The Multi-Criteria Impact of a Multimedia Mobile Application

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The impact analysis of a multimedia mobile application requires a multi-criteria process of breaking down the complex quality attributes implicated into an educational process conducted with the support offered by the newest mobile device hardware and software capabilities. A separation between attributes of quality is necessary to be done and, consequently, a model of interaction between educational forces should be proposed. From our theoretical model we emphasized a possible correlation between the metric indicator named effectiveness of a multimedia mobile application and a classification order, amongst a series of mobile application, generated by a multi-criterion making decisions mathematical method. We correlated the indicator of a general academic performance, previously studied and published, with the effectiveness of a multimedia mobile application and a multi-criteria process of making decisions considering our main objective as being orientated to the goal of finding arguments for a reasonable explanation concerning the impact generated by an optimum utilization of a multimedia mobile application. Our contribution is based on a theoretical model which emphasizing similarities between the teacher's role and the mobile technology with multimedia support on behalf regarding a possible path toward a higher academic performance resulted from such a power transition.

Keywords: *Mobile Applications, Mobile Learning, Android, Impact on Academic Performance*
DOI: 10.24818/issn14531305/25.2.2021.02

1 Introduction

From literature review we noticed an increasing level of importance allocated to the quality attributes as being direct responsible amongst educational consequences like academic performance and effectiveness of a multimedia mobile application. These consequences are linked together to our findings which will be correlated toward a specific point of view regarding the educational impact generated by the utilization of a multimedia mobile application. From authors like Büyüközkan [1] and Başaran [2] we found that a classification order between multi-criteria attributes could be realized with specialized mathematical method like TOPSIS. This acronym TOPSIS is an abbreviation for the technique for order of preference by similarity to ideal solution and is generally documented by Wikipedia [3] The quality attributes involved into our paper work are attached to the general category like connectivity, operating system, screen capabilities of mobile devices and specific attributes logically considered integrated into a complex package of multimedia mobile applications. We are eager to propose a method to separate the educational forces involved when a multimedia mobile application replace a traditional teacher activity in classroom. From this idealistic separation we are trying to explain the impact of such software upon learners. Searching through dedicated literature we reached tangible proves that a positive implication between academic performance and general characteristic allocated to the mobile hardware and software capabilities is possible. Mathematical tools involving linear regression and TOPSIS method were studied to be implemented in our paper work. This article is conducted considering the following statements. The first section is a mandatory foreword to this research in our desire to explain the general objectives. The second section is correlated with a searching task orientated toward specific scientific milestones anchored in our previously objectives declared. The third section gathers our methodology to acquire precise facts using a dedicated laboratory experiment and a physical model involving complex interactions between attributes of quality. From this section we find a way to calculate the effectiveness of the impact generated when a multimedia mobile application interacts upon a collectivity of learners. The next section shows a case study about how a questionnaire could be used to gauge the correlation between effectiveness of a multimedia mobile application and a relationship with the classification order generated by a TOPSIS method. This article ends with conclusions and remarks about future intentions possible to study in the future.

2 Literature review

Evaluation throughout using tools for multi-criteria making decision, applied to fuzzy manifestation of different variables studied, where multimedia mobile software applications evolve, was a central preoccupation for a researcher Büyüközkan [1] who conclude that TOPSIS method could be used to eliminate ambiguity when a task, dedicated to select an optimum solution from a complex perspective, is mandatory. He studies a different hardware quality attributes like battery life, memory capacity, processor speed, camera specifications and few more to capture the most adequate mathematical solution toward a reasonable selection regarding a particular classification between different smart phones. From this paper work we remarked a group decision scaffold extended toward a specialized user who transfer their opinion into a centralized computation system.

Furthermore, an extended literature review regarding TOPSIS putting to practical use was inserted into paper work written by this author. A study dedicated to mobile software field analyzed with multi-criteria decision making was conceived by the author Başaran [2]. This author remarks an increasing effort to select a proper mobile application suitable in the direction of user’s needs. He builds a research plan to study with pedagogical criteria the most downloaded mobile application using another multi-criterion making decision method, known by the abbreviation ELECTRE. This acronym ELECTRE is an abbreviation for the elimination et choice translating reality and is documented by Wikipedia [4]. In his conclusion the decision graph was necessary to discern an optimum path toward an optimum mobile software solution.

A mix of mobile technology composed by internet browsers, platforms dedicated to social interactions, camera, mobile applications for just in time messaging, different tools integrated into mobile operating system to explore the file content were studied by the author Toperesu [5], and previously by the author Kuhlemeier [6], who build a classification about the impact scattered toward learners when educational activities took place synchronized with mobile applications. He used a positive and negative method of evaluation following a Likert scale with 7 points designated to understand the positive impact against the process of learning anywhere and anytime. When something beneficial like the fact about bringing personal device during learning activities inside a classroom space is discussed an emphasized argument was considered due to the possibility to acquire a non-convergent attention to the main educational subject proposed by the teacher. From this intention a catalog with the most encountered and difficult problems was filled with best results ever attained about problems like free connectivity with WiFi and the general display size of a mobile phone. From his questionnaires the researcher Toperesu [5] found a strong correlation with multiple regression that indicate a negative impact against learning activity only when video capabilities are used in a not monitored way.

