

Article

## Modeling Factors with Influence on Sustainable University Management

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**Abstract:** The main objective of this paper is to present the factors with influence on the sustainable university management and the relationships between them. In the scientific approach we begin from a graphical model, according to which the extracurricular activities together with internal environmental factors influence students’ involvement in such activities, the university attractiveness, their academic performance and their integration into the socially-economic and natural environment (components related with sustainable development). The model emphasizes that individual performances, related to students’ participation in extracurricular activities, have a positive influence on the sustainability of university management. The results of the study have shown that the university sustainability may be influenced by a number of factors, such as students’ performance, students’ involvement in extracurricular activities or university’s attractiveness and can in turn influence implicitly also the sustainability of university management. The originality of the paper consists in the relationships study using the modeling method in general and informatics tools of modeling in particular, as well as through graphical visualization of some influences, on the sustainability university management.

**Keywords:** extracurricular activities; influence factors; modeling; sustainability; university management

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## **1. Introduction**

One of the most important objectives of the university management is to enhance the performance of human resources, becoming thus “the most important production factors”, since human capital is considered the most valuable resource of any organization.

In order to meet the needs of the present generation, while simultaneously considering the requests of future generations, we must take into account the constraint of costs and resource consumption, while maintaining a high quality of services. This aspect is conditioned by a performing and sustainable management that has to rely on efficiency and effectiveness. [1] Sustainability represents the key element in order to satisfy human necessities and to carry out human aims. It should fulfill the needs of the present generation without affecting the capability of upcoming generations [2].

Jean Mayer, president of Tufts University in the U.S., advanced in 1990 an important attempt to define the term “sustainable university”, through the Taillores Declaration. He called together 22 leading universities in Talloires, France, where they expressed their thoughts concerning the state of the world and where they developed a document in order to state out the key actions that universities need to take into account in order to become sustainable. They pre-defined the university’s role as follows: “Universities educate most individuals responsible for developing and organizing social institutions. For this reason universities have huge responsibility to raise awareness, knowledge, develop technologies and tools needed to create an environmentally sustainable future” [3].

Taking into consideration the chapter 36 of Agenda 21, UNESCO, on education towards a sustainable development, public awareness and training, four general goals have been identified. The first goals focus on promoting and improving the quality of education, by concentrating on lifelong acquisition of knowledge, abilities and values required by individuals in order to improve their quality of life. The reorientation of the curricula represents another objective. The education from pre-school to university must be redesigned to be a mean of knowledge, thought models and values to build a sustainable world. The public awareness on the concept of sustainable development have to be improved by developing active and responsible citizens. Another goal is represented by training for employment, through vocational training programs and developing specific skills of the students in order to meet the labor market requirements, promoting adaptability and flexibility, facilitating the transition to a more sustainable world [4].

Education for sustainability enables a change in sustainability thinking throughout the education segment taking into consideration the curriculum but also the governance of the institutions. Providing information, raising responsiveness, building individual and organizational motivation and capability to innovative solutions are key aspects when it comes to education for sustainability [5].

The Higher Education Institutions have the task of preparing graduates for the labor market, where they will be expected to apply their skills and knowledge. These skills, which are priority both for the employers and the Higher Education Institutions, will have a direct role on both the learning experiences’ content and how they are exposed to students. In the development of the curriculum specific aspects have to be taken into account, such as the role of values, or the role of the learner with the purpose of supporting the aims of a sustainable education [6].

The curricula that is highlighted through the education for sustainability is based on a systemic, complete and transdisciplinary method addressing knowledge, abilities, and attitudinal progress [7].

The education for sustainability requires new techniques of teaching and learning for both students and professors [8].

The sustainable university management is defined as a system or a process that leads to a high quality of life, by creating an animated campus economy, by protecting the environment and sustaining natural resources. A sustainable university is the one that offers sustainable programs based on the university organization's commitment to social, environmental and economic strength, or triple bottom line [9]. The sustainable development represents nowadays the biggest challenge for universities. [10] Higher Education is considered to be one of the sectors where implementing sustainability is most difficult [11].

The triple bottom line represents "an addition of social and environmental values to the traditional economic measures of a corporation or an organization's success" [12]. The triple bottom line of an organization, as suggested by the conceptualization is based on three main pillars, the profit and loss account, the people account and the organization's planet account. The main aspects of the triple bottom line represent the three Ps: profit, people and planet, aiming to measure the performance of an organization from the financial, social and environmental point of view over a period of time [13].

All institutions or companies pursue to generate value with limited resources. An organization can become economically sustainable by readjusting its strategies in order to become socially and ecologically sustainable [14].

To become sustainable for its students and for their life experience, the allocation of universities' resources has to be performed strategically. In other words, the resources have to be allocated in an intelligent manner if they are to sustain education in the long run. Not least important, constructing and promoting a culture of sustainability in universities contributes to the education of new generations of graduates who ultimately become the promoters of the sustainable development in society [15].

