taking responsibility	Responsibility
	Judgement and decision-making	Systematic thinking, Decision-making skills in complex situations
	Vision	Future-orientation
		Predictive approach
		Anticipation
		Long-term thinking
	Teaching	Fuelling development
	People management	Change agent
	Entrepreneurial skills	
	Analytical thinking and innovation	
	Giving and using feedback	Stakeholder involvement
	Participation and exercising influence	
	Control and social impact	
	Risk management skill	
	Verification	
	Choosing the right employees	

	Competencies that are useful in the world of labour and entrepreneurship skills	
Professional competencies		Sustainability literacy
		Understanding and analysing the issues of sustainable development
	Technical skills	
	ICT competency	
	Digital skills	Core digital competencies that are indispensable for sustainability in this context.
	STEM (science, technology, engineering and math) skills	
	Technical planning and programming	
	Data-driven decision-making	
	Operational analysis	
	Technological planning	
	Programming	
Trans-/Inter-/Multi-disciplinarity	Transdisciplinarity	
	Multiliteracy	
Integrity	Time management	Core intellectual competencies in developed countries.
	Learning strategies	
	Speaking	
	Ability for active listening	
	Reading comprehension	
	Writing skills	
	Languages	

Source: Edited by the author.

Table 35 summarizes the result of the competency matching. I made a match where the wording was slightly different but the underlying content clearly overlapped. Further analysis of this matching can form the subject of separate research if the purpose of the survey is the actual match of the content of the competencies.

In addition to competencies of similar meaning, I marked the competencies as matching during the pairing, where more than one competency can be matched with one other. So, there are future competencies that match one sustainability competency, and there are sustainability competencies that match one future competency. I marked them by merging the cells in the table.

It is obvious that only two sustainability competencies (Sustainability literacy and Understanding and analysing the issues of sustainable development) are difficult to place. Although they appear as competencies in the literature, they are rather cognitive skills or related skills. It is easy to see that if someone has these competencies, then "cognitive flexibility", the "perception of the outside world", "curiosity-driven

discoverer" and "cultural competency", being competencies of the future, also have to be in the storehouse of his skills, as sustainability literacy and the understanding and analysis thereof assume these future competencies as well. External conditions (climate change, water and energy security), which are relevant for every sector as they affect operations regardless of sustainability, must form part of the knowledge repository of every intellectual who is cognitively flexible and open to the outside world, etc. In this way, these two sustainability competencies are linked to four "future competencies" but no equivalence can be made between the two. Since they do not make matches, I did not consider them pairs, but the existence of a close relationship is clear.

7.7 Non-matching concepts after the competency matching

It appears based on the matching that there are competency groups that practically contain, wholly and completely, only non-matching skills. Owing to the method, this means that certain types of future competencies are missing from the sustainability set on the basis of the literature I reviewed.

Although certain future competencies cannot be directly matched based on the sustainability-competency literature reviewed, they are obviously and closely related to sustainability in view of other literature sources (that do not directly deal with competencies) I called to help.

A part of the competencies is such that no sustainability pair can be linked to them as they clearly serve adaptation to the requirements of the digital age (ICT skills) and their sustainability aspects have either not been examined so far or the relationship was not strong enough to give evidence on the relationship. ICT skills can be indirectly linked to sustainability in a way that sustainable development must be realized here and now, that is, in the course of the fourth industrial revolution. Those who do not have adequate digital literacy are unable to access information of appropriate quantity or quality and will not be able to use/utilize them properly for the "cause". Because "understanding and analysing the issues of sustainable development" is listed among the sustainability (professional) competencies, it assumes an appropriate relationship with information, which equals digital literacy in the 21st century. And this is associated with the existence of another future competency, namely, "new media literacy". Today, much of the news in the developed world reaches the people over the

Internet (Newman, et al., 2018). We see that the new forms of media (social media, media sharing) demand an increasingly bigger share. It is their share that is growing the fastest among the sources of obtaining information.

Table 36 Sustainability aspects of future competencies

	Future competencies	**Explanations related to sustainability**
EQ, Social intelligence	Service-orientation	Sustainability axiom, but does not appear as a competency (e.g. vehicle-sharing systems). (Tukker, 2004)
Flexibility, openness	Adaptability	They are fundamental sustainability concepts. They do not appear as competencies, but they are the most frequently mentioned concepts in connection with sustainability and climate change at the economic level. (Rammel & Bergh, 2003), (Smith, és mtsai., 2008) 1847 citations, (Walker, Holling, Carpenter, & Kinzig, 2004) 2259 citations (Scopus)
	Flexible finishing	
Leadership skills	Risk management skill	Analysis and treatment of environmental impacts (Sharfman & Fernando, 2008) Question of liability and negligence (Kleindorfer, Singhal, & Wassenhove, 2005)
Trans-/Inter-/Multi-disciplinarity	Transdisciplinarity	From the theory of complex systems to reflexive science (Popa, Guillermin, & Dedeurwaerdere, 2015), (Hadorn, Bradley, Pohl, Rist, & Wiesmann, 2006)
	Multiliteracy	„ It is our goal to explore the relationship between discourse and natural systems…" (Goggin & Waggoner, 2005, old.: 48.)

Source: Edited by the author.

The other non-matching competencies are core competencies that are not related to the fourth industrial revolution but, rather, cultural nesting and the life of educated humans. They belong to the group named "integrity". Integrity is the baseline level, which should not necessarily be included in future competencies, but cannot be ignored because of the literature collection. Here, I would like to refer to the context indicated in the introduction, namely, that the analysis was made in relation to developed countries. In this context, the acquisition of the skills listed in the "integrity" group is roughly necessary to successfully complete primary school. Although their relationship to sustainability is indirect, it is yet easy to see. Integrity is a basic requirement for someone to gain a value-based normative approach, to be able to think critically and make the right decisions in complex situations. Further research would be needed to understand that a significant part of the sustainability competencies assumes culture and openness. Lacking this, they cannot be mastered properly.

Of the managerial competencies, "control" and "choosing the right employees" are not related closely to sustainability in terms of that they cannot be considered as core competencies or follow from the literature sources I reviewed. And "competencies that

are useful in the world of labour and entrepreneurship skills" is a general wording, exactly based on the comparison of the subject of this analysis, that is future competencies (employability) and sustainability competencies.

Only the fact that the following competencies were left without a part requires some explanation:

- Participation and exercising influence
- Control and social impact

The link between these leadership competencies and sustainability cannot be justified based on my review of the literature. But the competencies of "Change Agent" include "exercising influence" and "control", so these competencies can also be indirectly associated with the scope of skills and abilities supporting transformation. Given that, for the moment, sustainability is primarily considered as a process that leads us from the present era to well-being that will carefully manage the economic resources, the two concepts can be associated with the sustainability transition from the perspective of the transition.

It is important to note that the competencies are not independent of each other. The correlations of certain competencies can be linked to other competencies both within the groups of the same competency sets and between different competency sets. Proving this relationship, just like the theory of competency matching, also needs further research.

I used the results of the questionnaire survey (NUPS survey 2016) to explain several hypotheses, so I would like to link the theme of competencies to higher education through the answers relevant to the topic. When asked which factors affect the sustainability literacy of graduate students most of all, the answers received prove that improving competencies has a priority over sustainability literacy. As I have already demonstrated, conscious action and the formation of habits are influenced by several factors. Of them, knowledge (and understanding) and skills (motivations, attitudes) are the conditions for the development of competency. Obviously, in addition to these internal factors, the external circumstances, such as tools, infrastructure and, potentially, the control that may limit the use of the given competency, cannot be neglected, either.

Among the conditions for the development of sustainability literacy, the two most important and, at the same time, dominant ones based on the opinion of the respondents (321 people) are "individual interests" (which, according to 82.5% of the respondents, has a large-scale effect) and the students' environmental awareness (80.3% of the respondents believe it has a major effect). These two factors are significantly ahead of the next one in the line, which is the appearance of the sustainability topic in the courses (47.2% of them think it has a big impact). This does not mean there is no need to transfer the sustainability knowledge, but that more attention should be focused on developing the abilities and skills.

Raising interest and supporting environmental awareness are superior to transferring scientific knowledge as detailed as possible. And competency development is a matter of technique, often regardless of the content. Particularly, if the institution in question is not training sustainability experts. Critical thinking, openness and digital literacy can help students recognize global problems. The universities' mission is to develop the competencies and create an infrastructure for sustainable behaviour (sustainability practices of NUPS).

7.8 Test of the fourth hypothesis and application of the results

First of all, the quantity of the literature reviewed is the limit during the testing of the hypothesis. Due to the novelty of the topic, this limit will be lower and lower over time. The next limit, which rather appears in the Hungarian-language thesis only, is that a significant part of the literature is in the English language, so some of the content is lost in translation. Hungarian translation does not always reflect the content underlying such abstract concepts. This is mainly because of the cultural nesting, which can even require the development of the competencies tailored to the context. These differences cannot be avoided because they are differences resulting from the nature of the system. In the analysis, therefore, caution should be exercised when attempting to analyse foreign-language literature in terms of the domestic situation.

Despite the limitations, I consider it justified that the two sets of competencies show a large overlap in content. The sustainability competencies form a part of the future competencies found in the literature analysed in the test. That is, skills can be developed and consolidated in the students through the development of

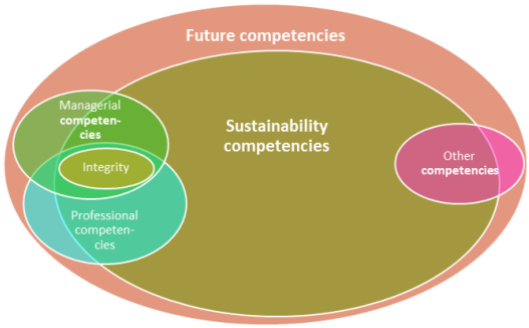
sustainability competencies that greatly contribute to their success in the future, regardless of the science area.

In part, this can be explained by that both themes are "future-oriented". Given their nature, the long-term outlook is a priority in both cases.

The analysis also shows that certain features of the fourth industrial revolution enhance the sustainability competences becoming "mainstream". Some sustainability competencies that are now concepts of common theme belonged to the topic of the so-called "alternative" economic approach even 20 years ago (e.g. well-being, ecological footprint, ethical corporate governance). The spread of the sustainability concepts is also due to that "big data", which has arrived together with the fourth industrial revolution, helps the scientists integrate a long-term perspective and allows making more accurate and reliable forecasts. Due to its nature, sustainability is a "long-term" concept, as it makes sense to talk about sustainable development only in the long term. Extending the time horizon for planning puts emphasis on new aspects that could not be interpreted in the short term.

The figure below illustrates the relationship between the future and sustainability competencies resulting from the literature collection. It is worth noting that the correlations that have not been proven in this research do not mean that these concepts are independent of one another or there is no relationship between them. Exploring these relationships require further tests.

Figure 45 Competency containment conditions



Source: Edited by the author.

The size of the sets in the figure refers to the number of competencies. The figure is based on the literature data examined. The competencies that are not part of the sustainability cluster fall outside it only conditionally. It cannot be stated about any of the listed competencies that it has nothing to do with sustainability, only the sources processed in this research have not mentioned them.

8 Conclusion and final thoughts

Education plays an important role in achieving sustainable development by deepening the necessary knowledge and hopefully the development of required competencies. Higher education plays a key role in this area because it has a direct connection to the labour market, so the effects can materialise in the short term. Beyond the social responsibility of the academic institutions, university education has an impact on the social processes at the individual level as well.

My research was primarily motivated by that I was interested in how a university can implement the transition to sustainability, what obstacles it should expect and what advantages it can gain through the implementation of the transformation.

I set out from some empirical assumptions, such as the importance of leadership commitment, the importance of transforming education and that, by integrating sustainability, an institution can become a member of a community that includes the "best ones" and creates an opportunity for networking and collaboration across disciplines. These were the assumptions I personally used for argumentation before the existence of the research results, in addition to why it is important to implement the sustainability transition.

When designing the research, I relied on several methods (Q methodology, questionnaires, literature and text analysis) in order to get answers to my research questions.

I relied on the available literature and my own experience on the road from raising the questions in general (Why does an institution start the transformation? What is the best way to start the introduction? What goals help overcome the barriers?) to the formulation of the hypotheses. I also owe much to my supervisor's instructions. Very few researchers are dealing in Hungary with the issues of the sustainability transformation of higher education, so I could most rely on foreign experience only.

The research focused on three main areas. First, I surveyed the views and attitudes of the university's internal stakeholders and how actively the leaders are committed to the implementation of the sustainability transition, and I was also focusing on the importance of integrating the sustainability topics into education. The second area was the comparison of the external stakeholders' expectations and the factors motivating the implementation of the transformation. I studied how excellence is related to the

integration of sustainability. Finally, I examined, in the context of higher education and the labour market, if the competencies that can be acquired during the university studies constitute an advantage for graduates in terms of that they can be successful in spite of the changes generated by the fourth industrial revolution.

Summarizing the experience of the research, I concluded that **the existence of a university sustainability strategy does not mean that the leadership is actively committed to the topic.** It can be declared based on the leadership survey conducted at the NUPS (Q-method) that, although the leaders consider the topic of sustainability important and have the relevant knowledge, they do not intend to take the initiative.

Research has shown, in addition to the positive attitude to the subject, that opinions are divided as to whether the sustainability transformation is feasible or how big its importance is. Most of the persons involved in the research are either not aware of how their current work is related to sustainability or did not reply to the question. The existence of a strategy did not dispel the doubts and uncertainty highlights the importance of awareness-raising and communication so that the internal stakeholders are aware of their own roles in terms of sustainability and, thus, able to contribute to the successful implementation of the strategy.

The experience of the international survey, although not representative, still confirms that becoming visible at the university level is an important barrier to overcome.

The fact that I conducted the research at the National University of Public Service has the great advantage that I could personally witness the development of the operation of a newly established (reorganized) higher education institution in an era when higher education has a larger role and importance. The "youth" of the university has created an opportunity to partially disregard one often occurring difficulty raised by institutional traditions (lock-in effect).