An author Farrah [7] remarked important attitudes of the learners resulted in a positive feedback associated with an increasing outcome on academic performance when a learning environment is catalogued as being an enjoyable and pleasurable place suitable to make a connection between a teacher and a learner. This motivation was considered to be a hedonic one with a major impact against of a learning environment. Any reference pertaining to hedonism was considered to be pointed by the author Nawaz [8] who shows that a variable orientated toward such concept could be

validated by statistical computation. The researcher Venkatesh [9] observed multiple occurrence of an increasing motivational behavior when a learning activity is wrapped with an entertainment envelope and his paper work bring back into memory a spreading habit orientated to the repetitive tasks. The same observation was encountered when we studied another author Oulasvirta [10].
Previous considerations emphasize the major role of a hedonic motivation when we analyze top reason causes for a significant positive impact. The author Shonola [11] observed that a trend among learners is a desire to enrich personal curricula through activities like browsing different educational supplementary materials. This desire could be explained by the obvious habit to be mobile connected by all means. From a researcher Hashemi [12] we discovered that information accessibility in any place without keeping into account the educational space should be a cause for transversal curricula integration. The whole formats of different environments, previously considering, viewed as a different kernel could be running away from any control possible and the process of learning is connected ubiquitous as the theory of connectivism written by the author Siemens [13] settled. Between the academic performance and the level of the mobile device integration there is a connection revealed by the author Melchor [14] that inferred a conclusion from which we are extracted that any explored combination of educational methodologies generated a positive impact from the utilization of a mobile devices.
In a more detailed analysis the author Melchor [14] discovered that the mobile device, by his intrinsic characteristics, does not offer a confirmation for a more profound satisfaction of student's academic performance but, as a replacement, the awareness of a learner is moving toward a more responsible behaving concerning the process of learning. This implies, consequently, a more complex habit in how the mobile device is used. This author Melchor [14] studied the influence of different cloud services against the general score of the student's academic performance and from his conclusions there are no proves that indicate a correlation. Speaking about young learners the researcher Gonca [15] concluded that such lightness, to solve just in time different tasks, against a new mobile technology could be explained by the importance of exploring through Internet. This is a possible positive impact upon learning process when mobile devices are used. The same opinion has the author Druin [16] who implements a surname, known as I-children, for this unusual phenomenon scattered throughout young children. Another researcher Koroleva [17] concluded that a more conservative method of doing teaching activities has a negative effect toward a rapid implementation of the actual mobile device tools which acquired a reputation against classical ways of managing educational process. The author Montrieux [18] conducted a laboratory experiment with two groups of teachers and students about the classical way of doing teaching. From his experiment he emphasized a type of teachers who are orientated to be aligned with tradition regarding how to do a teaching process in classroom. The other type of teachers is a new breed where the learning process is centered between teacher and learners with the guidance of the mobile devices' applications and hardware capabilities.

3 Methodology

The effectiveness of a multimedia mobile application was emerged from the confrontation of a dual perspective composed from mobile hardware and software quality attributes as we presented in our previous paper work [19]. We weighted with coefficients the following facets regarding curricula integration, time coverage of active learning time and the level of multimedia components involved altogether in a mathematical formula proposed to evaluate the effectiveness of a multimedia mobile application.
Our research assumption is settled by the opinion that the impact of a multimedia mobile application is direct proportional with the effectiveness metric indicator previously calculated and could be in a special relationship pattern with the order established by a multi-

criterion making decisions mathematical model. It is known that the classification order generated by a TOPSIS multi-criteria making model establish a highest value for the solution founded at a lowest geometrically distance between those criteria. Our research question is the following: *What is the relationship between the classifications determined by the numerical values obtained from the multimedia mobile software effectiveness formula, previously proposed, and the order of a multimedia mobile applications obtained by using TOPSIS, a multi-criteria mathematical making decision*? There are 9 mobile hardware quality attributes and 7 software multimedia mobile quality that are intertwined to create a numerical level of the effectiveness of the impact generated by a multimedia mobile application. This virtual complex scaffold composed by a generic multiplex quality attributes around a potential user involved in an educational activity is represented in figure 1.