The university sustainability is influenced by several factors, such as management, teaching, human resources, research, community engagement, partnerships or curricula, but also by its social, economic or natural commitment. The transformation of a university in a sustainable one requires taking into consideration various actions. The university management reinforces sustainability values. In order to be internationally known through excellence, the university has to invest in teaching and research, as well as to apply environmentally practice in order to reduce costs and to decrease the effect on the environment. It has to ensure that its students and human resources accomplish excellence during their academic path. In this manner, the needs of local communities are able to be satisfied, by developing students for their post-graduation trajectory, providing them with a qualitative academic experience. In order to achieve international excellence, the community engagement is also very important, by forming connections and developing partnerships that can lead to a strong, environmentally sustainable society that will respond to the community's needs [1].

In order to create the values system through which humans could correlate their existence and to find means to protect humanity it is indicated that sustainability to be implemented primarily in education [16]. The education for sustainability marks the shift towards a different learning paradigm based on flexibility, openness, innovation and engagement in science and politics. These aspects explain also why it is both significant and also challenging [17]. With a background where the university sustainability is influenced among other factors by teaching, curricula or community involvement, the transition to a sustainable university requires changes made in the curriculum with

the purpose of developing particular skills and abilities to students required in their life experience, aspects that could influence the triple bottom line of a university. Another influencing factor consists in the extracurricular activities of the universities, by developing new skills and abilities when it comes to social and civic aspects, community, environmental involvement or economic and business related capabilities. These aspects could have a positive influence on the university's triple bottom line, through an addition of social and environmental values. Professors have to create an appropriate environment for developing relationships with the academic environment and society, in order to develop a sustainable human society [16]. Analyzing these facts, we can identify that the extracurricular activities seem to influence the sustainability of a university, an aspect that could have a great impact both on the students' performance and the universities' attractiveness, influence which will be worth studying this topic.

In order to become sustainable, the educational system together with the universities have to be approached from three perspectives, socio-cultural, environmental and economic dimension. This can be achieved through a technological and vocational training, through acquisition of competences and specific skills, such as team work, responsibility, honesty, integrity, adaptability, creativity, critical thinking, or capacity to manage conflicts. An education about and for the environment has to be developed, by focusing on environmental quality, conservation, protection and education for recycling or re-use of resources. The socio-cultural dimension is concentrated on intercultural education, rights, gender equity, peace, education for leisure, free expression of opinion or cultural diversity [18].

In order to achieve social, economic and environmental sustainability, universities have to promote awareness, engagement, intercultural education, education for leisure, integrity, good governance, responsibility, critical thinking, ethics or conservation and protection of the environment, but also other skills that could help graduates to integrate in the labor market. This can be obtained through curricular activities and also through extracurricular ones [19].

Conducive to developing students' values and abilities, universities need to develop study programs, curricula and also extracurricular activities, academic and campus life, aiming to bring contribution to the sustainable development of the entire society and the protection of future generations. Sustainability has to closely rely on planning, facilities, activities, investments, student life, *etc.*: aspects that could also be related to the curricula [20].

Extracurricular activities are considered to be important in the development of an individual offering the opportunity to develop new skills and form new social relations. The main objectives of extracurricular activities focus on student, school and community level. Extracurricular activities improve the interaction with other students, leading to increased academic results and growth and thus to increasing university performance management. A group of friends proves to be very important in the academic and personal development of a student. The student is positively influenced in its emotional, intellectual, social and civic plan within his interpersonal development. Students develop communication skills, team spirit, organizational skills, leadership skills, time management skills, civic and social skills, and can understand the importance of the environment and its conservation and therefore understand the importance of sustainability. Voluntary activities relate to engaging students in various community service activities. They can be of various types, starting from medical and social activities, going to environmental protection, or protection activities and animal care. Academic,

professional and career guidance organizations bring students together in order to discuss topics of common interest areas [21].

Students' community development proves to be very important in order to form students, to increase their academic results and to develop their study motivation and thus increase the sustainability of university management and the integration of students in the academic environment.

For ensuring the sustainability of university management, it is indicated to pay particular attention to extracurricular activities' management, in connection with performance management as a principle that has to be respected in the act of management, namely environmental management. These need to be kept, in close liaison with internal and external factors influencing the system, education, research and innovation management, as key components of the university's activity and not least, its project management, as an implementation methodology of extracurricular activities and more. A clear connection between these areas is being observed, all of them having an important role in carrying out the management functions in universities, in achieving objectives with an efficient use of resources, with a lasting, sustainable impact, thus ensuring enhanced performance of extracurricular activities' management with a beneficial impact on the performance and sustainability of university management.

The main objective of this paper is to present the factors which are influencing the sustainable university management and the relationships between them. Based on a model of university management it is shown that extracurricular activities could have an influence on a sustainable university management. Through the methodology of modeling, relations and behaviors presented in the created model are validated.

As hypotheses of this study we can distinguish the following:

- The acquisition of students' specific skills influences the sustainability of a university;
- Time management influences among other factors the involvement in extracurricular activities;
- The students' implication in extracurricular activities seems to influence the sustainability of a university.

The first part of the paper presents the epistemological approach and the conceptual modeling elements, followed by the conceptual scheme underlying the sustainable university management model. Further on, the behavior, belonging to some extracurricular influence factors of the model is presented by using the Weka program, followed by the conclusions. Data was gathered through the questionnaire method. 306 students from universities of Sibiu, Timișoara, Bucharest and Cluj have been questioned.

