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ABSTRACT OF DOCTORAL DISSERTATION

Management and Sustainability in Higher Education

PhD Candidate:

Tâmpănariu (Brez) Teodora Raluca Odett

Supervisor:

Professor LUCIAN IONEL CIOCA, PhD.

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Key words:

The present doctoral dissertation includes the following key words: sustainability, modelling techniques, universities, resources, digitization, diagnosis, job market, bibliometric analysis, competences, sustainable development, higher education, alternative resources.

ABSTRACT

Education, research, and service institutions, universities play key roles in the sustainable development of society and economy. Thus, we find as necessary an analysis on institutional adhesion to sustainable developments and the way through which universities fulfil the expectations; how universities act and which future-oriented directions they follow and if a need of optimization arises.

University sustainability is determined by active implication of all higher education institutions in forging natural environment protection policies. A sustainable university is one that contributes, in addition to government implication, to protecting the environment through adapting the curricula to the ecological imperatives and through the progress of scientific knowledge, as result of teaching and research activities.

The way society works nowadays, through expansion of production capabilities and the consumption of goods and services, is not viable on long term and will have negative consequences. This aspect has determined nowadays an acute interest of both academia and policy makers in durable development - also known as sustainability.

Bearing in mind the above statements, we set the following objectives for our scientific endeavour:

Main objectives:

1. Literature review of the impact changes, digital transformation, and the way this influences the universities.
2. Defining and identifying the economic objectives of educational policies
3. Approaches on performance and financial sustainability
4. Identifying the practical implications of performance in higher education institutions
5. Analysis of the impact of accepting new digital technologies by teachers and students
6. Establishing general concepts of testing statistical hypotheses
7. Underlying modelling methods and techniques within social systems theory
8. Conception of a comprehensive model on Romanian universities management and sustainability

Research questions:

1. What are the economic objectives of educational policies?
2. What is financial sustainability of public universities?
3. What are the practical implications of performance in higher education institutions?
4. How digital transformation allows universities to develop sustainable competitive advantages?
5. What is the role of evolutive teaching in the development of digital advantages?
6. What opportunities the information technology is enabling in the digital transformation process?
7. What are the general concepts of statistic hypotheses testing?
8. Which are the modelling methods and techniques?
9. How should a sustainable higher education comprehensive model look like?

During the following, we shall briefly present the content of each chapter, hoping to have found an answer to the above-listed research questions.

The first chapter is a view on sustainability at university level. Following conceptual delimitations, we bring forward the nowadays situation of the literature review to identify a new way of research on the digital transformation and the way this is influencing universities, and to define and identify the economic objectives of educational policies.

The concept of sustainability is nowadays more prevalent than ever in our society and not only from the environment and climate change perspective. Protests on a weekly basis, started by school children, have gathered waves of popularity among the general public. Due to recent debates on climate change, sustainability has been largely discussed at societal and political level. Society requires companies to take responsibility (Reyes-Carrasco et al., 2020).

Sustainability stems from the acknowledgment that resources are being consumed at a higher rate than they are being regenerated. If these resources are not protected and continue to be overused, this may trigger irreversible consequences for the ecosystems and for the quality of human life. Sustainable development means ensuring the fulfilment of present needs without endangering the future generations. Sustainable development may be implemented in all areas of society. It is about reducing the carbon footprint and allowing natural resources time to regenerate and to sustain and accelerate the regeneration process (Adams et al., 2018). This concept supposes a balance between contemporary lifestyle and continuing growth on one hand and protecting the environment and identifying alternative resources on the other. In this particular case, the term “durable development” is used.

Another dimension of sustainability is society; it deals with social aspects for sustainability enables, promotes, and supports human resource. Among the objectives of this second dimension are prosperity and global peace.

A third dimension of sustainability is economy. A sustainable economic system prevents resource depletion and promotes long term planning. Special care goes to the efficient use of resources for satisfying individual and social needs (Murga-Menoyo, 2014).

These three dimensions of sustainability/durability – ecology or environment, social and economic – must evenly be encompassed in the sustainable management, as unbalanced preferences do not ensure long-term development. Despite all this, many sustainability objectives cannot be attributed to a single dimension. There are superpositions and they may be profitable to attaining the objectives. However, conflicting objectives may arise between individual DDOs (durable development objectives) (Albareda-Tiana et al., 2018).