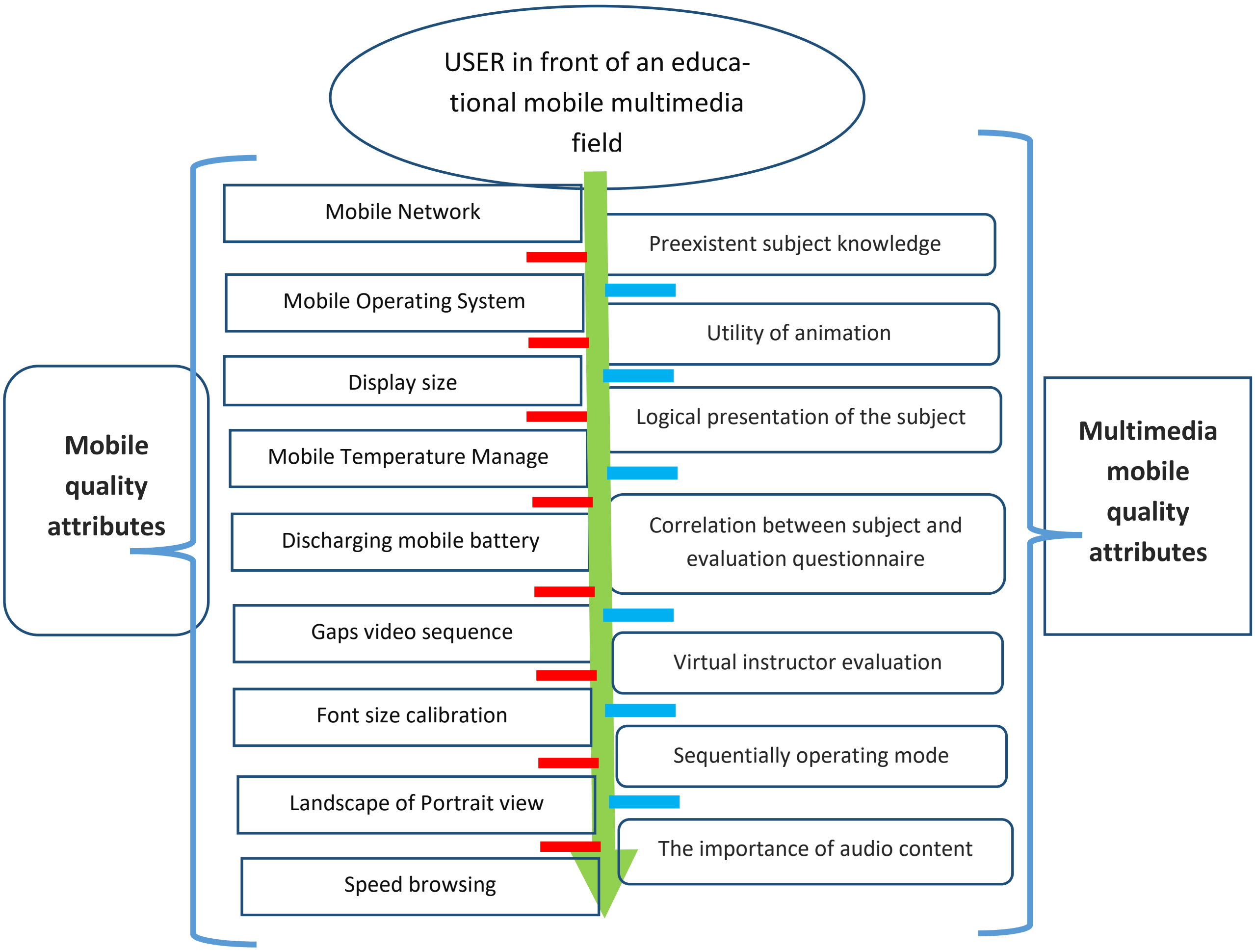

Fig. 1. The scaffold around a potential user in a multimedia mobile educational field

We are using four mobile software applications labeled from APP1 to APP4 bounded to the same curricula content about Firefox database management but with a decreasing ratio of multimedia components embedded into those mobile applications. The effectiveness of a multimedia mobile application toward a potential user, embedded into an educational mobile multimedia field, is calculated with a mathematical formula that calculated a resultant force determined by two forces allocated and orientated to the mobile hardware and multimedia mobile software application as we presented in figure 2. The theoretical model used to calculate the effectiveness of a multimedia mobile application impact begins with the observation that hardware mobile quality attributes could be derived from a teacher personality and, respectively, the software multimedia mobile application is possible to be synchronized with a teacher's method of doing pedagogical activity. The graphical representation of overlapping previous assumption is shown in figure 2. The hypothesis used in this paper work is based to the fact that as long as the pedagogical evaluation of the effectiveness starting from a teacher identity and his method of doing teaching activity is possible at any time then the same evaluation should be logically translated to the dual perspective consisted by a couple of mobile hardware and software quality attributes.