The Weka program can put a relationship in execution, in order to represent the behavior of a factor at a given time. The data can be pre-processed, classified, associated, visualized and makes it possible to be formed as clusters and regressions. The representation of these relationships is enhanced through tables, charts, clusters or diagrams [22].

## **2. Conceptual Elements of Modeling**

Modeling sets out to simplify objects or concepts, to stimulate the generation of concepts and how to learn and improve the visualization of phenomena [23–28]. The modeling process involves the transfer of certain aspects of the source model to the target model [29]. With the model's help, analogical

characteristics and transformations of a more complex system can be studied and by modeling, an object or a system can be schematically reproduced, using an analogical or a similar system.

This approach aims to achieve different purposes: the proper transfer of information, the ability to involve stakeholders in the decision-making processes [30], including very complex processes [29], to the simplification of the conflicts on economic or environmental items [31].

By means of abstraction, dates and processing methods regarding specific problems are grouped, according to the respective assembly's common property of elements.

Overall, the knowledge gained, both practical and theoretical, interacts on the level of thought processing with the external environment, thinking that is based on conceptualization, through the existence of objects and the existing relations between them [32].

The attribute is a characteristic or property of an object, which can change depending on the subject or moment and the attribute value signifies the quantitative value of it [33].

The notion of object is very comprehensive, representing in fact any detail about something. The task is a basic unit of execution within a system, and an activity means more tasks that lead to a common result. A variable signifies a quantifiable outcome of a task result. It does not have a fixed, determined value and it is capable to take any value depending on the task [34].

An instance means a group of attributes that can be valued at a time. A relationship means a group of instances (collected by questionnaire), which determine a factor, meaning a group of variables with a common behavior.

Weka software has an interface through which the algorithms can be used to preformatting data sets [35].

The Weka software is based on machine learning algorithms for certain tasks of Data Mining. Through Data Mining, large data sets can be analyzed, information or knowledge can be extracted, in order to find new relations and summarize them, so they can be more understandable and useful [32]. Data Mining signifies an extraction of useful information, previously unknown, imaginable, important and hidden in large volumes of data. As an example, the evolution of the environmental monitoring towards low cost intensive networks of sensors is going to generate huge amounts of data that can be valorized only through the data mining approach [36]. By means of software techniques patterns and consistency of certain data sets are identified [37].

### **3. Methodology**

This research makes usage of the methodology of bibliographical study by means of various secondary sources and the modeling technique.

The secondary research is characterized by secondary data, which facilitates the incorporation into the problem and already exists as information material. [38] By means of bibliographical study, several studies, books or scientifically articles have been analyzed.

The data is gathered by means of the questionnaire method and analyzed through the modeling technique. The collected data underlie the created model.

The strategy to achieve a model is the one capturing through abstraction some general educational characteristics of the university education system. The multiplicity and variability of these educational features involves the establishment of a model able to suggest some new meanings to the system of

higher education. The processing of the validation data of the proposed model by means of the Weka tool provides a conclusive predictive and decisional representation.

The representation of the results processed for the model validation are more accurately nuanced using the Weka package because it has several classification algorithms classes, that are very useful to construct decision rules within the created model. Due to the data processing by means of Weka, a number of results for specific predictions required in the operationalization of the modeled system can be created. The data gathered by means of questionnaires is nominal and the Weka package ensures their processing more efficiently than other packages of statistical processing.

The modeling method was chosen in this research because of its possibility to extract information or knowledge and to find new relations between various factors that can be simplified in order to be more easily represented and better understood. The use of the modeling method involves also a high level of originality which is a desired purpose within this research.

The Weka software was chosen because it contains an assembly of visualization tools and algorithms for analyzing and modeling data. It is also very user friendly due to its graphical user interfaces and functionality, it is an open source and has a free availability. Weka provides many different algorithms for machine learning and data mining [39].

