Chapter 3

Technology and Society Public Perception: A Structural Equation Modeling Study of the Brazilian Undergraduate Students' Opinions and Attitudes from Sao Paulo State

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1. Introduction

Humans has constantly changed the environment, requiring the design and the development of new technologies and these, in turn, eventually modify the man, his attitudes and society as a whole. This demand for innovations may be the result of well-intentioned ideas for a better life, or they may appear at the intention of ostentation of fetishes or even to perpetuate conditions of inequalities and hegemonic power [1-3]. Thus, different forms of relationship between society and technology are set out in pursuit of progress. A growing concern to integrate science and technology (S&T) for the welfare of society gets increasingly more space, especially since last century, when we felt a strong mixture of hope and fear on seeing the concretization of man's dream to conquer space at the same time in which the world feared for its end due to major advances in nuclear weapons [4-6].

In an attempt to discuss the results of progress, much has been said about the formation of citizens conscious and able to take decisions involving the welfare of the community, at the same time they get prepared to live in a technological and dynamic society [7-13].

To better understand the scene briefly discussed here, this work propose the creation and analysis of indicators of how society can influence people in their relationships with technology, reflecting their conceptions or their attitudes towards the technological development. The understanding of these relationships can generate foundations for many discussions, especially for the support of future questions of how public policies for science, technology and education will allow a more effective and active participation by the citizens in decisions involving technological aspects.

Thus, considering that the man, inserted in a society, conceives creates or enhances technologies, in this paper we will present hypotheses, futilely transformed in models that these social interactions also influence the conception that the individual has about the technology and these require different attitudes facing the technological development in the quest for sustainability.

2. Research problem

Considering the aspects mentioned in the introduction, here is formulated the research problem to be developed in this work: how the undergraduate students in the State of São Paulo perceive the relationship between technology and society and how they position themselves ahead of technological development.

3. Research goals

The main goal of this research is to analyze and test, using Structural Equations Modeling (SEM), the adhesion of different models that relate the interactions among man, society, environment and technology (conceptions and expectations and/or attitudes). To do so, we conducted a survey of the main aspects (or dimensions) of technological activities, such as: indicators of production and technology diffusion, the perception of the current model of society in our day by people from various sectors of our society and indicators of technological challenges in today's contemporary world scene. It will also be developed a scale capable of generate models that allow a better understanding of how individuals understand the technology and what they expect from it nowadays, taking into account the influence of social factors such as antecedent. Finally, we will present a theoretical hypothesis and the development of its respective model able to relate the points covered in previous sections.

4. Science, technology and society: Historical bases and sociological studies

The advancement of science and technology, often overblown, raised a concern to integrate science and technology for the welfare of society, especially since mankind, in the last century, felt a mixture of hope and fear when seeing realized man's dream to reach the space, at the same time that the world feared for their end because of major advances in nuclear weapons. The apathy of society regarding the decisions in science and technology at the beginning of last century was changing while new discoveries began to bring unpopular consequences and show disastrous prospects for the future of humanity. [14].

Especially in English-speaking countries, the economic crises turned on social alarms about some ecological aspects, such as, for example, the side effects of some bactericides and the war in Vietnam. These were some of the factors that led to the first anti-establishment actions, giving rise in the international arena to new positions and attitudes towards irrational advance of modern society. Due to strong political and economic crises that plagued the world, step by step, the belief in the neutrality of science and the naive view of technological development, which once dominated the social scene, was fading. A discussion of political and social implications of the production and application of scientific and technological knowledge was required, both in the social sphere as in the classroom [15, 16]. And so, as a way to consciously challenge the overblown advances that the world saw emerge, raised in some parts of the world in the mid-1970s, a movement that tried and still tries to establish a tripod: Science, Technology and Society (STS), searching for a stronger integration and a more critical training of future professionals, as well as seeking to obtain new theories about the implications and relations of science and technology in society [17].