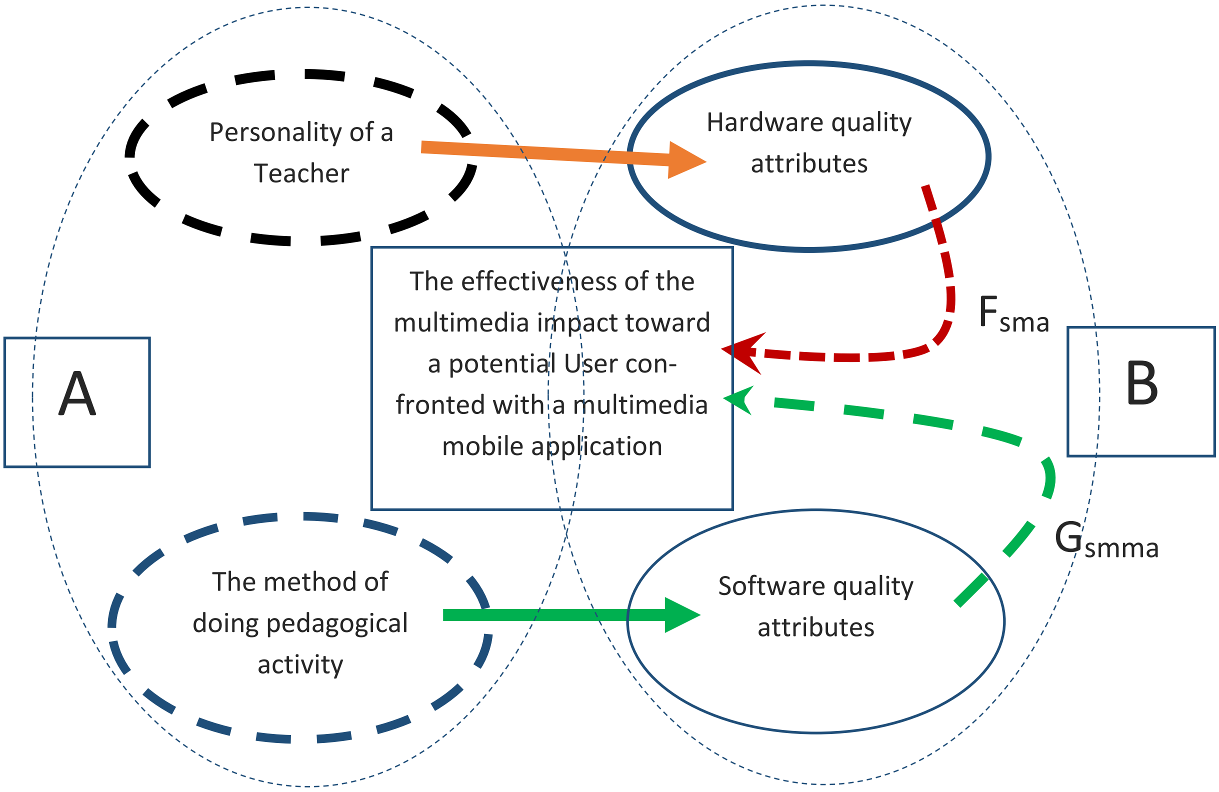

Figure 2. The overlapping assumption used to emulate numerical calculation regarding effectiveness of the impact of the multimedia mobile application toward a mobile's user

The zone A reflects a theoretically separation between those two sides represented by the personality of a teacher and his method of doing pedagogical activity and the same observation applied to the zone B. In a real world those quality attributes, represented in figure 2, are twined together and a resultant force should be calculated starting from a similar theoretical approach. In this paper work the effectiveness of the educational impact generated by the multimedia mobile application will be calculated with the formula 1 represented below.

$$E_{impact} = Q \times \frac{F_{sma} \times G_{smma}}{abs(F_{sma} - G_{smma})} \qquad (1)$$

where:

E_{impact}= the effectiveness of the educational impact using multimedia mobile application

F_{sma} = a force resulted by adding user's choices together about mobile hardware attributes used

G_{smma} = a force resulted by adding user's choices about multimedia mobile application

Q = the value of an educational mobile multimedia environmental factor created to evaluate the effectiveness of the learning impact using multimedia mobile application. The Q factor is a function being depended by three variables represented by curricula integration, time coverage allocated to the learning stage and the ratio of multimedia components embedded into those four mobile multimedia applications. The formula 2 shows the relationship between those variables.

$$Q = f(\,c_i, t_c, r_m) \quad (2)$$

where:
C_i = the curricula integration
T_c = the time coverage allocated to the learning stage
R_m = the ratio of the multimedia components embedded into mobile multimedia application
Q = the factor used to represent the educational environment generated by a multimedia mobile field. The mathematical formula to calculate the factor Q was presented with supplementary details in our previous paper work[19].
The method TOPSIS will be implementing starting with the observation that we have only four multimedia mobile alternatives from APP1 to APP4 and only 16 multi-criteria composed by a mix of hardware, 9, and software, 7, quality attributes. The original matrix with numerical values from which we previously calculated the effectiveness of the multimedia impact generated by the mobile applications from APP1 to APP4 will be used to build a grid composed by rows and columns. The rows will be allocated to each of the mobile multimedia application from APP1 to APP4 and, referring to them, we are saying that there are four possible alternatives. The columns with be allocated to the multi-criteria quality attributes exposed in the figure 1, that are considered to be attached to the hardware and software quality attributes. The matrix T_1 resulted from previous assumption is represented in figure 3 in a general perspective.

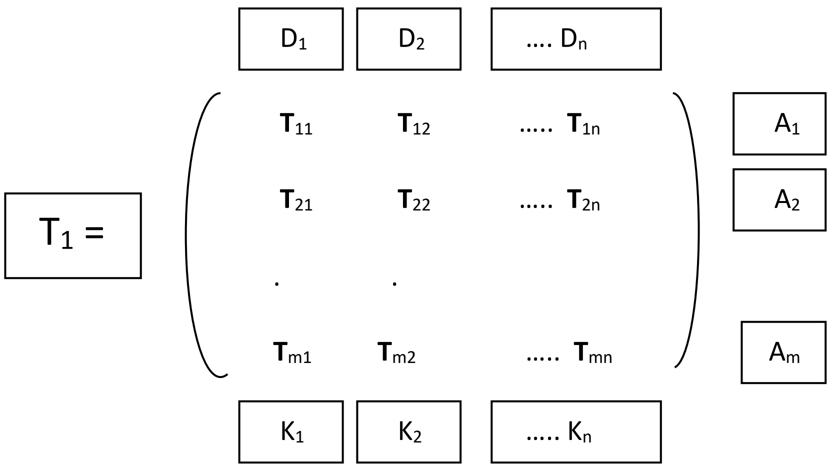

Fig. 3. The general matrix dedicated to a TOPSIS multi-criteria making decisions.

where:
m = the total number of alternatives represented by the particular number of 4 mobile applications.
n = the total number of multi-criteria, represented by quality attributes, used for making decisions.