To underline present trends in research, we have conducted a thorough literature review by bibliometric analysis based on *visualization of similarities* technique (VOS). The sample included in the analysis is based on English language *Web of Science* articles and includes approximately 6325 papers that have been analyzed, filtered, and reshuffled based on the clusters generated by VOS analysis. The results are indicating the fact that sustainability is a global issue that remains challenging both for corporations and individuals. Moreover, universities must adapt to new requirements on the market and to apply the principles of sustainable development for collective welfare. In addition, both the literature review and the requirements for 2030 OCDE education development are pointing to transforming education by digital means and highlights the importance of e-learning. Moreover, COVID-19 crisis may be interpreted as a turning point in the development of digital learning.

Furthermore, it is our social responsibility to regard welfare objectively and wisely – to ensure proper waste management, prevent pollution, cooperate in the best interest of the nation.

Consequently, the literature presents the two perspectives – sustainability and financial performance – as a relatively new research topic. Published studies present heterogenous investigations and empirical analyses with contradictory results. For instance, Iqbal and Piwowar-Sulej (2021) are highlighting the organisational dimension by suggesting an idealised leadership model to understand the way the companies are enabling strategies to manage environment concerns and the way the policies are influencing systems, functions, and management culture development in the company.

While implementing sustainable development as societal vision should be pervasive in all areas of education, higher education plays a major role for achieving this. Universities not

only generate and transfer relevant knowledge, but they also enable future change agents to contribute to sustainable development (Barth, 2015; Leal Filho et al., 2018 Tasdemir and Gazo, 2020).

University education is supporting and enabling change to acquire necessary skills and competences for sustainability.

Research on education in sustainable development in teaching programs is based on the tradition of more ample research regarding curricula change (Dmochowski et al., 2016; Smigic et al., 2020; Tasdemir and Gazo, 2020). During the past decade, we have witnessed many scientific papers on curricula change in university education for sustainable development (Dmochowski et al., 2016; Smigic et al., 2020; Tasdemir and Gazo, 2020). The research case study plays a prominent role in this part of the research.

We need more empirical research on typical models of implementing sustainable development in higher education, taking into consideration the form and magnitude of the implementation, the process features, role of factors and limits involved, and adapting strategies of certain institutions. Initial findings in the case studies suggest a limited amount of specific implementation models.

E-learning and *blended learning* are both important elements of nowadays university teaching. Study models are as diverse as the students are. Based on innovative teaching concepts, students' individual learning styles can be pinpointed on one side. On the other, different learning materials are being discussed. Universities from all over the world support students and teachers alike in creating and using digital courses, especially during the pandemic.

The end of development in e-learning is yet to come, not only due to organisational and motivational reasons, but especially because technical and policies progress enable new objectives – digitalization of learning and teaching. Such broad requirements are not only problematic from the data safety standpoint, but also from that of actual teaching. The main purpose should be the utilization of digital elements in teaching in a significant, integrative, and scaled way, ensuring that participants hold total control of their data. Other objectives regarding e-learning are being drafted as we can see from the state issued initiatives (and less at government level). Moreover, development in universities is different. If all involved agents are active and financial support is available, attractive and extensive e-learning elements may be used in teaching; or they could completely lack. The wide spread of MOOCs has stimulated the online learning as well (You, 2019; Meneses et al., 2020).

During the isolation prompted by COVID-19 crisis, universities have closed their doors and moved into online teaching, testing the sustainability of the teaching systems. COVID-19 crisis has impacted not only the teaching, but also the research in various manners. Regarding sustainable development research, the crisis has significantly altered regular communication channels and led to the cancellation of already planned meetings and events. Furthermore, research projects were delayed. There is a gap in the literature regarding the way in which a global crisis influences sustainability (Rameez et al., 2020).

COVID-19 global crisis has impacted teaching and research activities conducted by universities, research centers and research groups in various ways. Despite significant efforts to reduce the effects of the pandemic, some researchers have been forced to isolate and to cancel face to face meetings within the research teams, which bore a negative effect on the teams. Moreover, during the pandemic's peak, several research laboratories have been closed. This led to further delays in research projects. In many cases, researchers have had to request extensions of deadlines (Chan, 2020).

Bearing in mind that university sustainability encompasses more aspects, we have presented in Chapter 2 the financial performance of universities and also, we have realized a mathematical model regarding university income and expenses – noting that each university is reliant on the generated income in order to be as sustainable as possible. We see as useful this approach to reach our objectives on financial sustainability of universities, and respectively to identify the practical implications that financial performance brings in higher education institutions.

Curriculum dynamics must be an ongoing concern of the university's managerial team. One thing is certain: some curricula ensure a regional balance regarding human resource, as required by employers.

Industrial development, technology reshaping, the need of growing companies' production capacity leads to the need of creating and developing new study programs in universities that satisfy the need of skilled workers. Partnerships with employers are necessary in the context of developing new effective lines of study which create necessary competencies for future employers. Fast integration on the job market is the attribute of a healthy collaboration between universities and companies – through practical activities, internship programs, and the involvement of company specialists in the training of the employees.