Two traditions have been recognized within the scope of CTS: the North American, which emphasizes more the social consequences and prioritizes a greater emphasis on technology, marked by strong ethical and educational issues, and the European, which has the unmistakable mark to focus their investigations on issues which discuss more the science through anthropological, sociological and psychological referrals [18]. The power of the CTS movement took place through several curricular innovations around the world, either as a discipline, or even as changes in the way of inserting some topics in already existing and structured courses. Contents or the integral transformation of the curriculum, with the main objective to provide students a formation able to assist in the most different decision-making processes that occur in everyday life, having as reference the values considered as ethical and moral by society.

5. The facets of technology: Myths and realities

The diversity of ways in which technology was and is developed and studied over the years that man inhabits and modifies the world makes us realize that it is structured in its own field of knowledge, involving other aspects such as the culture of the society where it has been developed and its organization. In [19] it is shown that technology requires from their agents a deep knowledge of how and why your goals are achieved also are requiring a reformulation of structures and goals of the society where it is installed. Thus, technology can be seen as a set of human activities associated to an intricate system of symbols, machinery and instruments, always aiming the construction of works and artifacts, according methods and processes from modern science. Through the bibliographical survey presented, it is possible to see the diversity of opinions and studies that exist to try to better understand technology. Table 1 shows a summary of these conceptions.

CONCEPTION OF TECHNOLOGY	WAY OF UNDERSTANDING	REFERENCES
intellectualist	Understands the technology as a practical knowledge derived directly from the development of scientific knowledge through progressive and cumulative processes.	[20-26]
UTILITARIAN	Considers technology as being a synonym of technique. That is, the process involved in its development has not relationship with technology, just its purpose and use.	[7, 14, 24, 25]
TECHNOLOGY AS A SYNONYM OF SCIENCE	Faces technology as Natural Sciences and Mathematics, with the same logic and same patterns of production and design.	[16, 27-34]

CONCEPTION OF TECHNOLOGY	WAY OF UNDERSTANDING	REFERENCES
Instrumentalist (OR artifactual)	Considers technology as being simple tools, artifacts, or products, usually sophisticated.	[14, 22, 25, 35-38]
TECHNOLOGICAL NEUTRALITY	Understands that technology is neither good nor bad. Its use is that may be inappropriate, not the artifact itself.	[4, 22, 25, 39, 40, 41]
Determinism TECHNOLOGICAL (AUTONOMOUS TECHNOLOGY)	Considers technology as being autonomous, self-evolving, following naturally its own momentum and logic of evolution, lacking the control of human beings.	[4, 22, 25, 40, 41]
UNIVERSALITY OF TECHNOLOGY	Understands technology as something universal; the same product, service or artifact could arise in any location and, therefore, be useful in any context.	[9, 41]
TECHNOLOGICAL PESSIMISM	Considers technology as something harmful and hurtful to the sustainability of the planet, responsible for the degradation of the environment and the widening of social inequalities.	[7, 42-48]
TECHNOLOGICAL OPTIMISM	Understands technology as having mechanisms able to ensure the sustainable development and solve environmental, social and materials problems.	[2, 3, 7, 45, 49-60]
SOCIAL SYSTEM	Considers that technology is determined by the interaction of different groups through social, political, economic, environmental, cultural and others relationships.	[5, 17, 22, 24, 25, 27, 36, 61-71]

Source: [10]

Table 1. Referenced overview of the different conceptions of technology.

6. The challenges of technology in the contemporary world scene

It is known that sustainable development is volatile and requires a complex series of complementary policies, due to the uncertainty of the generation and distribution of knowledge of C & T [51]. In addition, there is the lack of appropriate instruments or the inability of scientific models to measure the environmental impacts. [72]. According to [73] the relationship between technology and the environment occurs in an uncertain way, being very difficult to predict which current and future impacts can be brought by technological innovation. The generation of new "clean technologies" becomes a challenge. At this point, the political factor should be relaxed, because the environmental goals of short and long term may not be compatible, as well as the policies in force, with innovative attitudes. From the literature reviewed, national and international papers and documents were analyzed, showing the main challenges identified by theorists, researchers and technicians, as being the current problems that the technological development faces worldwide. What we were able to check is that sustainability and environmental conservation are issues prioritized in the material analyzed ([2, 3, 7, 8, 34, 44, 45, 50, 56-60, 67, 74-89]).