The institution-level integration of sustainability requires the university to implement the transformation at the strategic level, taking into account every aspect of its operations and decision-making. **Education plays a special role in the activities of universities, as integrating the topic of sustainability into the curriculum is an essential component of the institution-level integration of sustainability.**

"Education with the objective of achieving sustainability varies from previous approaches to environmental education in that it focuses sharply on developing closer

links among environmental quality, human equality, human rights and peace and their underlying political threads." (Fien & Tilbury, 2002, p. 9)

Purpose of the conscious integration of sustainability into education: the most important (output) indicator (target to be achieved) is that there should be no graduate student who does not know the general aspects of sustainability and the aspects of sustainability relevant to his profession, that is, who does not have suitable sustainability literacy. (Sibbel, 2009), (Winter & Cotton, 2012)

We can see based on the analyses I performed that **the appearance of sustainability in education (both vertically and horizontally) reflects the stakeholders' expectations.** The institutions that have already started working on the transformation have completed the integration of the topic of sustainability into education, mostly as one of the first steps.

The result of the examination of the higher education sustainability declarations also showed that, based on international recommendations, education is one of the pillars of the integration of sustainability into higher education. Furthermore, the sustainability rating/ranking systems also give a priority to the issue of integrating sustainability into education.

The research conducted at the NUPS shows, however, that although 74% of the instructors agreed that students should complete sustainability courses related to their profession during their university studies but only 57% believe that these courses should be integrated into the curriculum and even fewer think this goal should be achieved by developing content within the courses. The aversion of the lecturers, as one of the most important stakeholders, raises the question of the importance of further training as well.

In addition to that higher education, based on its historical role, has the moral obligation to lead the society towards sustainability, the sustainability transformation is justified, among others, by the students' expectations (institution selection criterion) and the employers' preferences (looking for graduates with sustainability competencies) as well. (Waas, és mtsai., 2012) The opinion of the responders to the questionnaire of the international survey, namely, that the introduction of courses is the smallest obstacle to introducing sustainability, also argues in favour of the integration of sustainability into the curricula.

Given the flexibility of universities in this field and recognizing the importance of introducing the courses and redesigning the teaching materials, this is definitely the area where we should start integrating sustainability.

Universities are now institutions to be interpreted primarily in the international context. A basic requirement is that the institution should give a good performance at the international level as well and have a broad network of relationships. An increasing share of scientific and technical cooperation is implemented together with partner institutions in other countries. The speed of scientific development and globalisation also require international cooperation. This is important in terms of the sustainability transformation because the sustainability issues, just like the students or science, do not stop at the state borders. All higher education institutions aim to achieve excellence. I pointed out in my research that in the pursuit of excellence, sustainability must also be taken into account by the universities, as **the sustainability transformation of higher education institutions has become an element of excellence by now.**

Quality requirements must be fulfilled to become one of the best. The major voluntary higher education ratings now lay a strong emphasis on the issue of integrating sustainability at the institutional level. And I also found that, apart from this, the institutions at the top of the university scientific rankings have already integrated sustainability at the strategic level, so there is bustling sustainability life both at the level of the initiatives on their campuses and communication and social media in the universities I have studied.

Finally, one of my most important findings, namely, that the institution-level integration of sustainable development is advantageous beyond the commitment to the topic, has crystallized during the research process. Sustainability is not primarily about knowledge but also about attitudes, emerging habits and competencies. The existence of knowledge does not induce changes. In addition to knowledge, the implementation of sustainability requires skills that point beyond the transformation of the habits important from the basic environmental aspect. We can move to the next level if we go beyond selective waste collection, switching the lights off in the hallway or unnecessarily running the water. Cooperation, empathy, future orientation or even the question of responsibility arise here. In the complex interpretation of sustainability, making local and global changes requires, in addition to being aware of the problems,

a number of actors who can lead the changes with the "change agent" approach armed with sustainability competencies. The social responsibility of universities is to train citizens who are empowered with these skills. Beyond social responsibility, it is also a task of the universities to lay the foundation for the success of the graduates in the labour market. In addition to the existence of professional knowledge, the main expectation of prospective employers is that fresh graduates should have more useful competencies.

During my research, I studied and demonstrated that the labour market, which is changing as a result of the fourth industrial revolution and the implementation of sustainable development, requires nearly the same competencies. The competency sets of successful career development and contribution to the implementation of sustainability show a large overlap as a result of the fourth industrial revolution. Skills can be developed and consolidated in the students through the development of sustainability competencies that greatly contribute to their success in the future, regardless of the science area.

It can be declared on the basis of the research results that sustainability competencies are an important part of future competencies. The great similarity of the two sets partly lies in the "future orientation" of the topics. I also found that certain features of the fourth industrial revolution enhance the "mainstreaming" of sustainability competencies. As a result, I expect that the two competency sets will show a total overlap as the results of research expand in the near future.

The most important result of the research was that I proved that university excellence goes hand in hand with the institution integrating the theme of sustainable development at the strategic level, which includes the reorganisation of education along with awareness-raising. Another important achievement is that I demonstrated that students, regardless of the discipline, can acquire competencies as a result of the sustainability transformation that can make them successful in the future labour market.

Further research is required to explore how the resistance of the lecturers, experienced during the integration of the sustainability knowledge, can be overcome and how the skills can be compared more accurately by expanding the sources used for the comparison of competencies and conducting a quantitative analysis. This will help

further clarify the results and weigh every competency based on the number and weight of the citations. The comparison so developed can give an accurate picture regarding the overlap of skills.

Repeating the research in several universities can also provide an opportunity to examine the effect of the university's profile in light of the interests and course contents. During the introduction, the role of the university's profile in developing the sustainability training portfolio can be an important factor when designing the knowledgebase.

I believe that my results presented here can contribute to the scientific foundation of how higher education can become a key player in sustainable development that, together with research and innovation, has become one of the most important social and eco-political factors in the developed economies of the 21st century. Supporting all these areas, as well as that of sustainable development, requires a strategic and long-term approach from all countries.

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Annexes

1. Annex: UN Sustainable Development Goals

SUSTAINABLE DEVELOPMENT GOAL 4[50]

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

TARGETS:

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university

4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy

4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

[50] https://sustainabledevelopment.un.org/sdg4

4.A Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

4.B By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries

4.C By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States

2. Annex: Sustainability Survey of the National University of Public Service (extract)

How much are you interested in to the sustainability related issues?
Please specify what sustainability means for you?
How much do you agree with the definition below? “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
What aspects would you like to include in the concept of sustainability? (Multiple choice.)
Equality
Environmental Protection
Justice
Education / awareness
Nature
Waste reduction
Responsibility
Cooperation
Economy
Life cycle approach
Climate Adaptation
Welfare / well-being
Social
Which of the following aspects of sustainability that is of interest to you? (Multiple choice.)
Economic
Social
Environmental
Policies
Geopolitical
Demographic
Engineering Technology
Military, law enforcement
Ethical
Historical
Philosophical
Other (please specify)
How familiar are you with the following concepts?
Justice between generations
Precautionary principle
Ecological footprint
Circular economy

Life cycle approach
How familiar are you with the following documents?
Kyoto Protocol
Convention on Biological Diversity
United Nations Framework Convention on Climate Change
UN Millennium Development Goals
United Nations Sustainable Development Goals
National Sustainability Strategy
NUPS Sustainability Strategy
Are you involved in community initiatives on sustainability issues or in the work of organizations with such profiles? (Whether as a volunteer or as an employee or leader.)
Have you been involved in a course or program in your higher education studies where sustainability-related knowledge and aspects have emerged?
If yes: In what training program, did you study where the knowledge and aspects of sustainability have been highlighted? Please indicate the higher education institution and the specification or the program!
In the last 5 years, how many courses have been held where sustainability-related knowledge has appeared? (If not, please write 0!)
Do you plan to include more sustainability-related knowledge and aspects in your courses?
Why don't you plan to include more sustainability-related knowledge and aspects in your courses?
To what extent are the obstacles listed below an obstacle for you to incorporate the knowledge of sustainability?
Lack of your own knowledge
Colleagues' lack of interest
Management's lack of interest
Students' lack of interest
Lack of time to update the course material
Lack of scientific rigor
Financial constraints
Institutional structure
It is not clear what to teach
Lack of resources necessary for the formation of the courses of sustainability
Lack of support to realize my ideas
In your higher education studies so far, how many courses have you attended…
…where the sustainability was the main focus? Number of courses: If not, please write 0!
…where sustainability was an independent thematic unit? Number of courses: If not, please write 0!
… where did they address sustainability in the relevant topics? Number of courses: If not, please write 0!

…where sustainability was addressed ad hoc? Number of courses: If not, please write 0!
According to your opinion will the sustainability literacy of the graduate students of your faculty be sufficient to foster sustainable development at their work?
Please estimate how many percent of graduate students will have the appropriate sustainability education when you graduate?
According to your opinion how big is the impact of the following factors on a graduate students' sustainability literacy?
Student lifestyle in terms of environmental awareness
Student's individual interest
Sustainability theme among the main subjects
Ratio of sustainable courses to elective courses
Preferences of the lecturers
Sustainability practices of the NUPS as an organization
Sustainability initiatives of NUPS's student organizations
How much do you agree with the following statements?
The NUPS's operational practices fully respect the sustainability aspects..
All students of NUPS must complete courses that provide them useful sustainability knowledge for their later career.
Sustainability principles should be integrated as a separate course into the curriculum of all disciplines at all levels.
Sustainability principles should appear in all courses.
Sustainability principles must also appear prominently in public service training.
The NUPS should encourage voluntary experience.
The NUPS should address the topic of sustainability is a priority.
The NUPS should develop its own GPP (green public procurement) policy.
In your view, do the contents below appear properly weighed in the course(s) you also participate in?
Accountability and Ethics
Alternative Vision
Biodiversity
Citizenship, democracy, governance
Community adaptability
Consumption and ethical trade
Corporate social responsibility, business ethics
Cultural diversity and equality
Cultural heritage
Ecosystems and ecological principles
Education, awareness raising
Employability
Food safety
Globalization of trade

Health and well-being
Human rights
Intercultural understanding
Internationalization
Landscape Formation
Leadership and managing change
Organizational and community learning
Management of natural resources
Peace, security, conflict management
Pollution
Poverty
Quality management systems, environmental management systems
Responses to climate change
Rural and urban development
Social justice
Waste, water, energy
How much applied to you the following statements?
I collect hazardous waste selectively at home/at the university/at the dorm.
At home/at the university/at the dorm, I will do my best to reduce the amount of waste.
All conditions for selective waste collection are provided at home/at the university/at the dorm.
At home/at the university/at the dorm, I do my best to minimize the use of energy (electricity, gas, coal, oil).
At home/at the university/at the dorm, I try to minimize the use of chemicals and environmentally harmful substances.
At home/at the university/at the dorm, I try to reduce water consumption to a minimum.
I prefer public transport to work / university.
I prefer walking / cycling to work / university.
How much applied to you the following statements?
I buy locally produced food.
I buy chemical-free "bio" food if possible.
I buy food from an organic farm if possible.
I choose a domestic product if possible.
I choose Fair Trade if possible.
When selecting products, I take into account the social responsibility of the manufacturing company.
When selecting products, I take into account the ethical considerations of the manufacturing process.
When choosing the products I take into account the quantity of packaging material and its redeemability.
When selecting products, I take into account the environmental impact of the production process.
When selecting products, I take into account the environmental impact of usage.

I manage my finances with an ethically responsible financial institution.
When shopping, I keep in mind to buy only the minimum required.
Do you plan to make an investment or change in your life in the near future, with the direct or indirect purpose to make your lifestyle more sustainable? If so, please specify what it is! Comment: What obstacles do you see, what obstacles should you have / had to solve?
Please indicate to what extent do you agree with the following statements!
The pace of climate change will accelerate.
Water resources available for Hungary will be sufficient despite climate change.
Preserving biodiversity – the number and variety of living organisms – is essential for the efficient functioning of the ecosystem.
To achieve sustainability, a significant reduction in consumption in developed countries, including Hungary, is unavoidable.
A developed country is not where the poor travel by car but where the rich use public transport.
“Overuse” of natural resources poses a serious threat to the welfare (well-being) and health of CURRENT generations.
“Overuse” of natural resources poses a serious threat to the welfare (well-being) and health of FUTURE generations.
More effective environmental protection requires stricter legislation.
More effective environmental protection requires legislation based on social consensus.
In order to more effective environmental protection, current legislation needs to be enforced.
The realization of sustainable development will not be possible until developed countries exploit the labor and natural resources of poorer countries.
The realization of sustainable development will not be possible unless developed countries adopt the appropriate technologies and working culture in poorer countries.
Environmentally sustainable organizations, settlements and countries will be successful in the long run.
Designating sustainable development as a national priority is crucial for a country to be liveable and prosperous.
The rate of taxes on pollution must be such as to cover damage caused to communities and the environment.

3. Annex: Statements used in Q-method

No	Statement
1	Sustainability depends on the governments and companies because they hold the power and they can do whatever they want.
2	Sustainability is a hot topic, which is too much dealt with and the term has also become overdone.
3	Research on sustainability is still functioning well at the universities.
4	Teaching the sustainability principles should be included in the curricula of all fields of science at all levels of education, even at the expense of the number of classes currently held.
5	It is sufficient to address the sustainability issues at the level of organisational units only.
6	The damage caused by consumption should be recovered even at the price of an increase in the price of the products/services.
7	The root causes of the economic crisis are greed and, ultimately, money.
8	Students are open and cooperative in respect of the sustainability initiatives.
9	Conservation of drinking water is not the most important task because there is plenty of it in Hungary.
10	A better environment begins with ourselves. If we want to live a more sustainable world, we should first have a look around our own house.
11	The issue of climate change has already slipped out of our hands and we cannot do much.
12	Climate change is a real threat to humanity.
13	The environmental crisis also involves the possibility of a new kind of economy.
14	Environmentally sustainable organisations are more likely to be successful in the long run.
15	Greed is not part of human nature.
16	Multinational companies do not pose a serious threat to environmental sustainability.
17	The working atmosphere and human relationships are more important than the salary.
18	Non-leader colleagues are open to and cooperative in sustainability initiatives.
19	The real problem is caused by the poor institutional background and the regulations in Hungary.
20	The taxes payable for pollution should be increased to make the companies pay the damages caused to the communities and the environment.
21	The problem of the society is that many people are wasting resources just because they can.
22	The fulfilment of the scientometric objectives exhausts my resources so I do not have time for anything else.
23	I choose an environmentally friendly product even if it is more expensive.
24	The sustainability programmes of the universities contribute to the achievement of sustainable development only marginally but, compared to this, are resource-intensive.
25	The university has a high resistance to changes.
26	I do not consider food wasting a problem in Hungary.