The coefficients, labeled with K_i, will have the same numerical values used in our previous paper work, [19], to calculate the effectiveness of the impact generated by a multimedia mobile application into an educational field. For every subcategory of quality attribute represented in figure 1 the sum of the weights is equal with 1. The K_i coefficients represent a way for quantifying the weights of user's options and is presumably established before starting our laboratory experiment. The matrix T_1 will be normalized and weighted with the formula 3.

$$\overline{P_{mn}} = \frac{T_{mn}}{\sqrt{\sum_{i=1}^{m} T_{mn}^2}} \times K_n \qquad (3)$$

Positive path, labeled with VP_m^+, will be calculated with the formula 4 and the negative path, labeled with VP_m^- , will be calculated with the formula 5.

$$VP_m^+ = \sqrt{\sum_{j=1}^{m}\left(P_{mn} - P_j^+\right)^2} \qquad (4)$$

$$VP_m^- = \sqrt{\sum_{j=1}^{m}\left(P_{mn} - P_j^-\right)^2} \qquad (5)$$

where:
P_j^+ = the optimum specific to the criterion used
P_j^- = the inverse function reported against the value of P_j^+

The final classification obtained using the TOPSIS method designed for multi-criteria making decisions will be calculated with the formula 6.

$$S_m = \frac{VP_m^-}{VP_m^+ + VP_m^-} \qquad (6)$$

where:
S_m = the final score for every alternative represented by each multimedia mobile application.
The effectiveness of the multimedia impact calculated with formula 1 for each mobile multimedia application, from APP1 toward APP4, will be studied against the score S_m, calculated with the formula 6, to create a relationship pattern between those two mathematical methods to describe the impact of using multimedia mobile application into an educational activity. The objective of this paper work is to establish o relationship represented with R in figure 4.

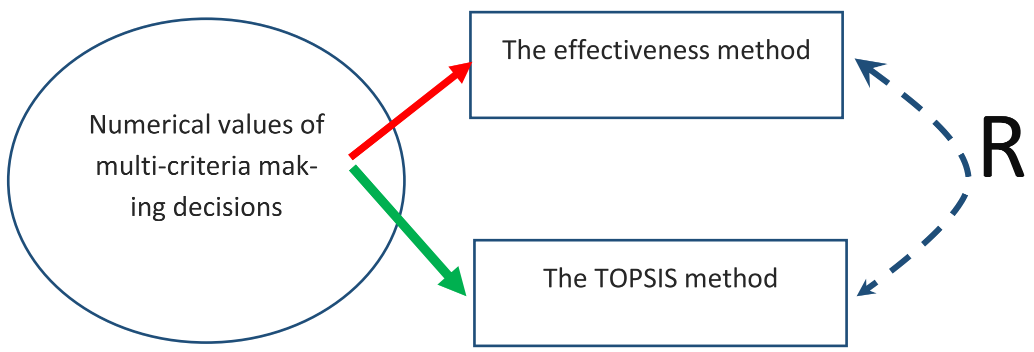

Fig. 4. The objective to estimate the relationship R between two methods to calculate the effectiveness of the multimedia mobile impact.

4 The proposed solution

For our research we build a questionnaire aiming to discover user's choices regarding hardware and software quality attributes, and to evaluate them, as we presented in table 1 and table 2.

Table 1. The questionnaire regarding hardware quality attributes

No	Question	User's choice	Count
1	What type of mobile connection do you used?	Mobile Data / Wi-Fi	**2**
2	What is your mobile's operating system?	Android / iOS / I don't know	**3**
3	What is your display's size?	>7 in / 5.5-7 in / 3 – 5.5 in / < 3 in	**4**
4	What do you consider about the temperature of your mobile device when mobile application ends?	High / Relative / I don't know	**3**
5	What do you observe regarding discharging battery when mobile application ends?	>30% / 10%-30% / < 10 % / I don't know	**4**
6	Are there any gaps between video sequences?	Yes / No / I don't know	**3**
7	What do you think about the size of the font used?	Yes / No	**2**
8	What kind of handling regarding mobile device are you used?	Landscape /Portrait/Both	**3**
9	What do you observe regarding speed of browsing?	Yes / No /I don't know	**3**
		Total	**27**

Table 2. The questionnaire regarding software quality attributes

No	Question	User's choice	Count
1	Do you have any previous knowledge about the subject Firebase?	Yes / No	**2**
2	What is your opinion about animation inserted in mobile application?	5 grade in a descending order	**5**
3	Is the main subject presented in a logically way inside mobile application?	Yes/No/Neutral	**3**
4	Is there any correlation between evaluation questionnaire and the mobile application content?	Yes/No/Neutral	**3**
5	What do you think about the importance of a virtual instructor?	5 grade in a descending order	**5**
6	Do you jump back and forth through applications' pages?	Yes / No	**2**
7	What do you think about the importance of audio content?	5 grade in a descending order	**5**
		Total	**25**

The effectiveness of the educational impact obtained using the package composed from those four mobile multimedia applications, APP1 to APP4, was calculated using formula 1 and 2 considering imposed coefficients to quantify the weights of every user's choice in our laboratory experiment. In our previous paper work we presented a correspondence between every user's choices embedded into questionnaire, exposed in table 1 and table 2, and the afferent coefficients. Considering our methodology to calculate the indicator of the multimedia mobile impact, named effectiveness, we obtained the following numerical results presented in table 3.