7. Methodological procedures of the research

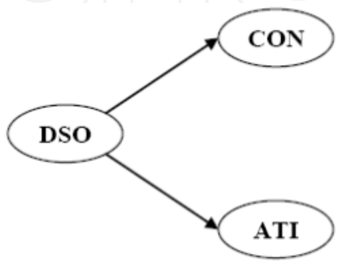
This work is characterized as a quantitative research. This option is based on the assertion in [90] that the structural equation model provides a direct method to simultaneously handle with multiple dependency relationships with statistical efficiency, exploring them in depth, generating confirmatory analysis, and allowing the representation of unobservable concepts in these relationships, verifying even possible measurement errors that occurred during the statistical process. By establishing an alternative to analyzing the relationship between society and its influence on conceptions and attitudes of undergraduate students facing the technological development, the structural equation modeling and the procedures for descriptive and multivariate analysis denote a precondition to the application of the technique.

7.1. Theoretical models and research hypotheses

In this way, evidences were pointed out that the literature, on numerous occasions, provides broad considerations that indicate that society generates demand for new technologies and these, in turn, change habits, relationships and forms of consumption of the individuals who make use thereof.

7.2. Introducing the model

We created a master model that relates the conceptions (CON) that individuals have about technology, their attitudes and expectations facing the technological development (ATI) and the influences of the social aspect (DSO). Due to the theoretical recommendations of the adopted method, four models were tested in the study. However, to simplify and make the research more objective, this paper will present only the original model, related to the null hypothesis of the research. Thus, starting from this model, the relations among the constructs with the lowest number of causal pathways will be defined, taking as fundamental change the antecedent factor (also treated as an independent variable or exogenous) in the causal relationships ([90, 91]). Initially, DSO1 model was chosen, which is characterized by having the social dimension (DSO) as an antecedent to the factors conception (CON) and attitude (ATI). Thus, the graphical representation of causal relationships among the constructs, known as path diagram, is shown in Diagram 1.



DSO: independent variable (exogenous). **CON e ATI**: dependent variables (endogenous).

Source: [10]

Diagram 1. Structural relationship Model - DSO1: Influence of Society.

In general, this model can be translated into the following hypothesis: the social dimension influences the conceptions of technology of the individuals within it, providing favorable attitudes in the face of a sustainable technological development.

This initial model formed the basis for other five variations, two of which were obtained by exchanging the places of the constructs in the model, and the remaining three were obtained from their respective inverse relationships.

7.3. Formulation of indicators and development of the research tool

All the literature review summarized in Figure 1 passed through a systematic process of analysis and classification for the construction of the research tool. The values obtained resulted from a process of content analysis which methodology will be described below. From papers, books, national and international documents, this study aimed to collect information provided in each text classifying all existing conceptions about technology as well as which are the challenges of technology in today's global scenario. It was also prioritized the provision of information that could classify the various sectors of society. Based on these categorizations, the indicators of this work were developed. All variables were grouped into categories and transformed into statements (indicators) and the end result, after a refinement based on the methodology of content analysis in [92], is presented in tables 2, 3 and 4.