27	People are planning on a short term and do not think about the long-term consequences.
28	It is important to promote minimizing energy and water consumption because it is cost-effective.
29	Large-scale livestock breeding is a barbaric thing.
30	This is an immoral consumer society.
31	If you want a stable people-centred economy, the difference between “work” and “leisure” must be reduced.
32	I would be willing to train myself on some of the themes of sustainability in my free time.
33	It would be good if we did not stick to the daily problems and were dealing with the more global cross-border issues of sustainability.
34	Today, a leader must be aware of the correlations of climate change because it is part of the general culture.
35	A developed country is not where the poor travel by car but where the rich use public transport.
36	I do not think university sustainability could be achieved in practice.
37	You cannot concentrate on one area because the environmental issues are interrelated.
38	I do not call myself specifically “green”.
39	I do not consider appropriate the top leaders’ attitude to issues related to sustainability.
40	I do not have enough influence to support the university’s sustainability efforts.
41	I gladly assume a proactive role when it comes to defining the university’s sustainability guidelines.
42	I believe there will be a technical/technological solution for most environmental problems.

4. Annex: Values of individual statements in different factors

No.	Statements	1 factor	2 factor	3 factor
5	It is sufficient to address the sustainability issues at the level of organisational units only.	-3	-2	-3
38	I do not call myself specifically "green".	-1	-1	-2
16	Multinational companies do not pose a serious threat to environmental sustainability.	-3	-3	-3
24	The sustainability programmes of the universities contribute to the achievement of sustainable development only marginally but, compared to this, are resource-intensive.	-1	-2	-2
9	Conservation of drinking water is not the most important task because there is plenty of it in Hungary.	-4	-4	-4
3	Research on sustainability is still functioning well at the universities.	0	0	-1
15	Greed is not part of human nature.	-2	-3	-3
13	The environmental crisis also involves the possibility of a new kind of economy.	1	2	0
27	People are planning on a short term and do not think about the long-term consequences.	2	1	3
26	I do not consider food wasting a problem in Hungary.	-4	-3	-4
21	The problem of the society is that many people are wasting resources just because they can.	2	0	1
32	I would be willing to train myself on some of the themes of sustainability in my free time.	1	-1	1
37	You cannot concentrate on one area because the environmental issues are interrelated.	2	4	3
14	Environmentally sustainable organisations are more likely to be successful in the long run.	3	1	2
4	Teaching the sustainability principles should be included in the curricula of all fields of science at all levels of education, even at the expense of the number of classes currently held.	2	0	2
35	A developed country is not where the poor travel by car but where the rich use public transport.	2	1	0
19	The real problem is caused by the poor institutional background and the regulations in Hungary.	0	-1	-1
36	I do not think university sustainability could be achieved in practice.	-3	-3	-2
31	If you want a stable people-centred economy, the difference between "work" and "leisure" must be reduced.	1	2	1
30	This is an immoral consumer society.	-1	-1	2
29	Large-scale livestock breeding is a barbaric thing.	-2	-2	-1
8	Students are open and cooperative in respect of the sustainability initiatives.	1	0	3

12	Climate change is a real threat to humanity.	3	4	4
34	Today, a leader must be aware of the correlations of climate change because it is part of the general culture.	3	1	4
17	The working atmosphere and human relationships are more important than the salary.	1	3	2
20	The taxes payable for pollution should be increased to make the companies pay the damages caused to the communities and the environment.	3	3	1
40	I do not have enough influence to support the university's sustainability efforts.	-1	-2	1
25	The university has a high resistance to changes.	-2	-4	-2
33	It would be good if we did not stick to the daily problems and were dealing with the more global cross-border issues of sustainability.	4	1	1
22	The fulfilment of the scientometric objectives exhausts my resources so I do not have time for anything else.	-2	0	-1
18	Non-leader colleagues are open to and cooperative in sustainability initiatives.	-1	2	0
6	The damage caused by consumption should be recovered even at the price of an increase in the price of the products/services.	0	3	0
41	I gladly assume a proactive role when it comes to defining the university's sustainability guidelines.	1	-1	-1
28	It is important to promote minimizing energy and water consumption because it is cost-effective.	0	1	-2
7	The root causes of the economic crisis are greed and, ultimately, money.	-1	2	3
39	I do not consider appropriate the top leaders' attitude to issues related to sustainability.	0	-2	-3
2	Sustainability is a hot topic, which is too much dealt with and the term has also become overdone.	-3	-1	-4
23	I choose an environmentally friendly product even if it is more expensive.	0	4	2
11	The issue of climate change has already slipped out of our hands and we cannot do much.	-4	-4	0
1	Sustainability depends on the governments and companies because they hold the power and they can do whatever they want.	-2	3	0
42	I believe there will be a technical/technological solution for most environmental problems.	4	2	-1
10	A better environment begins with ourselves. If we want to live a more sustainable world, we should first have a look around our own house.	4	0	4

5. Annex: Demographic statistics for participants in Q method

Gender

	Frequency	%
Male	19	70,4
Female	8	29,6
Total:	27	100,0

Distribution of Age

	Frequency	%
< 25	1	3,7
26-35	3	11,1
36-55	12	44,4
56+	11	40,7
Total:	27	100,0

Scientific degree

	Frequency	%
PhD	9	33,3
Habilitated PhD	6	22,2
Professor	3	11,1
DSc	1	3,7
Does not have any	7	25,9
No answer	1	3,7
Total:	27	100,0

Discipline

	Frequency	%	% (of respondents)
Military Science, Police Science	8	29,6	50,0
Engineering sciences	2	7,4	12,5
Natural Sciences	1	3,7	6,3
Legal, and Political Science, Public Administration	2	7,4	12,5
Humanities	3	11,1	18,8
Total:	16	59,3	100,0
No answer	11	40,7	
Total:	27	100,0	

Position

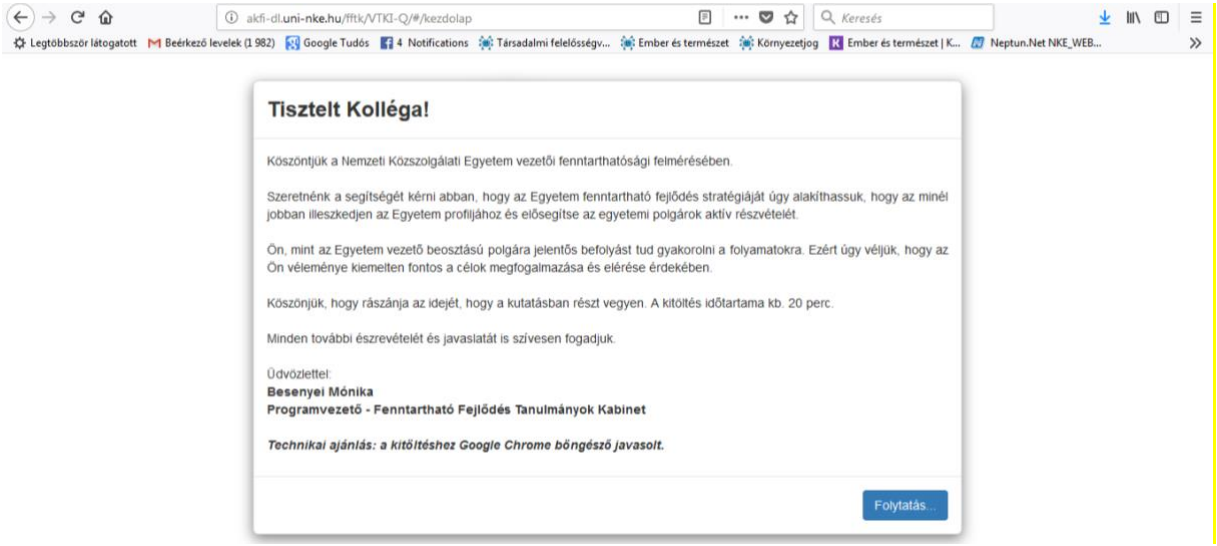
	Frequency	%
Top manager	4	14,8
Middle manager	20	74,1
No answer	3	11,1
Total:	27	100,0

Department

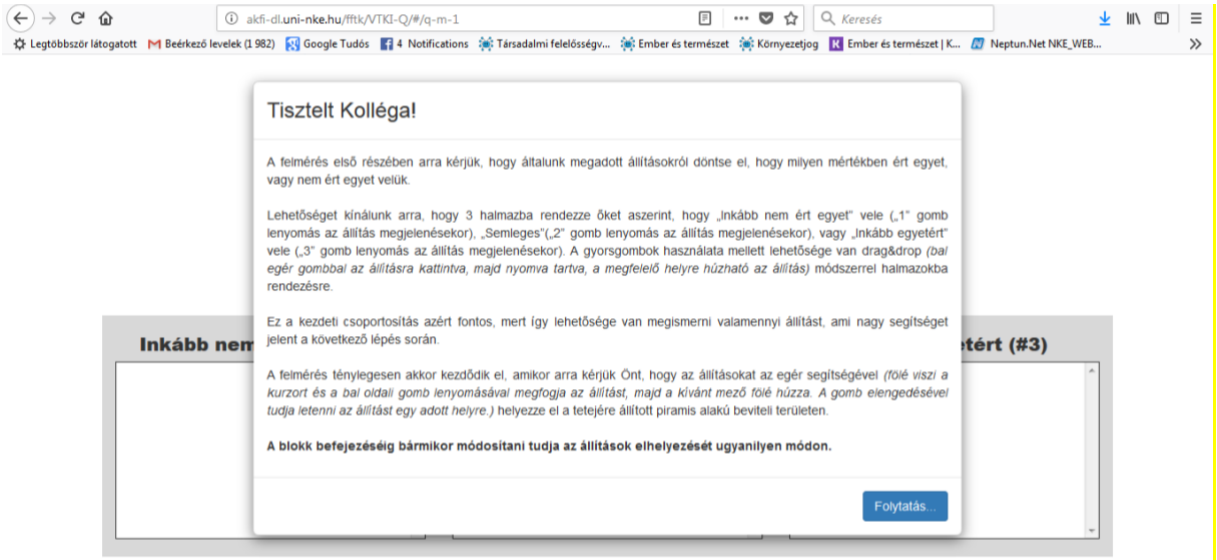
	Frequency	%
Faculty of Political Science and Administration	3	11,1
Faculty of Military Sciences and Officer Training	6	22,2
Faculty of International and European Studies	1	3,7
Faculty of Law Enforcement	5	18,5
Centre for Executive Training and Continuing Education	1	3,7
Institute of Disaster Management	2	7,4
Central departments	5	18,5
No answer	3	11,1
Student union	1	3,7
Total:	27	100,0

6. Annex: Visual presentation of the Q-method used at the National Public Service University

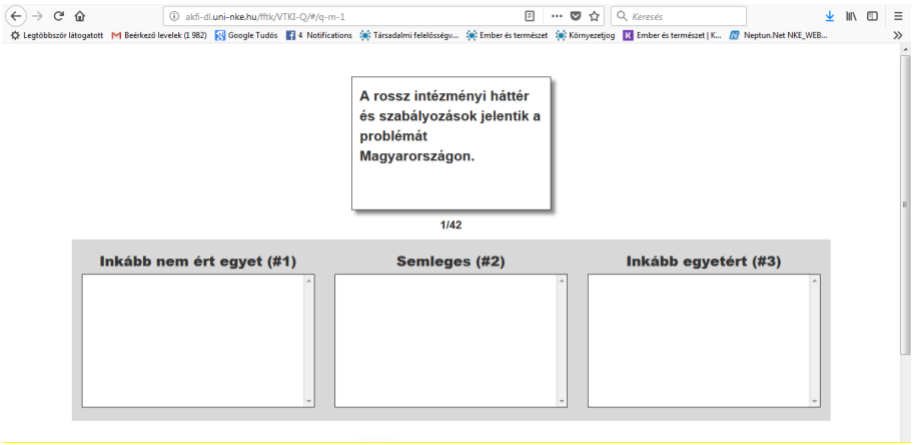
Welcome and introduction of the research's aims



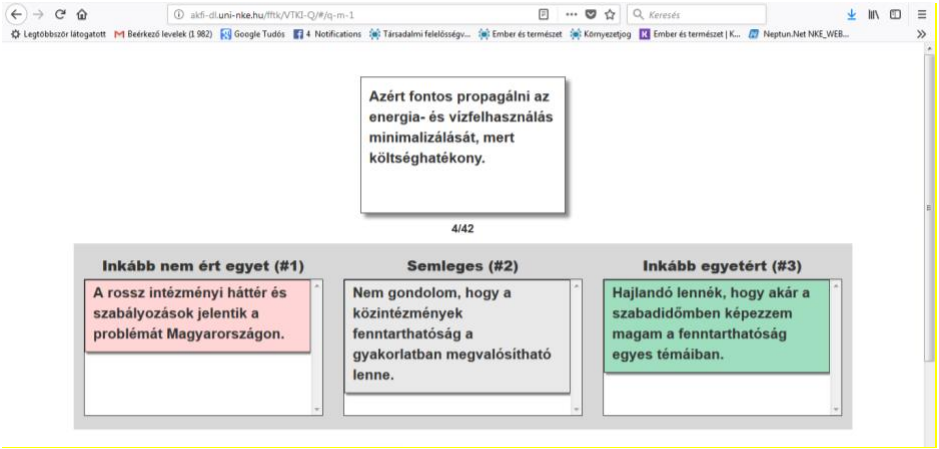
Introduction of the methodology and how to use the keyboard.