Table 3. The values calculated for effectiveness of the multimedia impact and TOPSIS results

Category	APP1	APP2	APP3	APP4
Multimedia quality attributes	66,798	79,056	***82,89***	71,172
Hardware quality attributes	93,2	89,6	***81,3***	84,65
K = Environmental multimedia factor	1,32908	1,763668	**2,532928**	5,537099
E_{impact} = Effectiveness of the multimedia impact	313,39	1184,82	***10735,40***	2475,10
PE = The academic performance	1298	2088	**2885**	1492

The numerical values for multimedia and hardware quality attributes presented in table 3 were calculated, as we said above, considering a grid of coefficients, K_i, that measure the weights regarding the importance of every quality attributes subcategory in our laboratory experiment. These coefficients are presented in table 4.

Table 4. The values of the coefficients used to calculate the indicator effectiveness of the multimedia impact generated by a mobile software and to apply TOPSIS methodology

1. Hardware quality attributes	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Type of mobile network	0.6	0.4			
Type of operating mobile system	0.6	0.3	0.1		
Display size	0.6	0.3	0.1	0.1	
The temperature of mobile device during application	0.1	0.3	0.6		
Discharging mobile's battery	0.15	0.2	0.6	0.05	
Gaps over the video sequence	0.6	0.3	0.1		
Device calibration of font size	0.7	0.3			
Device landscape or portrait view	0.1	0.3	0.6		
Speed browsing necessity	0.6	0.3	0.1		
2. Multimedia quality attributes	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Preexistent knowledge about educational subject studied with mobile application	0.2	0.8			
Utility of animation	0.4	0.25	0.2	0.1	0.05
Logical presentation of the content	0.6	0.3	0.1		
Correlation between learning objectives and evaluation questionnaire	0.6	0.3	0.1		
Virtual instructor evaluation	0.4	0.25	0.2	0.1	0.05
Sequentially operating mode	0.7	0.3			
The importance of audio content	0.4	0.25	0.2	0.1	0.05

The TOPSIS methodology used to establish a reasoning process regarding ordering **52** *hardware and software multi-criteria* exposed in table 1 and table 2 produced the following numerical results as we declared in table 5. The coefficients that measure the weights about the importance of every user's choice were considered having the same values according with those presented in table 4. From experimental data we observed that the formula 7 exposed in column 5 from table 5 produced a similar permutation order between applications APP1, APP2, APP3 and APP4. The column 6 from table 5 is referring to the concentration of multimedia components.

$$T_o = \frac{1}{S_m} \qquad (7)$$

where:

T_o = TOPSIS reciprocal value

Table 5. The values calculated with TOPSIS methodology

Multimedia Mobile application	**VP+**	**VP-**	**S_m**	**T_o**	**C%**
(1)	(2)	(3)	(4)	(5)	(6)
APP1	202,7594	417,3791	0,673041721	**1,485791**	**57**
APP2	296,2803	324,1545	0,522463425	**1,914009**	**42**
APP3	426,4597	211,4144	0,331435969	**3,017174**	**28**
APP4	408,749	236,3507	0,366378571	**2,729417**	**14**

In figure 5 we presented a comparison regarding values obtained for multimedia mobile applications APP1, APP2, APP3 and APP4 using TOPSIS method, effectiveness of the multimedia impact and the academic performance PE.