#### **4. Conceptual Scheme of the Model of Sustainable University Management**

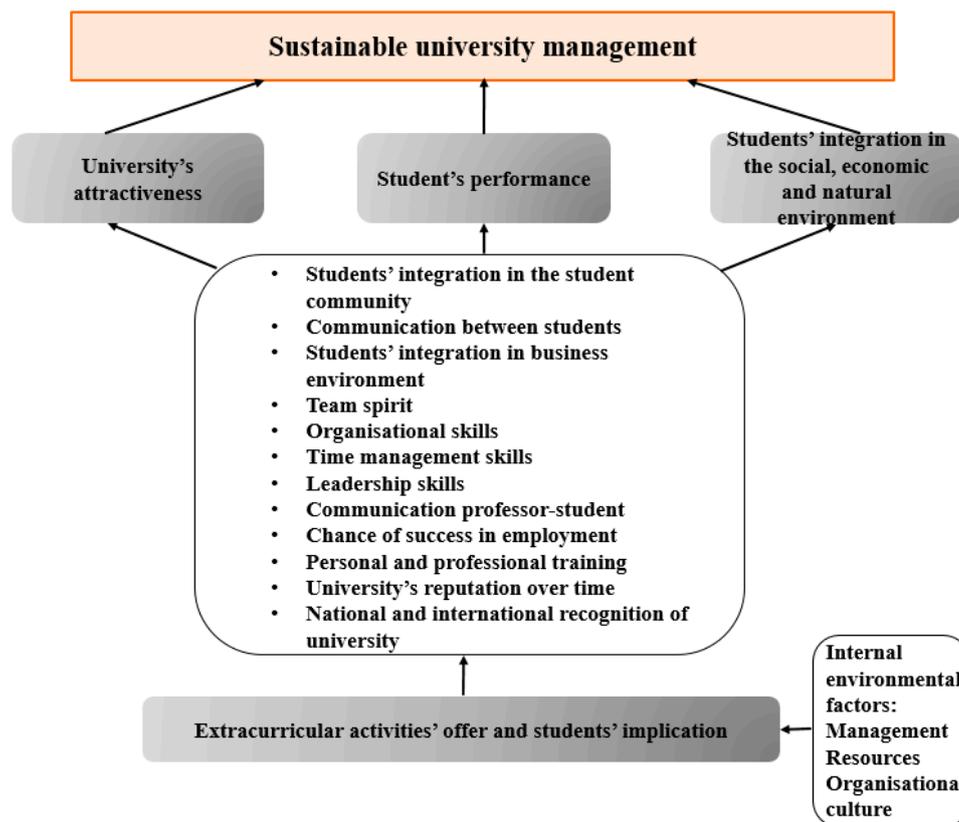
Starting from the various bibliographical sources that have been analyzed, universities have huge responsibility to raise awareness, knowledge, develop different technologies and tools required for creating a sustainable future [3]. The university sustainability has specific goals, such as concentrating on lifelong acquisition of knowledge, abilities, training for employment, through vocational training programs or developing specific skills of the students facilitating their integration into the labor market [4]. Developing specific skills of the students, such as team work, responsibility, adaptability, creativity, awareness, intercultural thinking or education for leisure, gender equity or peace, influence the sustainability of a university. This aspect also highlights the hypothesis that the acquisition of specific skills influences the sustainability of a university [18,19]. The university sustainability is influenced by management, teaching, human resources, research, community engagement, partnerships or curricula. In order to become a sustainable university, among others, some changes in the curriculum for the purpose of developing specific skills and abilities for students are required [1,16]. This can be obtained also through students' involvement in extracurricular activities that can lead to the development of new skills and abilities, when it comes to social, community oriented, civic or environmental implication. Extracurricular activities can influence community engagement, partnerships, research or management, but also the university's attractiveness and reputation, the student's motivation and performance, the student's integration in the social, economic and natural environment, the student's satisfaction, developing students' skills, such as communication skills, team spirit, organizational skills, awareness, responsibility, civic and social skills. All these aspects would also influence the university's sustainability and would show the logical line of the research [21,40]. This approach is represented in the own created model and has to be analyzed and validated through the modeling technique by means of Weka.

Based on the conducted research and among other factors, the indirect influence of the university's attractiveness, student's performance and students' integration in the economic, social and natural environment, on a sustainable university management can be observed. They depend on the extracurricular activities by their diversity, attractiveness and promotion and implicitly on student's involvement in such activities. Involving students in extracurricular activities facilitates their integration in the student community, develops communication between students, the integration of students in business, students' social and environmentally abilities, students' team spirit, organizational skills, time management, leadership skills, communication between professor and student, contributes to personal and professional formation and increases chances for employment that can lead to an economic growth [41].

Extracurricular activities, such as language courses, seminars, workshops, career guidance events, cultural and sports activities, influence the attractiveness of the university by increasing the university's reputation over time and its national and international recognition, issues that can influence among the performance of a university also its sustainability [42].

In order to represent these aspects, an own model has been created. This model will be studied through the technique of modeling, in order to establish certain relationships, influences, behaviors, decisions and to validate the relations. The model is based on bibliographical study but also on the data gathered from students by means of a questionnaire. As an analysis model, some influences and decision rules of certain factors will be presented, that may later be extended throughout the model. Due to the modeling technique only certain relationships are analyzed in order to explain the way of analyzing. This aspect provides the basis for future researches.

The model is focused on a research based on the questionnaire method, carried out in the period June-September 2014 (Figure 1). 306 students from universities of Sibiu, Timișoara, Bucharest and Cluj have been questioned. The students were chosen randomly from all university years, specializations or study programs and are distributed equally according to their university of origin and gender. The questionnaire is divided into six parts: students' university performance and its influence factors, students' implication in extracurricular activities, students' satisfaction regarding their university and the benefits that they expect from extracurricular activities, extracurricular activities offered in the field of sports, extracurricular activities offered in the field of vocational training, extracurricular activities offered in the cultural and recreational field and identification data. The created model is basically focused on the first part and third part of the questionnaire, namely students' university performance and its influence factors and students' satisfaction regarding their university and the benefits that they expect from extracurricular activities. These represent also the basis of the factors' decomposition of the model. The influence of extracurricular activities on developing specific skills of students, such as time management, team spirit, organizational skills, awareness, communication skills, responsibility and on the attractiveness of a university are shown in different studies developed by the author published in different internationally known databases [43–45].