Key actors in our society, universities are responsible for the sustainable development. Even so, universities can use their entire potential only if the change comes from within and they find a new image as enablers of sustainable development from their position of education

and research institutions, service companies and partners of students and agencies from the outside.

The European Commission has put forward, since 2006, the ideal of modernising universities; at the same time, the European Commission stated that modernisation is mandatory, should the universities wish to contribute to the UE objectives to become a knowledge-based economical area. European universities have a tremendous potential, which, unfortunately, is still to be exploited, due to rigid structures and typical malfunctions. Unlocking the vast knowledge, talent and energy base requires immediate, profound, and coordinated changes: from system governance to university management (European Commission, 2006).

University financing has decreased during the past several years, despite additional tasks and increased number of students. Structural change in university finance has led to universities financing necessary programs in a limited manner. Financial situation of universities has been negatively impacted, among others, by the structural underfunding of university buildings and the need to generate funds from third parties (Fülöp et al., 2020).

Universities' capacity to develop strategies to improve the courses quality and to offer long term perspective to young faculty members is severely limited as consequence of this development. This applies as well to important research tasks.

If we look at the universities' policies to guarantee successful study programs and the development of young faculty members, these objectives can be achieved only by using a viable and durable funding structure. Moreover, universities, are important actors to use their expertise in order to solve relevant long-term national tasks, by maintaining international competitiveness.

In modern societies, the state invariably plays a key role in funding education. However, states are fulfilling this role in different ways. From financial science perspective, three main questions arise regarding the involvement of the state. First, what are the reasons for public-funded education? Second, what is the adequate distribution of public and private funding during the stages of education: pre-school to secondary? And third, what are the appropriate changes in public and private funding? The answers to these questions depend naturally on the objectives set by educational policy.

When we deal with achieving performance in higher education, the analysis needs indicators that measure and highlight the quality of the products offered to societal use and the level of the student education; also, of the knowledge under any forms: fundamental and applied scientific research, consultancy, expertise, involvement of academia in society.

The answers to these questions naturally depend on the objectives set by educational policy. Practically, just as in other public areas, economic objectives of educational policy can be divided in efficiency and equity. Besides efficiency and equity objectives, promoting economic growth is occasionally mentioned as an independent objective of educational policy. This is valid especially from demographic perspective, as education is usually credited with increasing sufficient productivity to counterbalance workforce decrease.

Blaug (1997) identifies a fundamental external effect, arguing that a functional democracy is not possible without adequate education. Freeman and Polasky (1992) make an additional argument for the positive external effects of education. Knowledge has the quality of non-rivalry, sharing knowledge does not decrease the knowledge level of the emitter. However, if the transfer of knowledge can only be observed by the involved parties (hence it cannot be confirmed by a third party), knowledge buyers will not be willing to cover more than the technical costs of knowledge transfer. Henceforth, the transfer of new knowledge is not sufficiently funded. Indeed, Arnott and Rouse (1987) and Robertson and Symons (2003) bring evidence that positive externalities are especially vivid in early stages of education. These positive external effects of education set out the role of the state in funding education. The state may fill this role by offering free education or subsidizing private education. However, the role of the state is weakened during the individual life cycle. Heckman and Klenow (1997) are doubting the existence of positive external effects of higher education. They reach the conclusion that there is no empirical evidence which sustain that university education can produce positive externalities. It is true that achievements of university students in sciences and real life do bring a benefit to society and, consequently, to the non-academia.

For higher education, effects of liquidity constraints have been a research topic for years. The works of Kane (1994, 1996), Elwood and Kane (2000), and Card (2001) show how these constraints explain the reduced involvement of low-income groups in higher education. Cameron and Heckman (1998) and Carneiro and Heckman (2002) place this result in the context of the life cycle. Authors show that low-income levels have indeed a more reduced participation in higher education than high-income groups. However, this educational disparity shows up out of long-term liquidity constraints, rather than short term. Even preschoolers may lack adequate access to education. We note that liquidity constraints do not lead only to efficiency issues, but to an equity one. Educational opportunities are better in the high-income groups, even with certain liquidity constraints.

Based on the mathematical model we have realised, we note a surge in short term funding and programs of universities. Moreover, such measures should be permanently and

constitutionally implemented as part of universities' planning and management. The state plays an important role during all steps of the educational life cycle. The role of the state is based essentially on the lack of rationality in education demand, on the positive effects of education, on the private credit markets – incomplete to fund education – and the lack of equity in education opportunities. Investments in early education increase the productivity of later educational investments (early education investments being the most productive). Consequently, this effect is also known as the self-productivity of education.