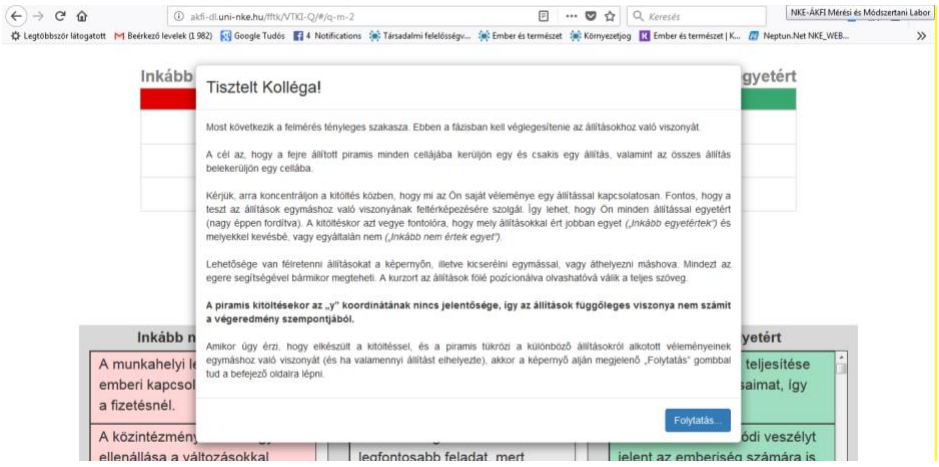
First phase: grouping the statements according to “uncomfortable with”, “neutral” or “rather agree with it” attitude



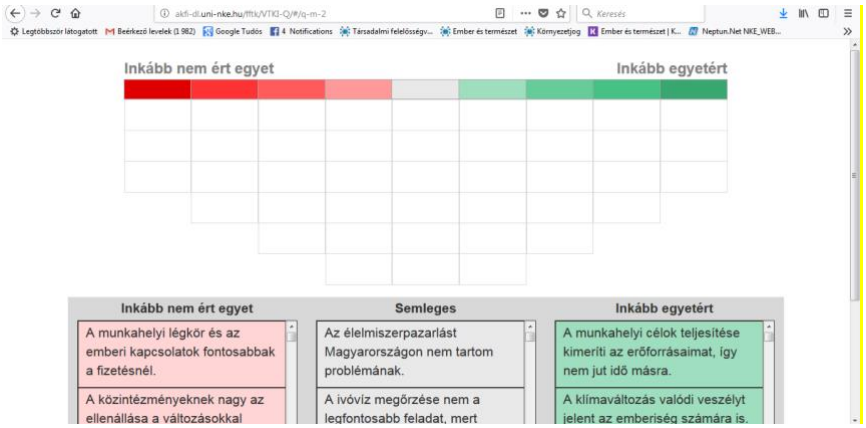
Result of the grouping



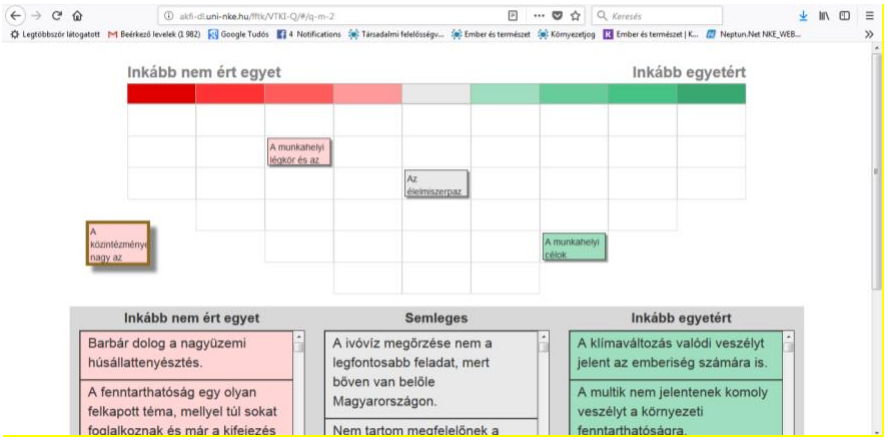
Explanation of the second phase (how to fill the Q-matrix-form)



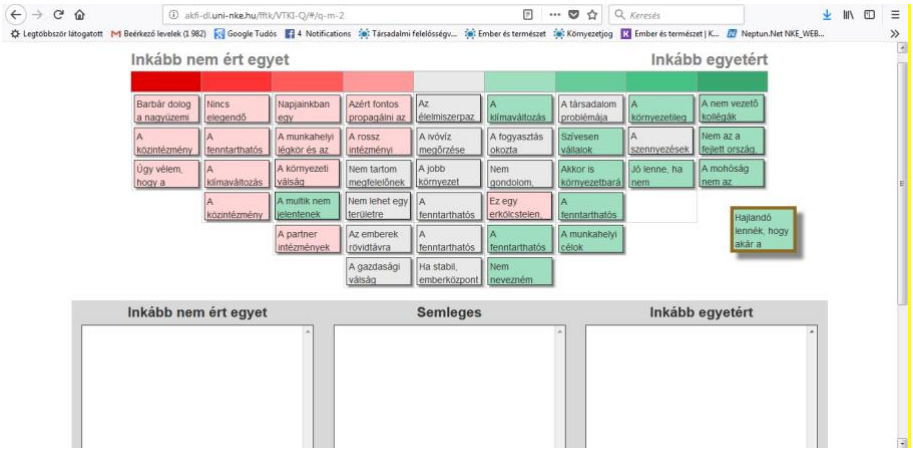
The starting screen of the Q-matrix



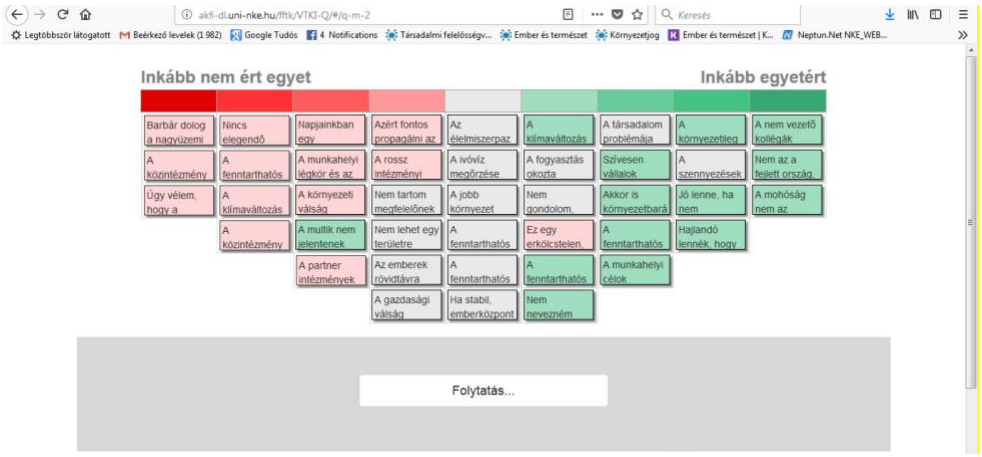
Digitalized version of Q-method during the process of filling in



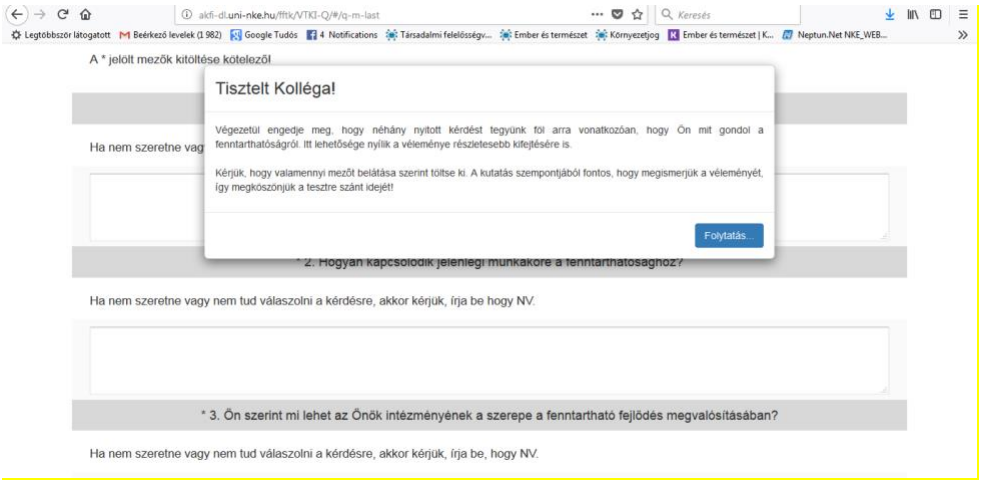
Q-method is almost finished by one participant



Q-method is finished and ready for the next step



The additional questions section with the introductions



7. Annex: Additional questions in the Q-method

1. In your opinion what sustainability means?

Please describe it briefly.

If you do not want or cannot answer the question, please enter NV.

2. How does your current job relate to sustainability?

If you do not want or cannot answer the question, please enter NV.

3. What do you think about the potential role of your institution in achieving sustainable development?

If you do not want or cannot answer the question, please enter NV.

4. According to you, how to start implementing sustainability in your institution?

If you do not want or cannot answer the question, please enter NV.

5. What would or could be the main obstacles? How to prepare for them and prevent them?

If you do not want or can not answer the question, please enter NV.

6. Gender

- Male
- Female

7. Year of born:

19__

8. Highest level of education

- Elementary school or less
- Secondary school
- College (BSc, BA)
- University (MSc, MA)
- I do not answer

9. Your job role:

- Finance
- HR
- Facility Management
- Customer service
- Other
- I do not answer

9/A. If you selected "Other" in question 9, please enter your answer here(optional)

10. Your position:

- Top manager
- Middle manager
- Junior
- I do not answer

11. At which organizational unit are you an appointed leader?

11/A. If you selected "Other" in question 11, please enter your answer here (optional)

12. Where did you go to elementary school?

- Capital
- Capital agglomeration
- County-City
- Other city
- Other village
- I do not answer

13. Where is he currently living?

- Capital
- Capital agglomeration
- County-City
- Other city
- Other village
- I do not answer

Acknowledgement and good-bye:

8. Annex: Sustainability research – International survey

1. Name (and website) of your Higher Education Institution: *	
2. Type of your Higher Education Institutions:	
	non-profit
	for-profit
	Public institution
	Private institution
3. Main education field of your Institute: *	
	Arts & Humanities (Archaeology, Architecture, Art & Design, English Language & Literature, History, Linguistics, Modern Languages, Performing Arts, Philosophy, Theology, Divinity & Religious Studies)
	Engineering & Technology (Computer Science & Information Systems, Engineering Chemical, Engineering CiviI & Structural, Engineering Electrical & Electronic, Engineering Mechanical, Aeronautical & Manufacturing, Engineering Mineral & Mining)
	Life Sciences & Medicine (Agriculture & Forestry, Anatomy & Physiology, Biological Sciences, Dentistry, Medicine, Nursing, Pharmacy & Pharmacology, Psychology, Veterinary Science)
	Natural Sciences (Chemistry, Earth & Marine Sciences, Environmental Sciences, Geography, Materials Science, Mathematics, Physics & Astronomy)
	Social Sciences & Management (Accounting & Finance, Anthropology, Business & Management Studies, Communication & Media Studies, Development Studies, Economics & Econometrics, Education & Training, Hospitality & Leisure Management, Law, Politics & International Studies, Social Policy & Administration, Sociology, Sports-related Subjects, Statistics & Operational Research)
	Vocational Education
	Professional Further education
	Other:
4. Country(ies) and city(ies) of the campus(es): *	
5. Your role (stakeholder status) at the institute: *	
	Academic (teaching and/or research)
	Administrative
	Student
	Alumni (I used to be a student, an administrator or an academic.)
	Parent/relative of student(s)
	Advisor or member of board
	Other:
6. Your name and contact (not mandatory)	
7. Would you like me to send you the final report? *	
	Yes! (Please, give me your contact details!)
	No, thank you!

In this part I would like to get deeper insight of the beginning and the recent status of the sustainability transition at your institute.	
8. Do you have any visible sustainability related activity at your institute? *	
	Just traces
	Yes
	No
9. If yes, please link the website and/or social media sites. - ami nem elérhető online, az nem létezik? Erről esetleg beszéljünk. Ági	
10. What kind of sustainability related activities you have at your institute? *	
	Sustainability-oriented faculty (please name, or link the website below)
	Sustainability-oriented institute (please name, or link the website below)
	Sustainability-oriented programs (please name, or link the website below) Sustainability-oriented courses
	Sustainability related courses
	Organized sustainability-oriented activities itt mire gondolsz?
	Voluntary sustainability-oriented activities with the support of the institute
	Sustainability-oriented students movement
	Sustainability-oriented conferences
	Opció: 9 ha magát az épületet alakítják át energiahatékonyabbra, bevezetik a szelektív hulladékgyűjtést, illetve további, az üzemeltetés szintjén megjelenő tevékenységet végeznek, azt is ide kellene venni.
	Other:
10./b. Please, indicate here any relevant links.	
11. Do you have any dedicated department for the sustainable development oriented/related activities? *	
	Yes
	No
	Occasionally (Different activities belongs to different departments)
	Other:
12. Do you have responsible person(s) (leader) for the sustainable development oriented/related activities? *	
	No
	Yes
	Yes, but more than one
	Occasionally yes (For example in case of certain activities you always choose a person in charge.)
13. Do you have an institutional level “key responsible person” of the sustainable development oriented/related activities? (please indicate the position of that persons) *	
	We don’t have any
	The rector
	One of the vice rectors
	A member of the top management
	One of the deans
	Head of a department

	We have a sustainable development manager (as a part of the management)
	We have a sustainable development manager (not part of the management)
	Other:
14. Please, give me information about how it started.	
How did you start to introduce sustainable development into your institute?	
14/a When did it start? (If you don't know the exact data please indicate the approximate year, and 1st of September) - nem nap.hónap.év? *	
14/b Who was the initiator? *	
	The management/One of the managers
	Academic staff
	Students
	Administrative staff
	It was a result of a project/research etc.
	Other:
14/c What was the motivation? több válasz is lehetséges? ha igen, ide kell írni és akkor: main motivations? vagy main motivational factors *	
	To show the excellence.
	To follow the trends.
	To support the sustainable development.
	To run related projects.
	Understanding the needs of our partners (prospective employers.)
	Commitment of the management.
	To meet the students' needs.
	It is closely related to the courses we teach.
	To meet the international quality reccomendations.
	To combat climate change.
	To reduce the expences of the institute.
	Other:
14/d What were the first steps? *	
	Introducing courses.
	Educating our staff.
	Supporting related research work.
	Applying for related grants.
	Organizing related events.
	Other:
14/e What were the 3 most challenging parts of the beginning? *	
	To gain support from the management.
	To be accepted/supported by the academics.
	To be accepted/supported by the students.
	To be accepted/supported by the administrative staff.
	To get financial support.
	To get visibility.
	Introducing courses.