**Figure 1.** Model of sustainable university management.

## 5. Behavior of Extracurricular Influence Factors from the Model

Components of the model have associated factors that influence the functioning of the university management system. The present analysis focuses on the factors that influence students' academic performance, their involvement in extracurricular activities and the university's attractiveness. A detailed breakdown of the components in factors is shown in the following figures. The decomposition of the factors and the number of factors depend on the aspects that were questioned by means of a questionnaire and are based on various bibliographical references.

Each factor consists of several numeric variables that describe the factor's behavioral rank. Numeric values are captured by the questionnaire released to students. Each questionnaire represents an instance of the factors' behavior from the model at a certain time. The exploration of the gathered sdata is accomplished by using Weka execution engine, through algorithms implemented by means of Artificial Intelligence.

Students' academic performance is influenced by many factors (Table 1), such as the integration of students, their management skills, communication, time management, motivational and psychological states and teaching facilities [46].

Through the affiliation of students we are able to understand their integration in student and business environment and their involvement in student organizations. Students' managerial skills refer to organizational and leadership skills, time management and team spirit. Communication refers to communication between students, between professor and student and team spirit. Time allocated to extracurricular activities, career guidance activities and sports depends on work, busy schedule at the

university and living conditions or financial possibilities. Psychological and motivational states include concentration capacity, tiredness, study interest and courses atmosphere. Educational facilities refer to the professors' way of teaching, the balance between theory and practice and other facilities and services offered by the university.

**Table 1.** Structural decomposition of the component “university performance of students”.

Managerial Model Component	Factor	Variable
1 Influence on students' performance	11 Integration	111 Students' integration in the community of students
		112 Students' integration in business environment
		113 Activities in students organizations
	12 Managerial skills	121 Organizational skills
		122 Time management
		123 Leadership skills
		124 Team spirit
	13 Communication	131 Communication professor-student
		132 Team spirit
		133 Communication between students
	14 Time management—extracurricular activities	141 Career orientation
		142 Work
		143 Busy schedule at the university
		144 Living conditions
		145 Participation to sports activities
	15 Psychological and motivational states	151 Ability to concentrate
152 Tiredness		
153 Study interest		
154 Courses atmosphere		
16 Educational Facilities	161 Teaching manner of the professors	
	162 Balance between theory and practice	
	163 Other facilities at the university	

Students' involvement in extracurricular activities is influenced by the integration of students in the student and business community, their managerial skills, communication skills and their psychological and motivational states (Table 2) [47].

The university's attractiveness is influenced by the teaching offer, the offered language courses, the study offer, the balance between theory and practice, the quality of teaching, the admission requirements and also by the additional offers, respectively seminars, workshops, career guidance activities, experience exchanges abroad, national and international recognition of the university and the university's reputation, by the recreational offer, namely the possibility to spend leisure time, cultural and sports activities offer and the reputation of the university which in turn depends on all the variables mentioned above (Table 3) [48].

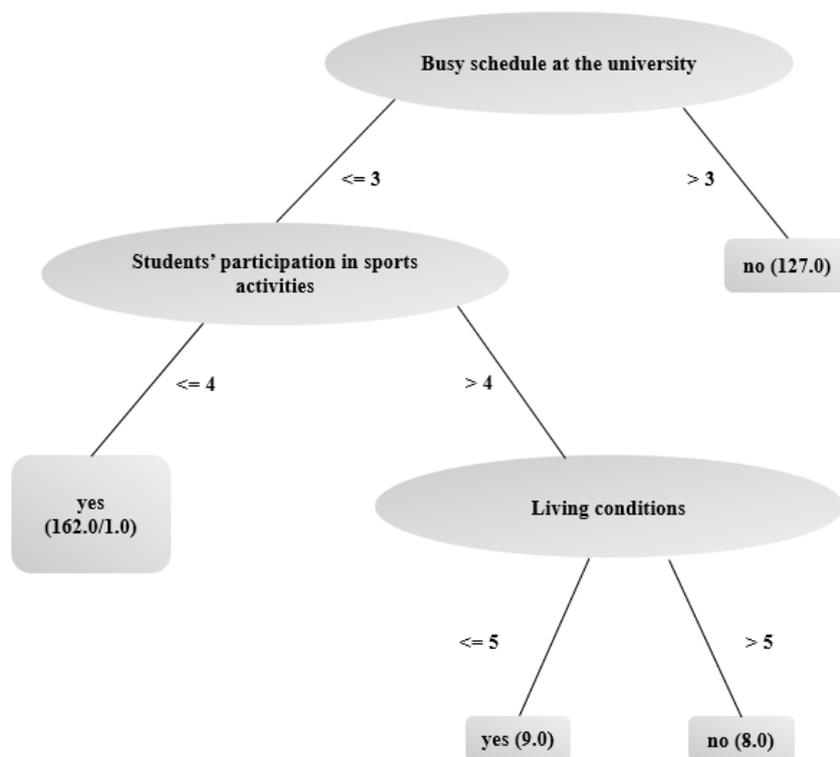
**Table 2.** Structural decomposition of the component “Students’ implication in extracurricular activities”.