If we were to compare educational policies, which are oriented towards efficiency and equity, to real educational policies, the deviations between the pre-school sector and university become obvious.

The reasoning we have conducted so far would recommend more public funding in pre-school and university private and public sectors. It is also true that often is being brought up an objection to a larger private funding of higher education (meaning tuition has a negative impact on society through its effect of selection, and being, consequently, unjust). In fact, this argument does not acknowledge that social selection in university is not triggered by tuition. Social selection is a lot earlier during the life cycle. Several studies suggest that the premises for educational success are set already during pre-school years. As far as higher education is concerned, it can be privately funded, without efficiency or equity issues (Wang et al., 2022).

This stance is backed by the fact that, while maintaining international competitiveness, universities bring out their competences to solve medium- and long-term national tasks. More precisely, digitalization, climate research, backing priorities in research and internationalisation.

All the prerequisites are met to create a general model of a sustainable university which could be applied based on the university's specific profile, and which could contribute to a medium-term development of a such institution. We find necessary the use of surveys to analyse the student satisfaction rate.

The management of university performance has been updated by the strategy of higher education based on the UN 2030 Agenda and the OECD framework on the future of education. The necessity of e-learning and digitalization is mentioned in this framework.

As social actor, universities and other institutions are being summoned to discuss their structure and to adapt to the new requirements. Meanwhile, lifestyle should lead to the updating of consumption and production patterns. Universities are of paramount importance as they form the future's decision makers.

Universities are promoters of social change and enable sustainable macroeconomic development. Due to their ethical and socio-political responsibility, universities must enable social change and a sustainable environment. By integrating sustainability in universities, they contribute to the development of the society in a sustainable manner and to the transition to a sustainable society (Breaz, 2021).

Universities may implement “sustainability” and sustainable management in several ways, which all result in fulfilling the action plan “Education for durable development” and in the practical implementation of the DDOs. As consequence, many DDOs can be acknowledged in the functioning of a university (UNICEF and the UN – Education for durable development – Learning objectives – 2030 Agenda for durable development).

The UN has developed and published 2030 Agenda regarding the objectives of the durable development which encompasses 17 main objectives among which we can find the objective regarding sustainable education for universities. The 17 durable development objectives have been conceived to raise awareness on durability/sustainability, by formulating specific targets with action plans for a large array of social, environment and technological issues: reducing poverty, healthcare for all, developing infrastructure, education, gender equality, sustainable use of oceans, energy, water, and waste. All 17 objectives are related to the field of engineering.

Responsibility in the development of innovative technologies may protect the environment, in such a way that nowadays engineering challenges are clearer than ever. Engineering plays a vital role in improving the quality of life and in creating opportunities for a sustainable growth at local, national, regional, and global level. Nowadays, sustainability is no longer an action principle to optimize the use of resources in economic sense, but rather a responsible handling of the environment through technical, economic, and social implementation.

Engineering sciences are vectors of using these resources in practice. Sustainable use of the environment should be acknowledged as well in teaching and learning. Pertaining to the digitalization of university education, the fourth objective of the UN Agenda on sustainable development, IT specialists and engineers are forerunners in the efficient use of data for process optimization, IT, resource saving software, renewable energy, energy transition and generation, efficient production, disposal of electronic waste, recycling, etc. New study programs should be developed in a flexible and driven manner. Moreover, courses should promote personal, ethical, social, and methodical abilities. The didactic, practical, technical, and interdisciplinary content or the partnerships with companies are more important than ever in engineering

formation. Tomorrow's engineers could very well face digital work challenges. Future as hub of technology and innovation depends on the successful and timely digitalization of businesses, research and teaching.

Virtual learning becomes more and more important for universities during the 2019 pandemic, and it should be seen beyond IT related instrumentation. Universities must explore merging humanities with virtual teaching to insure student participation and involvement. Virtual teaching technologies has developed tremendously especially in transnational universities and this phenomenon has influenced instruction and teaching methods.

The digital transformation of economy requires rethinking at all levels: from developing new products, processes, and services to business models. This is a major challenge, especially for small and medium sized companies, and well-prepared engineers are pivotal to this challenge. But the very definition of proper instruction is, similarly, subject to change: along with technical support, engineers need more and more digital skills, entrepreneur thinking and creative techniques for problem solving (Raita and Breaz, 2021).