DIMENSIONS	INDICATORS
CONCEPTIONS OF TECHNOLOGY	CON 01: Technology is the application of laws, theories and models of science.
	CON 02: The technology does not need theories; only needs to be practical and efficient.
	CON 03: Technology explains the world around us.
	CON 04: Today there are technologies that can be purchased at an affordable price for many, such as cell phones, stereos, computers, etc.
	CON 05: Technologies are tools (or artifacts) built to assist humans in solving different types of tasks.
	CON 06: The technology does not suffer influences from society.
	CON 07: The way we use technology is what determines whether it is good or bad.
	CON 8: The inventor loses control over the invention since it is available to the public.
	CON 9: A new technological discovery can be useful anywhere in the world.
	CON 10: Technology can destroy the planet.
	CON 11: Technology increases the socio-economic inequalities.
	CON 12: Technology threatens the privacy of individuals.
	CON 13: The benefits of technological development are greater than its negative effects.
	CON 14: Genetic engineering can help to cure diseases.
	CON 15: Different groups of interests determine the technological production from social, political, economic, environmental and cultural relationships.

Source: [10]

Table 2. Indicators proposed for Conceptions of Technology.

SOCIAL DIMENSION	DSO 01: The government must not influence in decisions of technological development.
	DSO 02: The technological research developed by companies is directed to hegemonic private interests aiming solely at profit.
	DSO 03: The decisions and technological choices have nothing to do with codes of ethics and conduct.
	DSO 04: The educational and research institutions, such as large universities must conduct research to develop new technologies.
	DSO 05: Non-governmental organizations (NGOs) should have an active voice in technological decisions.
	DSO 06: Environmental organizations can prevent or stop the technological development.
	DSO 07: Religious organizations can prevent or stop the technological development.
	DSO 08: It is important the effective participation of citizens in issues related to decision making in technology.
	DSO 09: Personal interests do not influence the process of technology creation.
	DSO 10: Religious beliefs do not affect the work of scientists and experts involved in the production of technology.
	DSO 11: Media influences the production of technology.
	DSO 12: Ethnic minorities have no guaranteed space to assist in choosing new technologies.

Source: [10]

Table 3. Proposed Indicators for the Social Dimension.

ATTITUDES TOWARD TECHNOLOGICAL DEVELOPMENT	ATI 01: I use technology to socialize information.
	ATI 02: I am not able to express an opinion about technology, because in decisions of this magnitude should be left to experts.
	ATI 03: I choose a technology by its efficiency.
	ATI 04: I choose a technology due to its practicality.
	ATI 05: At the time of purchase of a new technological product the price is the determining factor for my choice.
	ATI 06: Technology consolidates the democratization of relations among human beings.
	ATI 07: I am aware to the issues related to technology that appear in the media.
	ATI 08: I welcome the increase in investment in technology even if it means spending less on social programs.
	ATI 09: I would use nuclear power without questioning, because it is a plausible exit to solve future problems of the energy crisis.
	ATI 10: The concern about future generations should be a crucial point to drive technological choices.

	ATI 11: I am aware that my technological choices will help to overcome the water crisis in the twenty-first century.
	ATI 12: Having financial conditions, when buying a new phone, I choose the one which has more features and functions.
	ATI 13: With the safe use of technology it is possible to protect nature from human contamination.
	ATI 14: avoid using technological artifacts that cause environmental destruction.
	ATI 15: I know that genetically modified foods may be the solution to world hunger.
	ATI 16: I do not buy furniture that is not made from certified wood.
	ATI 17: I admit the exploitation of nature instead of the welfare of humanity.

Source: [10]

Table 4. Proposed Indicators for Attitudes toward technological development.

7.4. Sampling and data collection

In this research we adopted the technique of cross-section as it brings the advantage of allowing the acquisition of a picture of the variables of interest at a given moment in time and to emphasize the selection of a significant and representative sample of the target population ([93, 94]).

The four institutions that represented the sampling unit were selected considering the criteria of being institutions both public and private. The selected public university, located in Campinas/SP, has students from different regions of Sao Paulo State, as well as the other three private institutions. These private institutions were one university and one faculty of Sao Paulo/SP and one faculty of Campinas/SP. The two private faculties selected receive students from different regions in the state and were also chosen because the researcher had already served for a long period in one of them and is now starting activities in the other one. The diversity of courses that the four institutions have was also a decisive factor in their choices.