<b>Managerial Model Component</b>	<b>Factor</b>	<b>Variable</b>
2 Extracurricular implication	21 Integration	211 Students’ integration in the community of students
		212 Students’ integration in business environment
	22 Managerial skills	221 Organizational skills
		222 Time management
		223 Leadership skills
		224 Team spirit
	23 Communication	231 Communication professor-student
		232 Team spirit
		233 Communication between students
	24 Psychological and motivational states	241 Tonus
		242 Success in employment
		243 Personal and professional training

**Table 3.** Structural decomposition of the component “Influence—university’s attractiveness”.

<b>Managerial Model Component</b>	<b>Factor</b>	<b>Variable</b>
3 Influence university’s attractiveness	31 Teaching offer	311 Language courses offer
		312 Study offer
		313 Balance between theory and practice
		314 Teaching quality
		315 Admission requirements
	32 Additional offer	321 Seminars, workshops, career orientation events
		322 Experience exchanges abroad
		323 National and international recognition of university
		324 University’s reputation
	33 Recreational offer	331 Opportunities to spend leisure time
		332 Cultural activities offer
		333 Sports activities offer
	34 University’s reputation	341 Language courses offer
		342 Seminars, workshops, career orientation events
		343 Opportunities to spend leisure time
		344 Cultural activities offer
345 Sports activities offer		
346 Study offer		
347 Balance between theory and practice		
348 Experience exchanges abroad		
349 Teaching quality		
350 National and international recognition of university		
351 Admission requirements		

Input relationships for the Weka software were realized in the purpose of the analysis, corresponding to each model factor and based on the data gathered by means of a questionnaire. In order to obtain results concerning the behavior of factors from the model, we have processed the appropriate relationship based on some algorithms of the Weka execution engine. In Figure 2 one result of the execution of J48 classification algorithm (decision tree algorithm class) is represented.



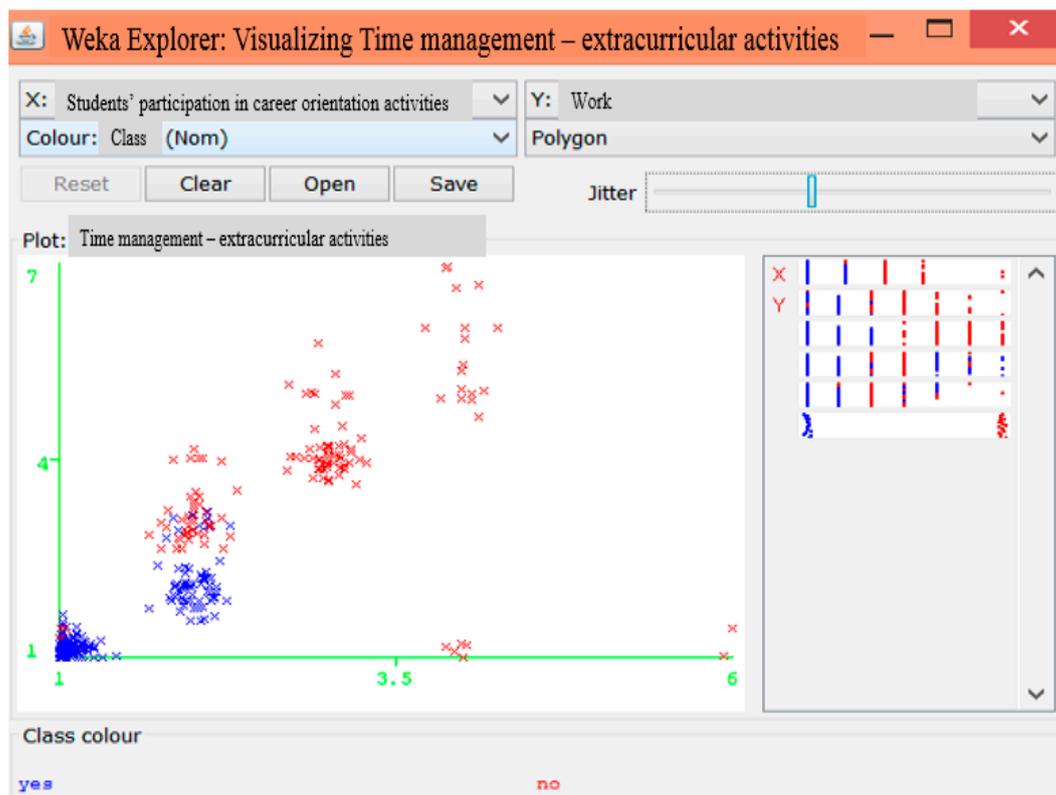
**Figure 2.** Decision tree for the factor “Time management—extracurricular activities”.

The result shown in the decision tree from Figure 2 suggests the fact that the way of behavior of the factor “Time Management—extracurricular activities” leads to some optimal decision rules, decisions that can positively influence university performance of students. These results also validate the hypothesis that time management influences the implication in extracurricular activities. The values shown in the graphic represent the results scale, where 1 stays for very important and 5 for not important. From the decision tree, it appears therefore that the optimal rule is the one that starts from a “busy schedule at the university” over the weighted average of instances (values less or equal than 3, with a high influence on university performance), and continues with “students’ participation in sports activities” above average (values less or equal than 4). The best-classified results (162 instances, a majority of possibilities) are obtained on this branch. 52.94% of the respondents considered that the above-mentioned factors are interdependent and can form an optimal decision rule.