The willingness to offer high quality education, which enables a world class experience and transform students to face globalized industry challenges are the basis of digital transformation strategy. Digital transformation may prompt resource savings not only by optimal use thereof, but also by avoiding budget constraints, as it is usually vetted and regulated. Digital transformation is used as means to attract high value students, by improving their experience, the access, the quality teaching materials, and combined teaching. However, top ranked universities are reluctant to take advantage of the digital era opportunities. Global phenomena, such as internet, digitalization, and social networks have rendered digital transformation inevitable for universities. To boost students' experiences, especially the access to education, digital transformation has become more and more a mutual trust process, a platform for projecting, developing, and maintaining competitive advantages (Breaz, 2021).

As transversal issue, digitalization is increasingly widespread in all areas of university life, offering new opportunities in teaching, research, and communication, but at the same time presenting the teachers and students with new challenges. Universities are set to utilize optimally the possibilities of this dynamic process. This way, digitalization may help with teaching-learning flexibilization and to keep better into account the individual needs of the students. The practical relevance of teaching may be promoted through visualization and virtualization techniques. In the context of research cooperation or of studies and teaching internationalization (domestic internationalization), the digital format and instruments offer new options (Anderson, 2020).

A systemic exploitation of the digitalization in universities has not yet been achieved due to differences in organization patterns and action logistics. Also, a uniform digitalization has not been obtained. We know that the university of the future will be different, but it is not yet clear how different. According to Ehlers (2018), the key factors of the university of the future are a larger participation in education, increasing diversity in life situations, digitalization, and the needs of the students. While Ehlers (2018) considers the importance of education in the society and the digitalization as the strongest factors, the students' needs are equally important as part of the digitalization process. Reason for this being the supposition that students' needs will become an essential part of their profile (Schmid and Bässler, 2016).

Developing a digitalized university is a tenuous and complex task. It would be too narrow to see digitization as standardized mechanization, mass produced and without including personalization, permeability, lifelong learning, job market requirements, educational partnerships and innovation (Al-Ani, 2016; Anderson, 2020).

During the past years, worldwide universities have been confronted to rapid and impactful changes which have influenced the technological process and the social tendency towards digitalization. As all revolutionary changes, digital transformation implies intense adjustment/readjustment. Seismic changes in socio-economic and educational systems, stemmed from the globalized economy, have led to changes especially in higher education, such as the standard of education, the quality, decentralization, virtual and independent learning. These factors in the field of education are collectively promoting transnational education.

Globalized education has radically influenced universities in modelling their own learning, teaching, and improvement development mechanisms. It is possible that the universities are no longer dependent of the traditional forms of learning to face the globalized challenges.

This paper brings forward the impact of digitalization on institutional management and performance, by examining the factors that influence digital transformation during COVID-19 pandemic which has determined the move to e-learning.

The theoretical part has been completed by an empirical study where we have analyzed, based on the technology acceptance model, the acceptance of the e-learning model in Romanian universities both from students' and teachers' perspective. Furthermore, we present a model of university sustainability based on the research results and on UN and OECD requirements.

Digital transformation in the field of education supposes the involvement of sustainable management, to adapt to changes prompted by new technologies. During the last decades, universities have known a set of important changes brought by social and technological trends towards digitalization.

As all revolutions, digitalization supposes an intense readjustment in all sectors. Nowadays, adopting technologies by universities is linked to a paradigm change in which technology is conceived as a complex and interconnected medium which allows digital learning. This way, the focus is more on the student and the need of technology. In this context, digitalization is a necessity in higher education institutions, which can attract more and better students, to improve learning materials and the formation process in general.

Several social and economic fields are generally impacted by the growth in use of digitalization and new technologies. Whether it is about private area assistance systems or the use of an exoskeleton to improve physical strain on a worker, these technologies change our life daily and in different ways. New hiring and work models, added value processes, business models, effects on communication, mobility, and innovation, are all associated with digital change. Along with new technologies, education and formation will also change (Alharthi et al., 2019).

Change has direct or indirect implications in projecting the future of education and professional upbringing regarding skills, work, learning materials, work discipline, space of work and hiring practices (Reuter et al., 2017). It is obvious that disruptive technologies and economic, sociologic, professional, and occupational associated constellations will have as result new requirements for workers' skills. It is usually expected that knowledge and skills in IT area, control and problem-solving abilities, and intercultural and interdisciplinary skills become more and more important for future education and formation. Bearing in mind the dynamics of technological development, one could presume that the relevance of *life-long learning* and *learning on demand* will increase. Digitalization bears diverse implications for methodological and didactic planning of the teaching-learning arrangements and professional formation. Especially new technologies, such as mixed reality simulation, have the potential to render work more flexible on a time-space scale and to promote the embodiment of learning (Reuter et al., 2017).