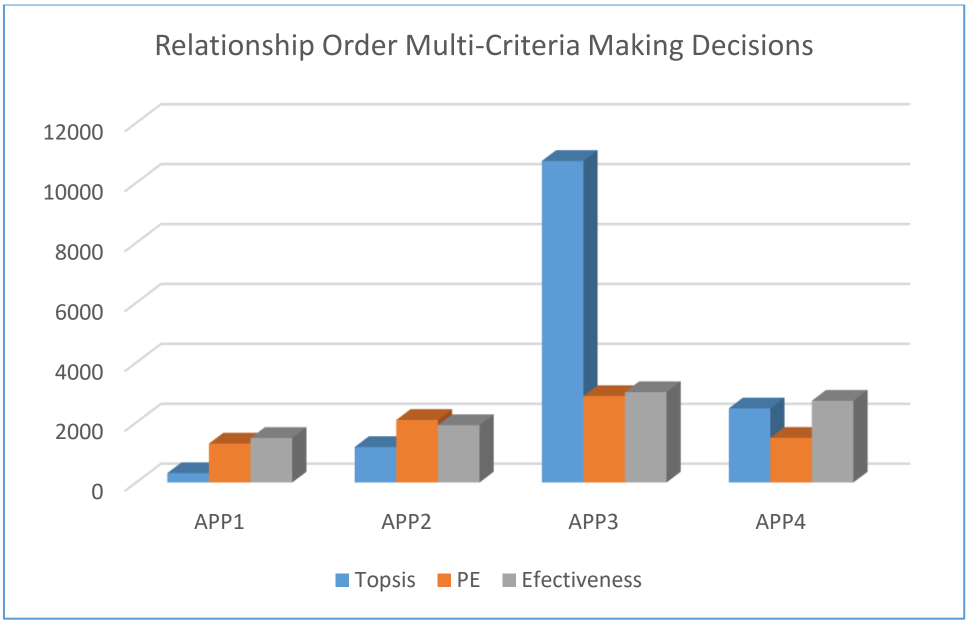

Fig. 5. A comparison between different mathematical methods to evaluate the impact of a multimedia mobile application

5. Results

From table 3 we observed that a valid statistical correlation occurs when we are using multiple regression between a dependent variable PE and the values of quality attributes, represented by multimedia mobile application and mobile device, shown in row 2 and, respectively, 3. The values obtained for that regression are shown in table 6.

Table 6. The linear regression to evaluate multiple correlations

Multiple R	R Square	Coefficient MM_{va}	Coefficient	Intercept
0,9644	0,9300	85,60	-16,86	-3008,01

where:
MM_{va} = represent the multimedia mobile version quality attributes
MD_a = represent the mobile device quality attributes

The equation resulted from linear regression will be in our experiment represented by the formula 8.

$$Y = 85.60 \times X_1 - 16.86 \times X_2 - 3008{,}01 \quad (8)$$

where:
X_1 = represent the multimedia mobile version quality attributes
X_2 = represent the mobile device quality attributes
Y = represent the academic performance PE

As we presented in our previous paper work, [20], the graphical evolution of the quality attributes divided into hardware and software categories are marked by a peculiar characteristic. This situation could be synthesized by the fact that software and hardware quality attributes covered an intersection zone where comparable numerical values appeared. This statement is graphically represented in figure 6.

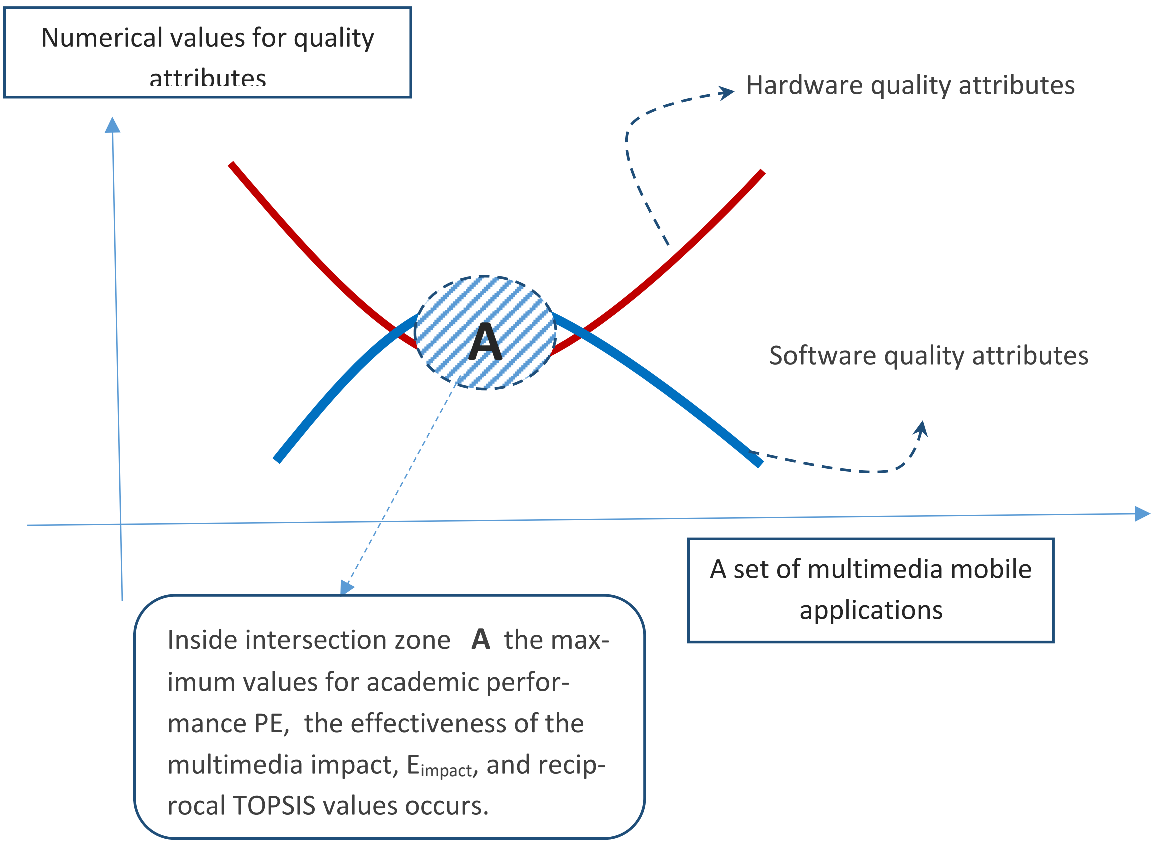

Fig. 6. The evolution of the values represented quality attributes inside a set of a mobile applications