Respondents who consider the influence of the busy schedule at the university on the university performance as high (responses scale is from 1 to 7, 1 represents the highest influence) also consider the influence of participation in sports activities on university performance as strong. High influence of the busy schedule at the university on the university performance influences students’ participation in sports activities, which are important aspects of time management. Thus, we conclude that the busy

schedule at the university can cause a decrease in students' involvement in sports activities, issues that depend on time management in terms of extracurricular activities.

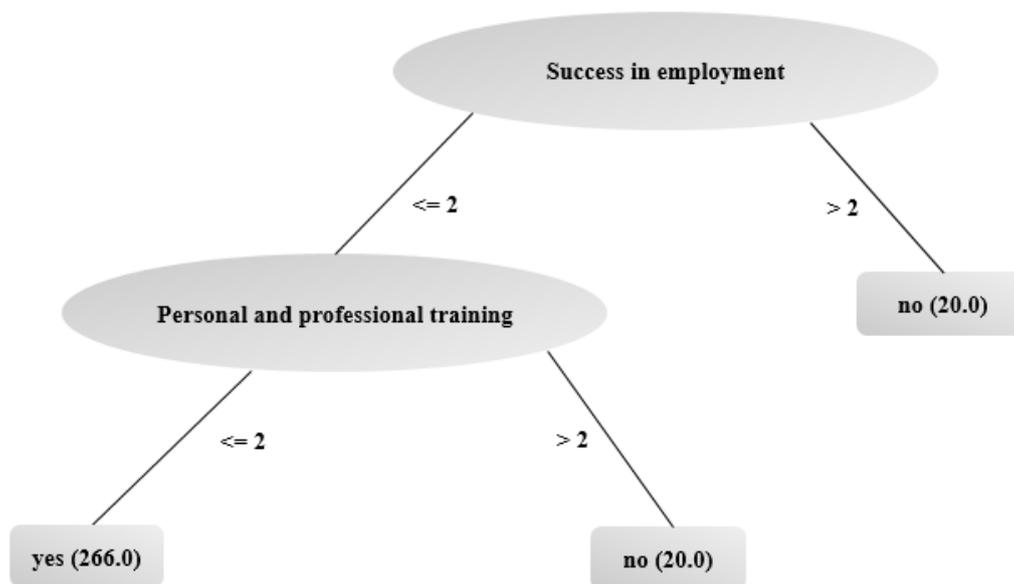
Another result of processing data through Cobweb clustering algorithm is shown in Figure 3.



**Figure 3.** Graphic with clusters of instances for the factor “Time management—extracurricular activities”.

Figure 3 represents a graph of the distribution of instances on clusters, as a result of execution of the relationship corresponding to the factor “Time management—extracurricular activities”, taking into account the participation in career guidance activities and work. The blue color in Figure 3 represents the instances of positive behavior of the factor (yes), and red represents agglomerations of instances less favorable to time regarding extracurricular activities (no). The blue points signify a positive influence of time management, in this case work, and extracurricular activities, focused on career orientation activities. The red points represent a negative influence of the same factors. Based on the questionnaire responses, positive instances are considered those instances whose average calculated value is below the average calculated for all instances deriving from the relationship. Instances that do not respect this rule are considered negative instances. In Figure 3 we can observe a clustering of these instances that represents groups of instances, that are favorable to time management of extracurricular activities (blue points) and unfavorable groups. Thus, an interdependent relationship between work and involvement in career guidance influencing time management of extracurricular activities, can be observed. The represented cluster shows that time allocated to work can influence involvement in career guidance activities. Also, the involvement in career guidance activities can influence the experience and skills gained at the work place.

Another result referring to the influence of the factor regarding psychological and motivational states on students' involvement in extracurricular activities is presented using the algorithm of execution from the decision trees class and is shown in Figure 4.