	To encourage people to take action rather than making theories and plans.
	Other:
14/f Which were the key success factors in your opinion? (What helped in overcoming the difficulties?) *	
15. Please describe the sustainability initiatives at your university, by completing the following sentences.	
	15/a We keep doing it because… *
	15/b The main aims of sustainability initiatives are… *
	15/c The most challenging parts are… *
	15/d Our key partners are… *
	15/e We are especially proud that… *
	15/f The next step would/should be… *
	15/g Including sustainability in the curricula of the university is... *
	15/h Our experience so far shows that… - megváltoztatnám a sorrendet, a végére tenném a we keep doing it because and the next steps...kezdetű részeket. Múlt-jelen-jövő logikát követném. *
16. Do you have a Sustainable Development Strategy? *	
	Yes
	No
	It's in preparation.
	I do not know about it.
	16/a. If yes, please, copy the link to the document here.
17. Do you include sustainable development goals into other university strategies (like R&D strategy or Institutional Development Plan) *	
	Yes
	No
	I do not know about it.
	Other:
18. Please, share with me your insight related to sustainability initiatives of your institute. - ez vajon mennyiben ad hozzá az eddigiekhez? A fentiekben kérted, hogy jellemezze, hogyan működik.	

9. Annex: The Higher Education Sustainability Declarations educational aspects

Declaration/ Initiative	Website	Released:	Educational aspects:
Talloires Declaration	http://ulsf.org/talloires-declaration/	1990	3) Educate for Environmentally Responsible Citizenship: Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens. 4) Foster Environmental Literacy For All: Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students. 7) Collaborate for Interdisciplinary Approaches: Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
Halifax Declaration	https://www.iau-hesd.net/sites/default/files/documents/rfl_727_halifax_2001.pdf	1991	4. To enhance the capacity of the university to teach and practise sustainable development principles, to increase environmental literacy, and to enhance the understanding of environmental ethics among faculty, students, and the public at large
Kyoto Declaration	https://iau-aiu.net/IMG/pdf/sustainable_development_policy_statement.pdf	1993	4. To enhance the capacity of the university to teach and undertake research and action in society in sustainable development principles, to increase environmental literacy, and to enhance the understanding of environmental ethics within the university and with the public at large. It is recommended that each university, in its own action plan, strive to: 3. Develop the capacities of its academic staff to teach environmental literacy;

			4. Encourage among both staff and students an environmental perspective, whatever the field of study; 5. Utilise the intellectual resources of the university to build strong environmental education programs;
Swansea Declaration	https://www.iau-hesd.net/ sites/default/files/ documents/the_swansea_ declaration.pdf	1993	4. To enhance the capacity of the university to teach and undertake research in sustainable development principles, to increase environmental literacy, and to enhance the understanding of environmental ethics within the university and with the public at large.
COPERNICUS Charter	https://www.iau-hesd.net /sites/default/ files/documents/copernicus.pdf	1994	Education of university employees : Universities shall provide education, training and encouragement to their employees on environmental issues, so that they can pursue their work in an environmentally responsible manner. Programmes in environmental education: Universities shall incorporate an environmental perspective in all their work and set up environmental education programmes involving both teachers and researchers as well as students - all of whom should be exposed to the global challenges of environment and development, irrespective of their field of study. Interdisciplinarity: Universities shall encourage interdisciplinary and collaborative education and research programmes related to sustainable development as part of the institution's central mission. Universities shall also seek to overcome competitive instincts between disciplines and departments. Dissemination of knowledge: Universities shall support efforts to fill in the gaps in the present literature available for students, professionals, decision-makers and the general public by preparing information didactic material, organizing public lectures, and establishing training programmes. They should also be prepared to participate in environmental audits.

			Continuing education programmes: Universities shall devise environmental educational programmes on these issues for different target groups: e.g. business, governmental agencies, non-governmental organisations, the media.
COPERNICUS CHARTA 2.0	https://www.copernicus-alliance.org/images/Downloads/COPERNICUS Charta_2.0.pdf	2011	Inside higher education institutions, • sustainable development is given fundamental status in their strategy and all their activities, i.e. institutional commitment, sustainability ethics, and dissemination of knowledge; • the creative development and implementation of comprehensive and integrated sustainability actions is promoted in relation to their functions in learning and teaching, research, internal and external social responsibility. In relation to the whole of education, • institutions of higher education pay particular attention to their role(s) in realising processes of lifelong learning for sustainable development by involving formal, non-formal and informal learning in this direction;
Lüneburg Declaration	https://www.iau-hesd.net/sites/default/files/documents/2001_-_the_luneburg_declaration_fr.pdf	2001	3. Calls on higher education institutions, NGO's and other stakeholders to: b. Ensure that the reorientation of teacher education towards sustainable development continue to be given priority as a key component of higher education; c. Provide continuing education to teachers, decision makers and the public at large on sustainable development;
Declaration of Barcelona	https://www.iau-hesd.net/sites/default/files/documents/declaration_of_barcelona_english.pdf	2004	Higher education is essential if we are to achieve sustainable development and therefore social progress. It also serves to strengthen cultural identity, maintain social cohesion, reduce poverty and promote peace and understanding.
Graz Declaration	https://www.iau-hesd.net/sites/default/files/documents/2005_-_graz_declaration_on_committing_	2005	Call on universities to give sustainable development fundamental status in their strategy and their activities and to promote the creative

	universities_to_sustainable_development_fr.pdf		development and implementation of comprehensive and integrated sustainability actions in relation to their three major functions – learning and teaching, research, internal and external social responsibility. By co-operating more closely institutions of higher education could share experiences and develop together inter- and transdisciplinary innovative approaches to sustainability in all their functions.
Principles for Responsible Management Education (PRME)	http://www.unprme.org/about-prme/the-six-principles.php	2007	As institutions of higher education involved in the development of current and future managers we declare our willingness to progress in the implementation, within our institution, of the following Principles, starting with those that are more relevant to our capacities and mission. We will report on progress to all our stakeholders and exchange effective practices related to these principles with other academic institutions: Principle 3 | Method: We will create educational frameworks, materials, processes and environments that enable effective learning experiences for responsible leadership.
Sapporo Sustainability Declaration	http://www.cirps.it/CIRPS/wp-content/uploads/2017/11/Sapporo-sustainability-declaration.pdf	2008	III/c) Acquire an accurate understanding of the scientific knowledge relevant to global sustainability issues and its application to an integrated approach to such goals as a low-carbon society, a resourcecirculating society, and a natureharmonious society; disseminate this knowledge to the citizens of each nation; and support problem-solving policies based in science.
Turin Declaration	https://www.iau-hesd.net/sites/default/files/documents/2009_-_torino_declaration_on_education_and_research_fr.pdf	2009	2. Restructuring of education and research to incorporate and integrate cutting-edge knowledge The development of a sustainable society requires the latest knowledge in all 4 E's, restructured to reverse past tendencies toward mono-disciplinary approaches and fragmentation in education and research, and to foster an integrated holistic approach to decision making and problem-solving. Disciplinary thinking has to be supplemented by systems thinking.

			Recommendations/Proposals to the G8Leaders: a) Educate students at all levels in the issues concerning sustainable development so that they may pursue the creation ofsustainable and responsible societies
SDG 4	https://sustainabledevelopment.un.org/sdg4	2016	Goal 4. 4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development 4.7.1: Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment

10. Annex: Tables – Factor Analysis of Interests

Component Transformation Matrix			
Component	1	2	3
1	,714	,558	,423
2	-,630	,248	,736
3	-,306	,792	-,529
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation.			

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,823
Bartlett's Test of Sphericity	Approx. Chi-Square	1115,340
	df	55
	Sig.	,000

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,288	29,894	29,894	3,288	29,894	29,894	2,280	20,731	20,731
2	1,284	11,672	41,567	1,284	11,672	41,567	1,748	15,887	36,618
3	1,027	9,334	50,901	1,027	9,334	50,901	1,571	14,283	50,901
4	,879	7,988	58,889						
5	,796	7,238	66,126						
6	,783	7,120	73,247						
7	,710	6,450	79,697						
8	,633	5,750	85,447						
9	,584	5,313	90,761						
10	,547	4,974	95,735						
11	,469	4,265	100,000						
Extraction Method: Principal Component Analysis.									

11. Annex: Cluster analysis tables of “missing topics”.

ANOVA						
	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Global issues	2,223	1	,991	143	2,242	,137
Social justice, well-being	16,531	1	,891	143	18,545	,000
Law and governance	3,449	1	,983	143	3,509	,063
Economy	2,127	1	,992	143	2,144	,145
Local issues	11,774	1	,925	143	12,733	,000
Organisation and control	61,909	1	,574	143	107,843	,000
The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.						

Number of Cases in each Cluster		
Cluster	1	34,000
	2	111,000
Valid		145,000
Missing		469,000

12. Annex: Demographic data of the NUPS survey (2016)

Legal relationship					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	234	38,1	45,3	45,3
	Academic	120	19,5	23,2	68,5
	Administrative	163	26,5	31,5	100,0
	Total	517	84,2	100,0	
Missing	System	97	15,8		
Total		614	100,0		

Age groups					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Students, young people (25-)	118	19,2	20,5	20,5
	Young adults (26-35)	149	24,3	25,9	46,4
	Middle-aged (36-55)	263	42,8	45,7	92,0
	Older (56-70)	45	7,3	7,8	99,8
	Aged (70+)	1	,2	,2	100,0
	Total	576	93,8	100,0	
Missing	System	38	6,2		
Total		614	100,0		

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	271	44,1	46,2	46,2
	Female	316	51,5	53,8	100,0
	Total	587	95,6	100,0	
Missing	System	27	4,4		
Total		614	100,0		

13. Annex: Relevant Results of the International Survey

14/b Who was the initiator?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Top manager/ manager	12	30,0	35,3	35,3
	Academic/admin staff	15	37,5	44,1	79,4
	Student(s)	3	7,5	8,8	88,2
	Result of a project	4	10,0	11,8	100,0
	Total	34	85,0	100,0	
Missing	Don't know/No answer	6	15,0		
Total		40	100,0		

14/c What were the main motivation factors?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	excellence/trends/quality reccomendations	9	22,5	25,0	25,0
	Run related projects/reduce the expences	3	7,5	8,3	33,3
	Understanding the needs of our partners/ students' needs/ Commitment of the management	5	12,5	13,9	47,2
	Result of a project	2	5,0	5,6	52,8
	Combat climate change/support the sustainable development	13	32,5	36,1	88,9
	Other	2	5,0	5,6	94,4
	All listed	2	5,0	5,6	100,0
	Total	36	90,0	100,0	
Missing	Don't know/No answer	4	10,0		
Total		40	100,0		

14/d What were the first steps

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Introducing courses/Educating our staff	6	15,0	16,7	16,7
	Supporting related research work	3	7,5	8,3	25,0
	Applying for related grants	2	5,0	5,6	30,6
	Organizing related events	8	20,0	22,2	52,8
	Other	7	17,5	19,4	72,2
	Several different type	4	10,0	11,1	83,3
	All above mentioned	6	15,0	16,7	100,0
	Total	36	90,0	100,0	
Missing	Don't know/No answer	4	10,0		
Total		40	100,0		

14/b Who was the initiator? * 14/d What were the first steps? Crosstabulation

			14/d What were the first steps?							Total
			Introducing courses/ Educating our staff	Supporting related research work	Applying for related grants	Organizing related events	Other	Several different type	All above mentioned	
14/b Who was the initiator?	top manager/ manager	Count	3	2	0	3	0	3	1	12
		%	25,0	16,7	0,0	25,0	0,0	25,0	8,3	100
	academic/ admin staff	Count	2	1	1	2	4	1	4	15
		%	13,3	6,7	6,7	13,3	26,7	6,7	26,7	100
	student(s)	Count	1	0	0	1	1	0	0	3
		%	33,3	0,0	0,0	33,3	33,3	0,0	0,0	100
	result of a project	Count	0	0	0	1	2	0	1	4
		%	0,0	0,0	0,0	25,0	50,0	0,0	25,0	100
Total		Count	6	3	1	7	7	4	6	34
		%	17,6%	8,8	2,9	20,6	20,6	11,8	17,6	100

15/a We keep doing it because…

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No reason	1	2,5	2,9	2,9
	stakeholders support/feedback	8	20,0	22,9	25,7
	communication/cooperation	1	2,5	2,9	28,6
	engagement/commitment/persistence	5	12,5	14,3	42,9
	making sense/raising awareness/results	14	35,0	40,0	82,9
	excellence/ranking/reputation	2	5,0	5,7	88,6
	institutionalisation/Resilience	2	5,0	5,7	94,3
	financial reasons	2	5,0	5,7	100,0
	Total	35	87,5	100,0	
Missing	Don't know	3	7,5		
	No answer	2	5,0		
	Total	5	12,5		
Total		40	100,0		

15/b The main aims of sustainability initiatives are…

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	engagement	1	2,5	2,9	2,9
	comprehensive (curricula, applied research, campus operations, outreach, communication about sustainability activities)	2	5,0	5,7	8,6
	resilience/lowering EF	6	15,0	17,1	25,7
	raising awareness/education	16	40,0	45,7	71,4
	improvement/reputation	9	22,5	25,7	97,1
	improve graduates skills	1	2,5	2,9	100,0
	Total	35	87,5	100,0	
Missing	Don't know	3	7,5		
	No answer	2	5,0		
	Total	5	12,5		
Total		40	100,0		

16. Do you have a Sustainable Development Strategy?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	9	22,5	22,5	22,5
	under construction	9	22,5	22,5	45,0
	Yes	17	42,5	42,5	87,5
	Don’t know/No answer	5	12,5	12,5	100,0
	Total	40	100,0	100,0	

14. Annex: STARS Table of Credits

ACADEMICS (AC)

Curriculum			**40**
	AC 1	Academic Courses	14
	AC 2	Learning Outcomes*	8
	AC 3	Undergraduate Program*	3
	AC 4	Graduate Program*	3
	AC 5	Immersive Experience*	2
	AC 6	Sustainability Literacy Assessment	4
	AC 7	Incentives for Developing Courses	2
	AC 8	Campus as a Living Laboratory*	4
Research			**18**
	AC 9	Research and Scholarship*	12
	AC 10	Support for Research*	4
	AC 11	Open Access to Research*	2

ENGAGEMENT (EN)