Studying the values from table 3 and table 5, graphically represented in figure 5, we could synthesize a permutation order between academic performance PE, the effectiveness of the multimedia impact E_{impact} and the reciprocal values resulted from TOPSIS method for multi-criteria making decisions. This permutation order is represented with numerical symbols in table 7 considering an ascending classification order using numerical values from 1 to 4

Table 7. The relationship order between indicators referring values attached to quality attributes

	Academic Performance PE	The effectiveness of the multimedia impact E_{impact}	The reciprocal TOPSIS values
APP1	1	1	1
APP2	3	2	2
APP3	**4**	**4**	**4**
APP4	2	3	3

6 Discussions

The major objective is orientated around the impact generated by a multimedia mobile application against a group of learners. The academic performance PE studied in our previous paper work [20] is correlated with the ability of a user to a self-efficacy for personal or informal evaluation before receiving any formal results from a reasoning process. From table 6 we are noticed that values referring hardware and software quality attributes are strong correlated with the metric indicator named academic performance PE.

The minimum educational impact was similar if we are studying values for the multimedia mobile application APP1 regarding those three aspects mentioned before. A reciprocal value resulted from TOPSIS analysis is evolving in an identical permutation pattern with the effectiveness of the multimedia impact because it is known that the TOPSIS multi-criteria mathematical models are emulating an optimum solution based on a geometrically distance between quantitative variables. Due to this argument we are knowing that a TOPSIS method offers an optimum numeric result for the smallest geometrically distance between multi-criteria represented here by a set of hardware and software quality attributes and its reciprocal value is associated with the highest priority when we are considering to calculate the indicator of effectiveness related to the impact generated by a multimedia mobile application. Using red color in table 7 we emphasized the observation that reciprocal value of TOPSIS method evolves identically with the metric indicator of effectiveness responsible for the multimedia impact of the mobile application APP*i* from the experimental package group of multimedia mobile applications used. This situation could be described in a better way when we are saying that the same permutation between APP1, APP2, APP3 and APP4 occurs when we are using two different mathematical methods of calculation represented here by the effectiveness of the impact generated by a multimedia mobile application, APP*i*, and the reciprocal value of the TOPSIS, a multi-criteria making decision. Furthermore, the same permutation occurs for those two methods, mentioned before, plus the academic performance PE, illustrated in table 7, when we are looking at the values generated by the mobile applications APP1, APP2, APP3 and APP4 specifically for the maximum and minimum numerical values.

7 Conclusions

Considering previous observations, it is possible to say that the metric indicator of effectiveness, regarding the multimedia impact of a mobile application, conveys toward a more reliable reasoning process against the academic performance PE, when we are searching for a method to discern between multi-criteria attributes. From figure 6 we are observing that the slope of the mobile quality attributes, are descending simultaneously with an ascending trend recorded for the multimedia quality attributes. The opposite behavior occurs after a minimum value occurs for the hardware quality attributes and, respectively, a maximum value occurs for multimedia quality attributes.

Using results presented above, in table 7, we observed that multimedia mobile application APP3 obtained maximum values about educational impact, in three situations, when we calculated the academic performance indicator PE, the effectiveness of the multimedia impact and the reciprocal values resulted from TOPSIS analysis. This social reaction of users confronted with a group of multimedia mobile applications, having a different concentration of multimedia components, could be explained by the fact that a self-efficacy of awareness about input, during a learning session, and output, by an evaluation probe, is attained when a medium concentration of multimedia components, about 30 percent, are embedded inside a multimedia mobile application. At the level of 30 percent of multimedia components embedded into a mobile application we are entitled to underline the opinion that there is an equilibrium state where educational energy are moving smoothly from hardware to software quality attributes toward a pleasurable and enjoyable feeling of learning. In this case the impact of a multimedia mobile application is maximized toward a state where a self-efficacy of awareness, regarding good acquisition of knowledge, are presumably to be founded around a collectivity of learners. In this paper work we correlated experimental observations regarding quality attributes about mobile hardware and software characteristics using a theoretical model based on a dual force interaction toward specific subcategories subordinated to the each of them. Using different numerical methods, we observed that the maximum value of effectiveness regarding user's academic performance and respondent's self-efficacy is encountered when the level of the multimedia components is established near the value of 30 percent. We obtained a similar permutation classification between our personal method to calculate the effectiveness of the mobile software educational impact and the reciprocal values generated by a decision method named TOPSIS. This peculiar aspect of reciprocal values should be investigated in a future research scope.

The following actions will be considered to be considering regarding next steps about the preoccupation of this paper work.

- Creating more scenarios to emulate correlations between hardware and software criteria
- Developing similar multimedia mobile applications for new laboratory experiments that will search remembering or reenacting previously presumably knowledge already acquired.

Acknowledgment

Parts of this research have been published in the Proceedings of the 20th International Conference on Informatics in Economy, IE 2021

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