Along with Covid-19 sanitary crisis, digital teaching has been brought forward. We could even argue that Covid-19 is an accelerator for acceptance of digital technologies in teaching, for teachers and students. Many universities still struggle with remote or part time teaching. Moreover, some university administrators seem to uncover a potential for budget

savings through virtual teaching, as fewer classrooms and offices are needed (Kemp and Grieve, 2014; Basilaia et al., 2020). Acquired knowledge during this crisis may help boost the future development of university teaching.

Virtual learning becomes more and more relevant for universities starting 2019. Virtual learning should be seen beyond the IT instrumentalization. Accordingly, universities must explore ways to merge humanistic attributes with digital learning to insure involvement and part-taking. Virtual learning technology has increased at a tremendous rate and its use has become more widespread in transnational universities. Teaching and teaching methods have been especially impacted.

The term *e-learning* has become very popular. Digital learning is online remote learning, just as hybrid learning, and it is used as a component in a instruction delivery system (Arkorful and Abaidoo, 2014; Chunjuan and Zongxiang, 2016; Oblinger and Hawkins, 2005). Consequently, Keller and Suzuki (2004), Bares (2008), Sangrà et al. (2012) and Paechter et al. (2020) agree that using e-learning in education has a substantial growth and is part of the new dynamics of the 21st century education. The literature review indicates numerous studies that bring up challenges which affect students in their e-learning use process.

An overview of the relevant literature has shown that nowadays scientific research is based on descriptive statements without thoroughly verifying theory-based questions. In this context the main objective of the paper was a behavioral analysis of e-learning acceptance. The theoretical framework for this discussion was the technology acceptance model (Davis, 1989, Davit et al., 1989). The technology acceptance model is one of the most popular prediction models of technical systems acceptance. According to the model, the acceptance behavior is directly determined by the behavior intention. Behavior intention suggest the intention of a person to realize a behavior in a more or less precise time frame. Behavior intent is determined by two factors: perceived utility and perceived easiness of use. The perceived benefit indicated the subjective value of a person regarding the extent in which the technical system may bring a profitable contribution to the requested task. On the other hand, the perceived degree of use of a system is described by a person. The first research question of the dissertation is dedicated to the acceptance model. We examine the extent in which the technology acceptance model is suitable for predicting e-learning acceptance. Along with these hypotheses from neighboring scientific fields, technology acceptance model has been extended in this research paper to include external factors. External factors have been included since people evaluate the benefits of e-learning more if they are convinced of the competence of the relevant person of reference.

The 36 items include perceptions of the respondents and the challenges in the availability of learning resources, the understanding of the materials, study attitudes, access facility, teaching methods and interaction models. In this study, the perceptions of the respondents have been obtained through teaching process or experience, both for the interaction models with the lecturers, with other students, sports facilities availability, internet networking and so on, and the availability of e-learning materials. In a structured manner, this perception involves indicators of perceived utilization and facility of use. The answers to the questions regarding the technology acceptance model and to the subjective norm items have been recorded using a five-point Likert scale, analogue to original questions: 1 = “totally disagree”, 5 = “totally agree”.

A questionnaire has been drafted based on the literature and sent to teachers and students to draw up the status of the still ongoing challenges in e-learning complete acceptance. More precisely, questions are aimed at the perceived utility and easiness of access. First section deals with personal data of the faculty members which reflects their field and experience. The second section is focusing on the e-learning level of use. The pilot tested questionnaires have been selectively distributed to teachers and students for a first feedback round. The purpose of the pilot testing was double-sided: noting the effectiveness of certain items and to confirm that respondents can easily understand the questions. Special care went into ensuring that the structure, the language, and the clarity are all at acceptable standards. These surveys have been distributed directly to students of three universities, using a non-probable sampling approach. Data for respondents has been collected – coming from different institutions, different academic years, men and women. Thus, we have ensured that age was not a variable when analyzing the usage behavior.

The study has used quantitative methods to collect data to empirically examine and underline factors that bore a more important influence of the usage behavior. We have selected a non-probable sample which is usually used in the field of higher education (Bokolo et al., 2020; Moore et al., 2011; Zainab et al., 2017). The study has been used to identify respondents that were teachers or students in universities and were using e-learning platforms offered by their respective universities. Data has been collected via surveys, using CAWI technique (Computer Assisted Web Interview). A link to online surveys was distributed to teachers and students at Romanian universities, via university e-mail. Sending out surveys took place during January-February 2022, and we have received 1875 filled-in forms from students and 243 from teachers.