Campus Engagement			**21**
	EN 1	Student Educators Program	4
	EN 2	Student Orientation*	2
	EN 3	Student Life	2
	EN 4	Outreach Materials and Publications	2
	EN 5	Outreach Campaign	4
	EN 6	Assessing Sustainability Culture	1
	EN 7	Employee Educators Program	3
	EN 8	Employee Orientation	1
	EN 9	Staff Professional Development	2
Public Engagement			**20**
	EN 10	Community Partnerships	3
	EN 11	Inter-Campus Collaboration	3
	EN 12	Continuing Education*	5
	EN 13	Community Service*	5
	EN 14	Participation in Public Policy	2
	EN 15	Trademark Licensing*	2

OPERATIONS (OP)

Air & Climate			**11**
	OP 1	Greenhouse Gas Emissions	10
	OP 2	Outdoor Air Quality	1
Buildings			**8**
	OP 3	Building Operations and Maintenance*	5
	OP 4	Building Design and Construction*	3
Energy			**10**
	OP 5	Building Energy Consumption	6
	OP 6	Clean and Renewable Energy	4
Food & Dining			**8**

	OP 7	Food and Beverage Purchasing*	6
	OP 8	Sustainable Dining*	2
Grounds			**3-4**
	OP 9	Landscape Management*	2
	OP 10	Biodiversity*	1, 2
	OP 16	Student Commute Modal Split*	2
	OP 17	Employee Commute Modal Split	2
	OP 18	Support for Sustainable Transportation	2
Waste			**10**
	OP 19	Waste Minimisation and Diversion	8
	OP 20	Construction and Demolition Waste Diversion*	1
	OP 21	Hazardous Waste Management	1
Water			**6-8**
	OP 22	Water Use	4-6
	OP 23	Rainwater Management	2

PLANNING & ADMINISTRATION (PA)

Coordination & Planning			**8**
	PA 1	Sustainability Coordination	1
	PA 2	Sustainability Planning	4
	PA 3	Participatory Governance	3
Diversity & Affordability			**10**
	PA 4	Diversity and Equity Coordination	2
	PA 5	Assessing Diversity and Equity	1
	PA 6	Support for Underrepresented Groups	3
	PA 7	Affordability and Access	4
Investment & Finance			**7**
	PA 8	Committee on Investor Responsibility*	2
	PA 9	Sustainable Investment*	4
	PA 10	Investment Disclosure*	1
Wellbeing & Work			**7**
	PA 11	Employee Compensation	3
	PA 12	Assessing Employee Satisfaction	1
	PA 13	Wellness Program	1
	PA 14	Workplace Health and Safety	2
INNOVATION & LEADERSHIP (IN)			**4**
		Exemplary Practice Catalog of credits available	0.5 each
		Innovation 4 credits available	1 each

* credit does not apply to all institutions

15. Annex: UI Greenmetric method [51]

Setting and Infrastructure (SI) (15%)	The campus setting and infrastructure information will give the basic information of the university policy towards green environment. This indicator also shows whether the campus deserves to be called Green Campus. The aim is to trigger the participating university to provide more space for greenery and in safeguarding environment, as well as developing sustainable energy.
The indicators are:	1. The ratio of open space area towards total area
	2. Area on campus covered in forest
	3. Area on campus covered in planted vegetation
	4. Area on campus for water absorbance
	5. The total open space area divided by total campus population
	6. University budget for sustainable effort
Energy and Climate Change (EC) (21%)	The university's attention to the use of energy and climate change issues takes the highest weighting in this ranking. In our questionnaire we define several indicators for this particular area of concern, i.e. energy efficient appliances usage, renewable energy usage policy, total electricity use, energy conservation program, green building, climate change adaptation and mitigation program, greenhouse gas emission reductions policy. With this indicator, universities are expected to increase the effort in energy efficiency on their buildings and to take more about nature and energy resources.
The indicators are:	1. Energy efficient appliances usage are replacing conventional appliances
	2. Smart Building implementation
	3. Number of renewable energy sources in campus
	4. The total electricity usage divided by total campus population (kWh per person)
	5. The ratio of renewable energy produced towards energy usage
	6. Elements of green building implementation as reflected in all construction and renovation policy
	7. Greenhouse gas emission reductions program
	8. The ratio of total carbon footprint divided campus population
Waste (WS) (18%)	Waste treatment and recycling activities are major factors in creating a sustainable environment.The activities of university staff and students in campus will produce a lot of waste, therefore some programs and waste treatments should be among the concern of the university, i.e. recycling program, toxic waste recycling, organic waste treatment, inorganic waste treatment, sewerage disposal, policy to reduce the use of paper and plastic in campus.
The indicators are:	1. Recycling program for university waste
	2. Program to reduce the use of paper and plastic in campus
	3. Organic waste treatment
	4. Inorganic waste treatment
	5. Toxic waste handled
	6. Sewerage disposal

[51] http://greenmetric.ui.ac.id/criterian-indicator/

Water (WR) (10%)	Water use in campus is another important indicator in Greenmetric. The aim is that universities can decrease water usage, increase conservation program, and protect the habitat. Water conservation program, piped water use are among the criteria.
The indicators are:	1. Water conservation program implementation
	2. Water recycling program implementation
	3. The use of water efficient appliances (water tap, toilet flush, etc)
	4. Treated water consumed
Transportation (TR) (18%)	Transportation system plays an important role on the carbon emission and pollutant level in university. Transportation policy to limit the number of motor vehicles in campus, the use of campus bus and bicycle will encourage a healthier environment. The pedestrian policy will encourage students and staff to walk around campus, and avoid using private vehicle. The use of environmentally friendly public transportation will decrease carbon footprint around campus.
The indicators are:	1. The Ratio of total vehicles (cars and motorcycles) divided by total campus population
	2. Shuttle service
	3. Zero Emission Vehicles (ZEV) policy on campus
	4. The ratio of Zero Emission Vehicles (ZEV) divided by total campus population
	5. Ratio of parking area to total campus area
	6. Transportation program designed to limit or decrease the parking area on campus for the last 3 years (from 2015 to 2017)
	7. Number of transportation initiatives to decrease private vehicles on campus
	8. Pedestrian path policy on campus
Education and Research (ED) (18%)	In 2012 questionnaire, one new criterion added to the questionnaire: education. This criterion has 18% of the total score. This criteria is based on the thought that university has an important role in creating the new generation concern with sustainability issues.
The indicators are:	1. The ratio of sustainability courses towards total courses/subjects
	2. The ratio of sustainability research funding towards total research funding
	3. Number of scholarly publications on environment and sustainability published
	4. Number of scholarly events related to environment and sustainability
	5. Number of student organisations related to environment and sustainability
	6. Existence of a university-run sustainability website
	7. Existence of published sustainability report

16. Annex: UI Greenmetric ranking 2018

Ranks	Name of the university	Country	Total score	Location and infrastructure	Energy and climate change	Waste	Waste	Transportation	Education and research
1	**Wageningen University & Research**	NL	9 125	1 250	1 725	1 800	1 000	1 550	1 800
2	**University of Nottingham**	UK	8 600	1 175	1 675	1 575	1 000	1 450	1 725
3	**University of California Davis**	USA	8 575	1 400	1 375	1 725	1 000	1 500	1 575
4	**University of Oxford**	UK	8 525	1 150	1 625	1 650	850	1 600	1 650
5	**Nottingham Trent University**	UK	8 450	1 225	1 675	1 800	550	1 400	1 800
6	**Umwelt-Campus Birkenfeld**	D	8 350	1 350	1 700	1 500	800	1 275	1 725
7	**University of Groningen**	NL	8 350	1 100	1 550	1 575	1 000	1 550	1 575
8	**Bangor University**	UK	8 325	1 250	1 500	1 650	425	1 700	1 800
9	**University College Cork**	IR	8 250	1 150	1 475	1 725	600	1 650	1 650
10	**University of Connecticut**	USA	8 150	1 200	1 350	1 800	700	1 450	1 650
77	**University of Szeged**	H	7 050	1 175	1 025	1 650	550	1 450	1 200
140	**University of Pécs**	H	6 075	975	1 100	1 350	550	1 075	1 025
264	**Eötvös Loránd University Budapest**	H	5 225	925	675	1 350	350	775	1 150
354	**University of Debrecen**	H	4 750	650	750	975	250	1 050	1 075
459	**Budapest Business School**	H	4 275	600	1 250	825	400	600	600
498	**University of Miskolc**	H	4 075	500	1 150	450	100	575	1 300
525	**Corvinus University of Budapest**	H	3 950	650	700	450	450	650	1 050
532	**Szent István University**	H	3 900	675	725	525	325	825	825
595	**Óbuda University**	H	3 375	350	1 175	450	300	475	625

17. Annex: Top Universities sustainability overview

	Stars	Bacheler	Master	Scientific	Other	Year of foundation	Does strategy exist? (yes/no)	Latest released strategy year/validity	First sign (appear) of SD topic	SD office (yes/no)	Living lab
Harvard University	0	6 700	15 250	4 671		1636	yes	2015-2020	2004	yes	yes
	member						http://issuu.com/greenharvard/docs/harvard_sustainability_plan-web/1		Harvard adopted a set of Sustainability Principles	The Harvard Office for Sustainability (OFS)	https://green.harvard.edu/series/living-lab
University of Cambridge	0	12 221	5 641	7 913	3 615	1318	yes	2015-2020	2015	no	yes
	NO						https://www.environment.admin.cam.ac.uk/policy https://www.environment.admin.cam.ac.uk/policy-overview			The Environment and Energy team Staff Volunteers - Environment and Energy Coordinators	https://www.environment.admin.cam.ac.uk/living-lab

Stanford University	Platina	7 062	9 368	2 219	13 208	1885		2015	2001	yes	yes
	2.1 Platinum 2017.06.28. (2011)						https://sustainable.stanford.edu/			The Office of Sustainability and Business Services (OOS), in the Department of Sustainability and Energy Management	https://roblesustainability.stanford.edu/
University of Oxford	NO	11 747	11 687	6 404	5 283	1096	yes	2016 (2020)	2013	no	yes
							https://www.ox.ac.uk/sites/files/oxford/field/field_document/EMS_P_0001_Policy_2016_%28Signed%29.pdf https://www.ox.ac.uk/about/building-our-future/environmental/strategies-policies?wssl=1			The Environmental Sustainability team	https://www.admin.ox.ac.uk/estates/ourservices/environment/livinglab/

Massachusetts Institute of Technology (MIT)	Gold	4 547	6 919	7 193	5 414	1861	igen	2017	2013	yes	yes
	2.1 Gold 2018.10.23.						http://web.mit.edu/cstfreport-pre/docs/cstf-prelimreport.pdf		The MIT Office of Sustainability (MITOS) was established in 2013	The MIT Office of Sustainability (MITOS)	https://sustainability.mit.edu/living-labs
California Institute of Technology	Member	948	1 285	300		1891	4	2017	2013	partly	yes
							Témakörönként. Pl.: https://sustainability.caltech.edu/documents/156-water_management_overview.pdf kevésbé áttekinthető	http://www.sustainability.caltech.edu/documents/289-fy17_annual_report_final_web.pdf	https://www.sustainability.caltech.edu/documents/283-2013_sustainability_annual_report_final_130520.pdf	The Facilities Department	http://www.sustainability.caltech.edu/GreenLabs
University of California, Berkeley	Gold	30 853	11 666	11 258	8 369	1868	yes	2016	2001	yes	partly
	2.1 Gold 2018.08.16 (2018)						https://sustainability.berkeley.edu/plans-reports/sustainability-planning	Klíma terv	First UC Berkeley Recycling Summit held. Residential Sustainability Education Coordinators (RSECs) program formed.	https://sustainability.berkeley.edu/office-sustainability	Utalás szinten itt is megjelenik: Campus as a Living Lab

Princeton University	Gold	5 260	2 845	1 261	5 639	1746	yes	2008	2006	yes	yes
	2.1 Gold 2018.02.28 (2012)						https://sustain.princeton.edu/sites/sustainability/files/Sustainability%20Plan.pdf		In 2006, Shana Weber joined the staff as the University's first sustainability manager and established the Office of Sustainability.	https://facilities.princeton.edu/about-us/office-of-sustainability	https://sustain.princeton.edu/lab
Yale University	Silver	5 453	6 859	4 410	5 100	1701	yes	2016 (-2025)	2005	yes	partly
	2.1 Silver 2018.06.29. (2011)						https://sustainability.yale.edu/resources/yale-sustainability-plan-2025		The founding of the Office of Sustainability	https://sustainability.yale.edu/about/office-sustainability	https://sustainability.yale.edu/resources/yale-west-campus-living-laboratory

Columbia University	Gold	8 186	19 848	4 205	17 775	1754	yes	2017 (-2020)	2017	yes	yes
	2.1 Gold 2018.08.29 (2012)						Columbia Sustainability Plan: 2017–2020 https://sustainable.columbia.edu/sites/default/files/content/Columbia%20University%20Sustainability%20Plan(1).pdf			Environmental Stewardship office	https://sustainable.columbia.edu/content/campus-living-lab

	Traces of strategy implementation - follow-up	**The latest report issuance**	**Sustainability programs**	**Existence of sustainability research**	**The appearance of sustainability in education (programs, courses)**
Harvard University	5	2017	5	5	5
	http://report.green.harvard.edu/		Harvard's Sustainability Science Program https://www.hks.harvard.edu/centers/mrcbg/programs/sustsci	Living lab: Campus Sustainability Innovation Fund ($700,000 fund) Climate Solutions Living Lab Student Grants	Sustainability Degree: https://www.extension.harvard.edu/academics/graduate-degrees/sustainability-degree
University of Cambridge	5	2017	5	5	5
	https://www.environment.admin.cam.ac.uk/Annual-Report		https://www.environment.admin.cam.ac.uk/what-are-we-doing Centre for Sustainable Development https://www-csd.eng.cam.ac.uk	SDG-k https://www.gci.cam.ac.uk/	Cambridge Institute for Sustainability Leadership https://www.cisl.cam.ac.uk/
Stanford University	5	2018	5	5	5
	https://sustainable.stanford.edu/resources http://sustainability-year-in-review.stanford.edu/2018/		http://sustainable.stanford.edu/	http://sustainable.stanford.edu/	http://sustainable.stanford.edu/