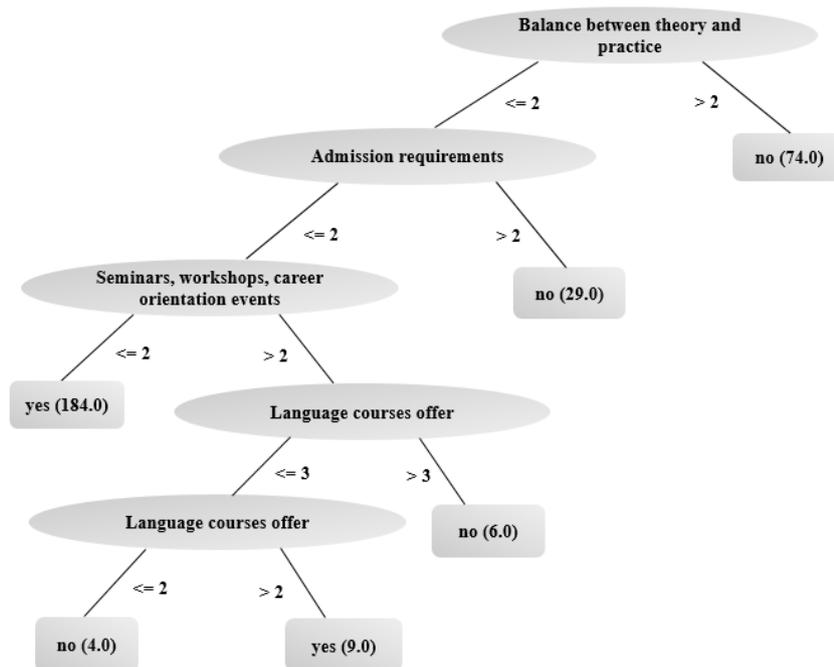


**Figure 4.** Decision tree for the factor “Psychological and motivational states”.

Figure 4 shows the behavior of the factor “psychological and motivational states” which may derive some rules of decision. Thus, to determine the optimal decision, it starts from the success in employment, with a very high impact on students' involvement in extracurricular activities (values less or equal than 2), which also strongly influence personal and professional training. In this branch of decision, 86.92% of the respondents, namely 266 instances considered these factors to be interdependent, and is also the branch where we encountered the best-classified results.

The decision tree shown in Figure 5 presents the university's reputation as a factor of influence on the attractiveness of the university.

This figure presents that the optimal decision as the one that starts from a balance between theory and practice, continues with the admission requirements and with seminars, workshops and career orientation events, issues that have a positive influence on university's reputation. Exactly 60.13% of the respondents state that these factors influence the university's reputation. The best-classified results, respectively 184 instances, are obtained within this branch. Thus, respondents who consider the influence of the balance between theory and practice on the attractiveness of the university as high, also consider the influence of the admissions requirements and seminars, workshops and career orientation events as a strong influence.



**Figure 5.** Decision tree for the factor “University’s reputation”.

## 6. Conclusions

The transition to a sustainable university requires changes in the curriculum with the purpose of developing particular competences for the students. This would influence the teaching or community involvement, the students’ performance, the development of students’ skills, factors that influence among others the university’s sustainability and attractiveness. These aspects represent the input components of our model and are decomposed into factors and variables. The students’ involvement in extracurricular activities within the universities develops new skills in the social, civic, environmental, economic and business field or in the community [16]. Starting from theory, developing students’ specific skills, such as responsibility, time management, awareness, team spirit, community engagement, management skills influences the sustainability of a university, aspect that also validates the hypothesis of the research.

The influence of extracurricular activities on the student’s integration in the social, economic and natural environment, the student’s satisfaction, the university’s attractiveness and reputation, the student’s motivation and performance and indirectly also the university sustainability are represented through an own created model. For a better analysis and interpretation, this was divided into factors [40].

The processing results of the relations corresponding the model factors have helped us to achieve a series of analyses and behavioral interpretations of factors influencing sustainable university management, which may serve as examples for future analyses and also outline the main objective of the paper. Through the representations obtained by means of the execution engine Weka, dependence correlations between different factors of the model can be obtained.

The community’s involvement, teaching or curricula, factors that influence the university’s sustainability may be influenced by a number of aspects, such as time management and involvement in

extracurricular activities, but also by the university's performance [16]. Thus, it can be concluded that the high influence on the university performance of the busy schedule at the university also influence students' participation in sports activities, issues that influence time management in terms of extracurricular activities, but also university performance of the student and implicitly sustainability of university management.

Another influence factor on time management is represented by the time allocated to work, which can also affect students' involvement in career guidance activities. As a result of the modeling technique influence relations between students' performance, time management and involvement in extracurricular activities are validated. Due to the data analysis, the hypothesis that time management influences the involvement in extracurricular activities is also validated.

The involvement in extracurricular activities is influenced, among other factors, by psychological and motivational states. These states may depend on the success in employment and on personal and professional training.

The reputation of a university plays an important role regarding its attractiveness. This is influenced primarily by the balance between theory and practice, admission requirements and by seminars, workshops and career guidance events.

By applying the modeling method, influence relations between the involvement in extracurricular activities, psychological and motivational states and the students' integration in the social, economic and natural environment were validated. Also influence relations between the reputation and attractiveness of a university could be determined, aspects that are influenced by the curricula and extracurricular activities.

In order to increase the university sustainability it is recommended to improve the curricula, the community involvement, the teaching methods, by increasing the involvement in extracurricular activities, the attractiveness of the university, but also the performance of the students and to develop particular students' skills that will help graduates enter the labor market.

Considering the analyzed bibliographical studies and the data analysis, extracurricular activities play a certain role in the development of a sustainable university as a result of the specific skills that students acquire due to their involvement in such activities. It is also determined that the teaching methods, the curricula, the students' university performance and the university's attractiveness influence the sustainability of a university and can in turn be also influenced by extracurricular activities. The hypothesis that extracurricular activities influence the sustainability of a university is partially validated through indirectly influences, relation that is recommended to be studied in future researches. The present research analyses and validates only certain aspects of the developed university management model. In order to improve the performance and sustainability of university management and to validate the entire model, further studies of the relationships, influences and decision rules using the modeling tool are recommended to be conducted in future research.

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## Author Contributions

The two authors contributed equally to this work. All authors have read and approved the manuscript.

## Conflicts of Interest

The authors declare no conflicts of interest.

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