Structural Equation Modelling (SEM) was utilized to process the model. The use of SEM will ensure more precise estimations, as it offers a concurrent analysis level both for the structural

model and for the input measurements. Moreover, SEM offers a more detailed method through which one can test hypotheses pertaining to latent and observed variables. SEM is the most widespread approach when we measure the technology acceptance level by users (Al-Gahtani, 2008, 2011; Alshammari et al., 2016; Salloum, 2018; Salloumi et al., 2019).

E-learning based learning in this study refers to the entire remote learning process that utilizes internet platforms and hardware to provide students with learning materials from teachers. All interactions, synchronic and asynchronic, are delivered through mass-media.

Results indicate the fact that students adapt a lot easier to new technologies than teachers. From the 21 hypotheses we have drafted, only five were rejected by students. However, teachers rejected almost half, which indicates that teachers adapt a lot harder to digital age even though digital transformation in the global industry of higher education will be the sustainable management strategy for the future. The world we live in changes rapidly and so does the way we teach.

Universities are of paramount importance regarding objectives implementation, as they are a hub of knowledge, innovation, and solutions. Decision makers of the future are instructed and empowered to action. Universities release specific abilities to society, and they steer discourse and social debates.

An increasing number of universities are becoming more aware of their social responsibility, their function as model and their associated opportunities. They have sustainability at the core of their offers, they have consultative councils dedicated to sustainability, nation level networks are being created. Moreover, more universities not only conduct teaching and researching on sustainability, but they bring forward their own contribution to the field.

It is important that universities know what and how to do to become sustainable. The model we suggest is not a rigid structure, as sustainability is a complex issue, and it is tackled differently by the involved actors. However, the model is set to be a guiding tool to explore transformation strategies of sustainable universities.

The model supposes that a university, through its teaching, research and societal service operations is in a rather unique position to set an example and to bear an influence on the culture and on the concerned parties and to actively take part in sustainable development. Thus, we propose an objective implementation model according to 2030 Agenda and OECD framework to reach a management level and sustainability in accordance with future requirements.

According to the strategic management process, the leaders of a certain organization develop and sustain the core vision and values of the organization, setting goals and objectives to maintain the organization. The important role of mission, vision and strategy utilization is nowadays acknowledged in most organizations. In brief, the mission is the reason for which the organization exists; vision is the ideal state of the organization in the future, and the strategy defines the ways to achieve the ideal state. Developing a sustainable vision for higher education is a first strategic step to a sustainable university. Creating a mission represents the core value of an organization and the vision is the necessary step to mission development.

To successfully implement change for a sustainable university, a holistic vision should be adopted; hence we are bound to highlight the importance of performance management as result of a sustainable university. Performance management can be defined as a performance improving mechanism through synchronisation and alignment of individual, team and organizational results and objectives. Critical factors of the performance management success include their synchronisation to the strategic company objectives, their credibility within the organization and their merge to other management or human resources functions. Performance management has three major objectives: strategic – which includes ways of drafting the objectives -, development (focus on the individual), and administrative (decision making). Utilization of the performance indicators as performance management and updating in education is nowadays so well spread in universities that education without it could hardly be imagined.

A sustainability-aspiring university must be able to be flexible with its programs according to job market fluctuations, especially through adapting to economic activities that take place in their main recruitment pool, showing a particular interest to practical internships and to the timing of implementing these programs.

In brief, university sustainable development is increasingly important. However, during analyzing the feedback of the respondents (teachers and students), it became clear that the implementation of durable concepts and measures is still in the early stages for many institutions, except for pioneering universities.

A detailed analysis of their own company, of the interested parties and of the contrast group is a first important step to draft objectives for the own university and achieve a blanket strategy for sustainability.

E-learning as concept is very appealing at first sight: it enables possibilities for advancing education according to individual needs and with no space and time restrictions. An

internet connected computer is indispensable to human life, which prompts the idea of e-learning and teaching.

As technology is advancing rapidly, e-learning will make additional progress, but we should bear in mind that this also has limitations. On one hand, electronic learning platforms must be considered based on their didactic core and not only based on their technological feasibility. Moreover, the learner is the same as with traditional learning methods. Without proper motivation and effort, e-learning will not succeed. It may be also the case that the flexibility and constant availability of learning programs might even increase stress in learners and even overwhelm them.

Briefly, e-learning cannot replace teachers. Hybrid teaching concepts seem to make more sense than just e-learning. Social contact among learners is important and it should primarily materialize through direct interaction and only secondarily through forums, etc. E-learning offers many possibilities, but its use is reliant on the teachers and learners, while a learning software can be a mere learning support.

The study has proven that e-learning acceptance may be explained as a function of socially determined factors. This stance allows nowadays the development of promising measures for e-learning practice. If predictors are changed, acceptance will too.