University of Oxford	4	2017	5	5	5
	https://www.ox.ac.uk/sites/files/oxford/media_wysiwyg/Ox_Uni_Sustainability_review_FINAL_INTERNET.pdf		https://www.eci.ox.ac.uk/ http://www.one.ox.ac.uk/events/ http://www.admin.ox.ac.uk/estates/ourservices/environment/	https://conted.ox.ac.uk/about/sustainable-urban-development-research https://conted.ox.ac.uk/about/culture-mobility-and-social-sustainability	Economics of Sustainability, https://www.smithschool.ox.ac.uk/research/economics-sustainability/ https://conted.ox.ac.uk/search#/?s=sustainability&sort=relevance (34 kurzust ad a kereső) https://www.eci.ox.ac.uk/ https://www.conted.ox.ac.uk/about/environment-and-sustainability
Massachusetts Institute of Technology (MIT)	5		5	5	5
	http://datapool.mit.edu/ (Csak MIT tagoknak elérhető)		https://mitsloan.mit.edu/sustainability/	https://mitsloan.mit.edu/sustainability/ Search Engine for Business Sustainability Resources https://shift.tools/	https://environmentalsolutions.mit.edu/degree-programs/
California Institute of Technology	5	2018	5	5	5
	Témakörönként és jelentésekben pl.: http://www.sustainability.caltech.edu/energy		http://www.sustainability.caltech.edu	The Resnick Sustainability Institute at Caltech: resnick.caltech.edu	http://www.sustainability.caltech.edu/research
University of California, Berkeley		2018	5	5	
	https://sustainability.berkeley.edu/sites/default/files/stars_report_university-of-california-berkeley-ca_2018.pdf	https://www.ucop.edu/sustainability/_files/annual-reports/2018-annual-sustainability-report	Pl.: https://sustainability.berkeley.edu/office-sustainability/os-projects Green Guide for Universities http://www.iaruni.org/sustainability/green-guide	Laboratory for Manufacturing And Sustainability http://lma.berkeley.edu/ https://sustainability.berkeley.edu/our-performance/research	https://extension.berkeley.edu/areas-of-study/construction-and-sustainability.jsp?method=load&selectedProgramAreaId=10394

Princeton University		2017	5		
	https://sustain.princeton.edu/sites/sustainability/files/Sustainability%20Highlights%20Brochure_2014.pdf	2014 Report on Sustainability: Pathways to Leadership Highlights from the November 2014 Annual Report produced by Princeton University's Office of Sustainability. https://sustain.princeton.edu/progress	https://sustain.princeton.edu/events	High Meadows Foundation Sustainability Fund https://sustain.princeton.edu/lead/funding	Environmental Humanities, Science, Technology, and Environmental Policy Princeton Environmental Institute (PEI) Andlinger Center for Energy and the Environment https://sustain.princeton.edu/lead/study-and-research
Yale University	5	2018	5	5	5
	https://sustainability.yale.edu/priorities-progress	https://sustainability.yale.edu/priorities-progress 9 téma szerint csoportosítva	https://sustainability.yale.edu/take-action https://sustainability.yale.edu/priorities-progress	https://sustainability.yale.edu/priorities-progress/leadership https://urban.yale.edu/	The Implementation Steering Committee is a rotating selection of faculty and staff that support the execution of the Yale Sustainability Plan, particularly its integration into the scholarship at Yale. This group meets three times per year. https://sustainability.yale.edu/academics-research/scholarship-and-sdgs https://som.yale.edu/term/33
Columbia University	3	2018			
	https://sustainable.columbia.edu/content/tracking-and-reporting Sustainable Columbia Annual Progress Report 2017-18.pdf		https://sustainable.columbia.edu/node/168 Tematikusan, intézetenként (Programs and Initiatives: Department/Audience/Categories	Campus as a Living Lab https://sustainable.columbia.edu/content/campus-living-lab	MPA Environmental Science and Policy Program (MPA-ESP) http://mpaenvironment.ei.columbia.edu/ https://sustainable.columbia.edu/content/academic-programs http://bulletin.columbia.edu/columbia-college/departments-instruction/sustainable-development/ MS IN SUSTAINABILITY MANAGEMENT https://www.sustainability.ei.columbia.edu/

	Sustainability website (Involvement of stakeholders - external and internal communication)	Social media	Sustainability Vision
Harvard University	yes	2009	https://green.harvard.edu/commitment
	https://green.harvard.edu environment.harvard.edu/harvard-office-sustainability https://hr.harvard.edu/sustainability https://community.harvard.edu/sustainability	https://twitter.com/GreenHarvard	Harvard University is devoted to excellence in teaching, learning, and research, and to developing leaders in many disciplines making differences globally. While Harvard's primary role is to address global challenges, such as climate change and sustainability, through research and teaching, the University is also focused on translating research into action. Harvard is using its campus as a living laboratory for piloting and implementing solutions that create a sustainable and resilient community focused on health and well-being.
University of Cambridge	yes	2009	http://www.environment.admin.cam.ac.uk/files/environmental_sustainability_vision_policy_and_strategy_for_web.pdf
	https://www.environment.admin.cam.ac.uk/ University's monthly sustainability newsletter, Greenlines	https://twitter.com/cisl_cambridge; https://twitter.com/CambridgeSust	The University of Cambridge is committed to making a positive impact through outstanding environmental sustainability performance. The Environment and Energy team support staff and students in achieving this commitment. Our Environmental Sustainability Vision is that the University of Cambridge is committed to making a positive impact through outstanding environmental sustainability performance.
Stanford University	yes	2011	
	http://sustainable.stanford.edu/	https://twitter.com/SustainStanford	Stanford's mission since its founding in 1891, when Jane and Leland Stanford exhorted university leaders to "promote the public welfare by exercising an influence on behalf of humanity and civilisation."
University of Oxford	yes	2013	https://www.ox.ac.uk/about/building-our-future/environmental/strategies-policies?wssl=1
	https://www.ox.ac.uk/about/building-our-future Oxford Networks for the Environment (ONE) http://www.one.ox.ac.uk/	https://www.instagram.com/oxfordenvsust/ https://www.facebook.com/OxfordEnvSust https://twitter.com/oxfordenvsust	The University of Oxford is committed to reducing the environmental impact of departments in line with its Environmental Sustainability Policy. Efficient use of natural resources, and ethical concerns including living wage, are central to our decision making when procuring goods and services.
Massachusetts Institute of Technology (MIT)	yes	2014	http://sustainability.mit.edu/about
	https://sustainability.mit.edu/	https://twitter.com/SustainableMIT https://twitter.com/MITSloanSusty	Our mission is to transform MIT into a powerful model that generates new and proven ways of responding to the unprecedented challenges of a changing planet via operational excellence, education, research and innovation on our campus.

California Institute of Technology	yes	2010	http://www.sustainability.caltech.edu/documents/93-cit_facilities_sustainability_statement.pdf
	http://www.sustainability.caltech.edu/ http://www.sustainability.caltech.edu/get_involved	https://twitter.com/CaltechGreen	The Facilities Department is committed to reducing its ecological footprint in a fiscally and socially responsible way while executing its mission to support research and education at Caltech. The Facilities Department will execute their mission while adhering to guidelines in the following six initiative categories. The goals within each initiative will be updated periodically.
University of California, Berkeley	yes		https://policy.ucop.edu/doc/3100155/SustainablePractices
	https://sustainability.berkeley.edu/home	https://www.facebook.com/BerkeleySustainability/? https://www.instagram.com/calsustainability/	Chancellor's Advisory Committee on Sustainability: Membership is drawn from faculty, staff, students and alumni and meetings are open to everyone.The University of California ("University") is committed to responsible stewardship of resources and to demonstrating leadership in sustainable business practices. The University's locations should be living laboratories for sustainability, contributing to the research and educational mission of the University, consistent with available funding and safe operational practices. Policy goals are presented below in nine areas of sustainable practices.
Princeton University	yes	2011	https://sustain.princeton.edu/sites/sustainability/files/Sustainability%20Plan.pdf
	https://sustain.princeton.edu/ https://environment.princeton.edu/outreach/sustainability	https://twitter.com/sustainptn https://twitter.com/TigersGoGreen	The University has a significant environmental impact. That fact alone would justify developing a comprehensive strategy to minimize its environmental footprint. However, as a major research university with a distinguished faculty committedto studying and fi nding solutions to the global climate problem and environmental degradation, Princeton has a responsibility to shape the national sustainability agenda and to promote environmental leadership on its campus.
Yale University	yes	2010	https://sustainability.yale.edu/sites/default/files/sustainability_plan_2025.pdf
	https://sustainability.yale.edu/	https://twitter.com/YaleSustain	As a higher education institution with a global presence, Yale is committed to sustainability planning and actions that forge new paths. Yale is committed to academic leadership in the sciences, social sciences, arts, and humanities, and to providing a campus learning environment that cultivates innovators, leaders, pioneers, and entrepreneurs in all fields and for all sectors of society. This plan is based on a vision of a Yale where sustainability is seamlessly integrated into the scholarship and operations of the university, contributing to its social, environmental, and financial excellence and positioning Yale as a local and global leader.

Columbia University	yes	2009	
	https://sustainable.columbia.edu	https://twitter.com/SustainablCU	At Columbia, we recognize that to be truly sustainable is to take a multi-faceted and multi-tiered approach. We are looking to tackle these issues through world-renowned research occurring right here on our campus, engaging staff leadership and individual participation.

18. Annex: Encoding Top University Analysis I.

	AASHE Stars[52]	Number of students (FTE persons)		Number of employees (FTE persons)		Year of foundation	Appearance of sustainability	Strategy[53]	Latest strategy	Validity [54]	Monitoring[55]	Latest riport
		BA/BSc	MA/MSc	Academics	Other							
Harvard University	1	6 700	15 250	4 671	na	1636	2004	2	2015	1	2	2017
University of Cambridge	0	12 221	5 641	7 913	3 615	1318	2015	2	2015	1	2	2017
Stanford University	5	7 062	9 368	2 219	13 208	1885	2001	2	2015	1	2	2018
University of Oxford	0	11 747	11 687	6 404	5 283	1096	2013	1	2016	1	1	2017
Massachusetts Institute of Technology	4	4 547	6 919	7 193	5 414	1861	2013	2	2017	1	1	2018
California Institute of Technology	1	948	1 285	300	na	1891	2013	1	2017	1	2	2018
University of California, Berkeley	4	30 853	11 666	11 258	8 369	1868	2001	1	2016	1	1	2018
Princeton University	4	5 260	2 845	1 261	5 639	1746	2006	2	2008	1	1	2017
Yale University	3	5 453	6 859	4 410	5 100	1701	2005	2	2016	1	2	2018
Columbia University	4	8 186	19 848	4 205	17 775	1754	2017	2	2017	1	1	2018

[52] 0= No, 1=member, 2=reporting, 3=silver, 4=gold, 5=platina
[53] 0= do not have, 1= yes, but it focuses only on certain aspects, 2=yes, there is
[54] 0= do not have, 1=van
[55] 0= do not have, 1=yes, but is not complete or up to date 2=yes, and up to date

19. Annex: Encoding Top University Analysis II.

	SD office (yes/no)[56]	education[57]	research[58]	Living lab[59]	program[60]	website[61]	Social media	Start of social media[62]	SD Mission statement (policy)[63]
Harvard University	2	1	2	2	2	2	1	2009	2
University of Cambridge	1	2	2	2	2	2	1	2009	2
Stanford University	2	2	2	2	2	2	1	2011	2
University of Oxford	1	2	2	2	2	2	1	2013	2
Massachusetts Institute of Technology (MIT)	2	2	2	2	2	2	1	2014	2
California Institute of Technology	1	2	2	2	2	2	1	2010	2
University of California, Berkeley	2	2	2	1	2	2	1	NA	2
Princeton University	2	1	2	2	2	2	1	2011	2
Yale University	2	2	1	1	2	2	1	2010	2
Columbia University	2	2	1	2	1	2	1	2009	2

Resources: https://green.harvard.edu, environment.harvard.edu/harvard-office-sustainability, https://hr.harvard.edu/sustainability, https://community.harvard.edu/sustainability, https://www.environment.admin.cam.ac.uk/, http://sustainable.stanford.edu/, https://www.ox.ac.uk/about/building-our-future, http://www.one.ox.ac.uk/, https://sustainability.mit.edu/, http://www.sustainability.caltech.edu/, https://sustainability.berkeley.edu/home, https://sustain.princeton.edu/, https://environment.princeton.edu/outreach/sustainability, https://sustainability.yale.edu/, https://sustainable.columbia.edu

[56] 0= do not have, 1=yes, but not assigned department, 2=yes
[57] 0= do not have, 1=yes, there are several courses in several programs, 2=yes, there are special degree programs (MA, MPA stb)
[58] 0= do not have, 1=yes, sporadically, 2=separate research institute
[59] 0= do not have, 1= yes, but only marginally mentioned, 2=yes
[60] 0= do not have, 1= yes, sporadically, 2= in all areas, structured
[61] 0= do not have, 1=yes, there are more than one/specialization, 2=coherent, transparent, homogeneous website
[62] 0= do not have, 1=yes
[63] 0= do not have, 1=yes, but only marginally mentioned, 2=yes

20. Annex: Future competencies

Summarizing the competencies of the "future"

Competency group	Future competencies
Creative spirit	Creativity and innovation
	Innovative and adaptive thinking
	"Design" mindset
	Creating new value
	Originality and initiative Logical and creative skills
EQ, Social intelligence	Social intelligence Critical thinking
	Service-orientation
	Sensemaking
	Ethical considerations Emotional intelligence
Complex vision, system approach	Complex problem solving
	Reasoning, problem-solving and brainstorming
	System analysis, understanding, evaluation
	Placing into context
Flexibility, openness	Cognitive flexibility
	Perception of the outside world
	Active learning
	Adaptability
	Flexible finishing
	Learning to learn
	Curiosity-driven discoverer
Contact capability	Communication
	Interaction and expression skills
	Negotiating skills
	Personal presence and participation
	Virtual collaboration
	Cross-cultural competency
	Cooperation skills
	Networking
	Internal and external team-building skills
	Building relations and trust
	Coordination of conflicts and dilemmas
	Cultural competency
	New media literacy
Leadership skills	Taking responsibility
	Judgement and decision-making
	Vision Teaching
	People management
	Entrepreneurial skills
	Analytical thinking and innovation
	Giving and using feedback
	Participation and exercising influence
	Control and social impact

	Risk management skill
	Verification
	Choosing the right employees
	Competencies that are useful in the world of labour and entrepreneurship skills
Professional competencies	Technical skills
	ICT competency
	Digital skills
	STEM (science, technology, engineering and math) skills
	Technical planning and programming
	Data-driven decision-making
	Operational analysis
	Technological planning
	Programming
Trans-/Inter-/Multi-disciplinarity	Transdisciplinarity
	Multiliteracy
Integrity	Time management
	Learning strategies
	Speaking
	Ability for active listening
	Reading comprehension
	Writing skills
	Languages

Source: Edited by the author based on: (Leishman, 2017), (Armstrong, Parmelee, Santifort, Burley, & Fleet, 2018), (Bach, 2017), (IFTF, 2011), (Vitikka, 2014), (PWC, 2018), (OECD, Education 2030, 2018), (Gray, 2016), (Leopold, Ratcheva, & Zahidi, 2018), (Jones, 2017), (Zobrist & Brandes, 2017), (Gustein & Sviokla, 2018)

Results of literature collection with references

Reference:	**Competencies**
Crucial competencies in the fourth industrial revolution (Leishman, 2017)	Creativity and Innovation will become one of the top three competencies workers need. Creativity and Innovation Leadership competencies Adaptability Digital proficiency
Preparing tomorrow's workforce for the Fourth Industrial Revolution, For business: A framework for action (Armstrong, Parmelee, Santifort, Burley, & Fleet, 2018)	time management personal presentation, and attendance creativity complex problem solving relationship building communication emotional intelligence critical thinking technical skills Nontraditional employment: entrepreneurship
Critical Capabilities & Competencies of the Future - Is Change the Only Constant? 5 Key Skills of 2020 Leaders	In 2020, employees will expect five principles to resonate strongly in their workplaces: 1. "Collaboration" – This calls for interwoven work, internally and externally.

(Bach, 2017)	2. "Authenticity" – Core values and transparency demonstrate genuineness. 3. "Personalisation" – Employees want tailor-made career paths. 4. "Innovation" – In a changing world, new thinking enables sustainability 5. "Social connection" – Workplaces will be based on sharing and forming a community.
Future Work Skills 2020 (IFTF, 2011)	sense making Social intelligence Novel&adaptive thinking cross-cultural competence computational Thinking new-media literacy transdisciplinarity design mindst cognitive load management virtual collaboration
Finland Taking the Lead on Future Work Skills Curriculum Reform and Development in Finland[64] (Vitikka, 2014)	Transversal competences as part of every subject: Thinking and learning to learn Taking care of oneself and others, managing daily activities, safety competence, interaction and expression Multiliteracy competence Working life competence and entrepreneurship Participation and influence, building the sustainable future
Workforce of the future - The competing forces shaping 2030 (PWC, 2018)	Adaptability Problem solving Collaboration skills Emotional intelligence Creativity and innovation Leadership skills Digital skills Risk management skills STEM skills Entrepreneurial skills
The Future of education and skills - Education 2030[65] (OECD, Education 2030, 2018)	Creating new value Reconciling tensions and dilemmas Taking responsibility
The 10 skills you need to thrive in the Fourth Industrial Revolution[66] (Gray, 2016)	1. Complex problem solving 2. Critical Thinking 3. Creativity 4. People Management

[64] https://www.the4thindustrialrevolution.org/finland-taking-the-lead-on-future-work-skills/

https://www.curriculum.ut.ee/sites/default/files/ht/12.111.15_curriculum_reform_in_finland_vitikka.pdf

https://www.oph.fi/english/curricula_and_qualifications/basic_education/curricula_2014

[65] Programme for the International Assessment of Adult Competencies (PIAAC)

[66] https://guthriejensen.com/blog/skills-future-2020-infographic/

	5. Coordinating with others 6. Emotional intelligence 7. Judgement and decision making 8. Service Oriantation 9. Negotiation 10. Cognitive flexibility
The Future of Jobs Report 2018 - WEFORUM (Leopold, Ratcheva, & Zahidi, 2018)	Trending, 2022: Analytical thinking and innovation Active learning and learning strategies Creativity, originality and initiative Technology design and programming Critical thinking and analysis Complex problem-solving Leadership and social influence Emotional intelligence Reasoning, problem-solving and ideation Systems analysis and evaluation
Millennial Managers: 7 Skills for the Next Generation of Leaders (Jones, 2017)	1. Building relationships and trust face-to-face 2. The art of giving and using feedback 3. Data-driven decision-making 4. Internal and external team-building skills 5. All leaders need to have a big vision 6. Learn to hire the right person 7. Become a constant learner driven by curiosity
What key competencies are needed in the digital age? (Zobrist & Brandes, 2017)	Mass competencies: Creativity, Complex problem-solving skills Social intelligence Systems understanding, Judgement and decision-making Abilities in logic and creativity Flexibility/adaptability Niche competencies: Negotiation Systems analysis, Systems evaluation Operational analysis, Technology design, Programming Originality Perception Flexibility of closure Basic competencies: Reading comprehension Active listening Speaking Active learning Writing Critical thinking Languages Monitoring
7 Skills That Aren't About to Be Automated (Gustein & Sviokla, 2018)	1. Communication 2. Content 3. Context 4. Emotional competence 5. Teaching 6. Connections 7. An ethical compass.

21. Annex: Sustainability competencies

Summarizing sustainability competencies

Competency group	Sustainability competencies
Creative spirit	Change agent
	Social innovations
	Results-orientation
	Readiness to act
	Action-orientation
	Strategic approach
EQ, Social intelligence	Empathy
	Physiologic tolerance
	Critical thinking
	Value-based or normative approach
	Normative approach
	Active values
	Ethics
	Interpersonal skills (emotional intelligence)
Complex vision, system approach	Management of complexities
	Decision-making skills in complex situations, *"Change Agent"*
	Thinking in systems
	Understanding the interconnections
Flexibility, openness	Decision-making skills in complex situations, Understanding the interconnections
	Change agent
	Active values, Understanding the interconnections
Contact capability	Stakeholder involvement
	Cooperation in (heterogeneous) and external groups
	Cooperation skill
	Inclusion, pursuit for consensus
Leadership skills	Responsibility
	Systematic thinking, Decision-making skills in complex situations
	Future-orientation
	Predictive approach
	Anticipation
	Long-term thinking
	Fuelling development
	Change agent
	Stakeholder involvement
Professional competencies	Sustainability literacy
	Understanding and analysing the issues of sustainable development
	Core digital competencies that are indispensable for sustainability in this context.
Trans-/Inter-/Multi-disciplinarity	

Integrity	Core intellectual competencies in developed countries.

Source: Edited by the author based on: (Wiek, 2016), (Anderson, 2015), (Wiek, Withycombe, & Redman, 2011), (Wiek, és mtsai., 2016), (Weinreb, 2015), (Strandberg, 2015), (Knight, 2018), (Meza, Herremans, Wallace, & Althouse, 2018), (Redman & Larson, 2011), (Rieckmann, 2010)

Results of literature collection with references

References	**Competencies**
Overview of the Key Competencies[67] (Wiek, 2016)	Interpersonal Competence Systems Thinking Competence Futures Thinking Competence Values Thinking Competence Strategic Thinking Competence
Developing Key Sustainability Competencies through Real-World Learning Experiences: Evaluating Community Environmental Services (Anderson, 2015)	Systems-thinking Anticipatory competence Normative competence Strategic competence Interpersonal competence
Key competencies in sustainability: a reference framework for academic program development (Wiek, Withycombe, & Redman, 2011)	Systems-thinking Anticipatory competence Normative competence Strategic competence Interpersonal competence
Operationalising Competencies in Higher Education for Sustainable Development (Wiek, és mtsai., 2016)	Systems thinking competence Futures thinking (or anticipatory) competence Values thinking (or normative) competence Strategic thinking (or action-oriented) competence Collaboration (or interpersonal) competence
5 core competencies of sustainability leadership (Weinreb, 2015)	1. Systems thinking 2. External collaboration 3. Social innovation 4. Sustainability literacy 5. Active values
What are the key sustainability leadership competencies? (Strandberg, 2015)	3 skills and 2 knowledge areas: Systems Thinking External Collaboration Social Innovation Sustainability Literacy Active values
A Behavioural Competency Model for Sustainability Leaders (Knight, 2018)	Visionary Thinker (Exploring Possibilities) Change Agent (Generating Ideas) Inclusive Operator (Establishing Rapport)

[67] Educating Future Change Agents Research Project: http://educatingchangeagents.org

	Results Driven (Developing Expertise) Ethically Oriented (Interacting with People)
Strengthening sustainability leadership competencies through university internships (Meza, Herremans, Wallace, & Althouse, 2018)	Six foundational competencies are the focus for sustainability education at the University of Calgary: (1) anticipatory thinking and long-term foresightedness; (2) empathy and understanding of different worldviews and relationships; (3) capacities for stakeholder engagement and group collaboration; (4) action-oriented leadership skills and change agency skills; (5) critical thinking and decision-making capacity within complexity; and (6) systems thinking and an understanding of connectedness.
Educating for Sustainability: Competencies & Practices for Transformative Action (Redman & Larson, 2011)	Systems Thinking and an Understanding of Interconnectedness Long-Term, Foresighted Thinking Stakeholder Engagement and Group Collaboration Action-Orientation and Change-Agent Skills
Future-oriented higher education: Which key competencies should be fostered through university teaching and learning? (Rieckmann, 2010)	All Experts 1. Systemic thinking and handling of complexity (9.5) 2. Anticipatory thinking (9.3) 3. Critical thinking (9.3) 4. Acting responsibly (9.1) 5. Recognizing and analyzing problems of unsustainable development (9.0) 6. Cooperation in (heterogeneous) groups (9.0) 7. Participation (9.0)

22. Annex: Benchmark - The appearance of sustainability efforts in selected institutions

QS rank	Name	Country	Existence of a sustainability initiative (yes / no / traces) and sustainability website, research
1	Massachusetts Institute of Technology	USA	Yes, https://sustainability.mit.edu/
2	Harvard University	USA	Yes, https://green.harvard.edu/
3	University of Cambridge	UK	Yes, http://www.environment.admin.cam.ac.uk/, www.cisl.cam.ac.uk Cambridge Institute for Sustainability Leadership: www.cisl.cam.ac.uk
3	Stanford University	USA	Yes, https://sustainable.stanford.edu/, sdgc.stanford.edu/
5	California Institute of Technology	USA	Yes, https://www.sustainability.caltech.edu
6	University of Oxford	UK	Yes, http://www.eci.ox.ac.uk/ MSc programme in environmental change and management
7	UCL (University College London)	UK	Yes, https://www.ucl.ac.uk/greenucl, www.bartlett.ucl.ac.uk/sustainable
8	Imperial College London	UK	Yes, www.imperial.ac.uk/estates-facilities/sustainability/
9	ETH Zurich	Svájc	Yes, https://www.ethz.ch/en/the-eth-zurich/sustainability.html
10	University of Chicago	USA	Yes, https://sustainability.uchicago.edu
501-550	University of Szeged	Mo.	Yes, http://www.u-szeged.hu/tik/zoldintezmeny
601-650	Eötvös Loránd University	Mo.	Traces, CC/2009. (VI. 29.) Senate decision ELTE Strategy for Sustainable Development
	University of Debrecen	Mo.	Traces, University of Debrecen, Sustainable Development Strategy 2008
701+	Corvinus University of Budapest	Mo.	Traces, As a research project, discontinued department, Institutional Sustainability Strategy 2010[68]

Source: Edited by the author based on: (QS Rankings, 2018)

[68] In 2018, major changes were made to the Faculty of Business Administration to better meet the qualification requirements.

23. Annex: Benchmark - Sustainability Focuses of Selected Institutions (examples) – *preliminary survey*

Name	Major sustainability targets
MIT	**Solving global sustainability issues at a local level:** By utilizing the campus as a testbed and incubator, we aim to transform MIT into a powerful model that generates new and proven ways of responding to the challenges of our changing planet. Low carbon campus: climate, buildings, energy, and mobility. Advancing resilient ecosystems: water , landscape , and air quality Material lifecycle: procurement and waste reduction strategies. Healthy people: food Thriving Networks: campus, city-wide, region to globe.
Harvard	GHG emissions, Energy Reduction, Renewable energy, New Investments, Green Building Standards, Reducing Water Consumption, Green Cleaning Standards - With specific objectives and deadlines. Sustainable IT Standards, Reducing emissions from transport, Campus Air Conditioning, More environmentally friendly products, Sustainable and Healthy Food Standard
Cambridge	Energy consumption, water consumption, waste reduction, sustainable work for workers. The Prince of Wales's Business &SustainabilityProgramme
Stanford	Energy, water, buildings and their environment, transportation, waste reduction, food and lifestyle, business systems
Caltech	Energy, water, materials used, built environment, transportation, emissions, wastewater and waste, research and education, Caltech Energy Conservation Investment Program - CECIP (Caltech Energy Conservation Investment Program)
Oxford	Climate, ecosystem, energy, food, water consumption
Semmelweis University	In 2015, the SZTE is one of the 20 most green universities in the world. The main areas of sustainability strategy are: 1. Power management 2. Environmental protection Greenhouse gas emissions, waste management, Car use at university, Office paper consumption 3. Formation of social awareness 4. Protecting built and natural values 5. Information Management in Sustainable Development

Eötvös Loránd University	CC/2009. (VI. 29.) Senate decision ELTE Strategy for Sustainable Development: environmentally conscious management and planning, continuous improvement of operation and maintenance for sustainable development, employees' perspective
University of Debrecen	In-house training for grants, environmentally conscious management and institutional organization, engineering, technical measures, environmentally conscious measures, social policy measures, educational policy measures
Corvinus University of Budapest	At its meeting on 3 May 2010. the Senate supported the adoption of the Institutional Sustainability Strategy 63/2009/10. (CUB, 2010) (CBS, 2019) Protecting the natural environment: environmental education, research on various aspects of sustainability, resource-efficient treatment, favouring the use of renewable resources, minimizing harmful emissions. Social Justice: Equal Treatment/Opportunities, Support for Women and minorities to improve their situation, Promoting the Integration of International Students and Trainers, Promoting Career Development for Young Colleagues, Cooperation with Local Communities and other entities. Economy: long-term preservation of financial resources, improvement of staff remuneration, development of infrastructure, improvement of working conditions.

Source: Edited by the Author