Extremely important has been proven to be the evaluation of subjective utility. Due to its causal relation, this characteristic was proved to be the most important factor for e-learning acceptance. Based on this, several arguments can be detached for practical intervention. When e-learning as education tool is introduced, we should bear in mind the interests and attitudes of all relevant target groups. As a rule of thumb, when a new e-learning system is purchased, a strategical team will be responsible for its implementation.

It is of the essence that this team reunites representatives of all interested parties. Technicians and system providers, decision-making representatives, members of the faculty, and students. Such a heterogeneous team is a prerequisite for the inclusion of all concerns and arguments. This is a basis for e-learning advantages to be highlighted since the very beginning. If the benefits are evident for teachers and students, then they will act as multipliers within the appropriate groups.

A second argument of our research pertains to the influence of subjective norm on individual evaluation of utility. According to this, people are guided by their social environment when they evaluate the system benefits. During the theoretical proceedings, we have shown that an informative influence of certain relevant persons or groups can be presumed. According to this, people show a conforming behavior if they trust the reference

persons or groups and if they consider them competent. For e-learning providers, this means internal marketing schemes are available to convince users of e-learning benefits. Thus, accepted persons (teachers, managers) can play a role in presenting e-learning and advertising it. Moreover, constant use of different communication channels is a good way to underline the value and meaning of e-learning through information transparency and to prompt the emotional involvement of the participants.

From the system developers and education providers standpoint, there is an interesting perspective on the facility of use. A user will never use e-learning if they do not know how. So, the developers need data on the target groups. As familiarity to computer use varies greatly, different systems should be put into place for the elderly and young users. Design, guidance, learning content – they all impact the easiness of use. Formation providers may include in training sessions details regarding the possible applications of teaching and learning technologies (Fisher, 2018). It is important that these training sessions be part of the launching proceedings before rolling out real learning scenarios. Thus, one could identify group or individual flaws during early stages of implementation. It is ensured as well that learning difficulties are being prevented.

What are the implications of the present work for future research? First, this work is a first in-depth investigation on e-learning acceptance at Romanian universities. By using the technology acceptance model, new perspectives for e-learning acceptance can be identified. Consequently, the paper should be seen as a starting point for future research. Investigating e-learning acceptance has been realized by using two systems. On one side – e-learning technology was analyzed from teacher and student standpoint. It was a purposeful decision to not delve into software types and platforms. Thus, the way in which students are using the system and how different types of platforms influence learning was not investigated. However, this will be the focus of further research – investigating different e-learning systems.

Behavioral intention variable is key. If intention continues to be supposed as decisive behavioral predictor, then verifying the mediator effect is imperative. For further research endeavors, one should consider the extension of acceptance determinants. This paper argues that previous user experience plays a dominant role in the predisposition to use e-learning. Results are constrained by the selection of study participants. Including other demographics in e-learning use (businesses, for instance) was beyond the scope of the present paper. However, to validate the arguments, it is necessary to use a random user sample that largely represents an important e-learning user group – businesses.

Data collection based on a well-structured online questionnaire has proven to be an adequate tool for this research. Both studies have reached satisfactory response rates. A higher response rate could have been achieved if a written questionnaire was handed out (or even a hybrid approach), but the health crisis has prompted the exclusive use of the online version. An extension of the data collection method could trigger even more responses and a more precise result could be envisaged. As expected, there is a discrepancy between the two respondent categories, and one could argue that an age-based analysis could be drafted. This study acknowledges its limitations, but this too could open future research opportunities.

Literature review was focused on the relation between university and sustainability; the factors that influence achieving a sustainable management within universities. This study may be extended to include future research directions in more detail.

Regarding financial performance of universities, only one Romanian university has been used in the analysis, so the conclusions are not exhaustive. For this topic, a university type analysis could be done, to identify similarities and differences based on the university types.

To analyze the management and university sustainability, we have selected the digitalization elements that significantly impacted the educational process during the pandemic. For competitiveness purposes, management and sustainability have played a major role in the digitalization process.

This study focuses first and foremost on the dominant factors that influence the behavior of e-learning resources users, students and teachers alike. However, additional research could tackle more deeply the established common factors that influence user behavior, developing a deeper understanding of the topic, especially the fact that factors such as determination and prioritization could be edited based on different countries demographics. Secondly, the non-probable samples and their characteristics are not entirely indicative for the general population and, thus, enable discrepancies within study generalizations and conclusions.

In conclusion, the concept of this study depends on quantitative research which is, consequently, dependent on survey data to observe relational correlations. Particularly, a deeper and richer understanding of factors that alter student and teacher user behavior may be facilitated by future research.

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