The data collection in the public institution was done directly with the students, from different courses, and the questionnaires were, in the most part, passed before the beginning of the classes in the days chosen for the data acquisition. Students were selected from the following courses: Environmental Engineering, Computer Science, Nutrition, Psychology, Business Administration with emphasis in International Business, Electrical Engineering, Production Engineering, Physics, Mathematics, Technology in Environmental Management, Administration and Education.

Initially, around 1006 questionnaires were returned, yielding a proportion of almost 23 interviewed by assertion. However, LISREL software was used in a procedure that made the disposal of questionnaires that were not fully answered. Thus, the amount passed to 600 valid questionnaires, representing a proportion of nearly 14 respondents per statement, which is a significant value considering [90] as basis, and taking into account that the model is not complete and it still gave a good fit in LISREL software.

8. Methodology of data analysis and results

Following guidelines from [90], at the end of the collect, the data recorded in the questionnaires were entered in an Excel spreadsheet to be later processed by specific statistical software's to aid in the treatment and analysis of quantitative data. The software *SPSS®* 13.0 was used to verify the reliability and constructs unidimensionality, as well as the system *LISREL® 8.54*, one of the most traditional statistical structural equation modeling package that became popular in social science research, as shown in [95], and has adequate resources to the purposes of this research ([91, 95-102]). A The coding was made with the SIMPLIS™ command language, available in the system, which made possible the estimation of the parameters of the model through confirmatory factorial analysis, according to different estimation methods, and the verification of the respective measures of adjustment of the models.

8.1. Individual evaluation of the constructs

From the individual evaluation of each construct was then possible to conduct the validation of the models of measures of each of these (DSO, ATI and CON) and this validation was performed by applying the Confirmatory Factorial Analysis (*Confirmatory Factor Analysis - CFA*). This technique has the purpose to test the hypothesis of adjustment of empirical data to a theoretical model, where a relationship structure is imposed and confirmed by analysis. Nevertheless, the variables need not to be related to all common factors. In particular, as is the case of this investigation, each variable is related to only one factor.

8.2. Unidimensionality of the constructs

The constructs presented earlier had their dimensionalities tested since this action is an premise to the reliability of the construct. The observation of the unidimensionality was made observing if each value of the normalized residue matrix of the construct was lower than 2.58, in modulus, at a level of significance of 1%, indicating if the effect on the overall adjustment of the model was low. In each process the indices of fit were checked, supplemented by information generated by the option "Modification Index" programmed in LISREL ®, which points out how much is expected to decrease the chi-square if a given a re-estimation occurred, as in [98]. A detailed analysis of the standardized residuals of all dimensions was made and it was found that the overall quantity of residues which exceeds the value of 2.58 is very low and don't reaches 3% of the total. Thus, the unidimensionality of the constructs is not compromised.

8.3. Reliability of the constructs

Reliability is a measure of the internal consistency of the construct indicators and of the adequacy of the scales to measure it. According to the authors, a value commonly used for acceptance of reliability is 0.70, although this is not an absolute standard, and values below

0.70 have been accepted if the research is exploratory in its nature and this value was observed in the research. The results from each one of the dimensions are indicated in the following table (Table 5):

Constructs	Composite Reliability of the Construct
DSO Models	0,704161
CON Models	0,703772
ATI Models	0,716902

Source: Lisrel® Software

Table 5. Composite Reliability of the Constructs

As can be seen, the values are higher than the reference commonly established when calculated for each of the constructs. This indicates that the measures performed are suitable.

8.4. Adjustment measures of the constructs

In this step we evaluated all the models seeking to understand the structural relationships hypothesized. The most common procedure for the estimation of these parameters and which usually has higher efficiency, in accordance with [90], is the Maximum Likelihood method (*Maximum Likelihood Estimation – MLE).* The results achieved (Table 6) with the MLE method were well adjusted, considering the values given in the literature.

Main Indicators of the Adjustment of the Model	Values Obtained with the MLE Method						REF. VALUES
	DSO1	DSO2	CON1	CON2	ATI1	ATI2	
Degrees of freedom	144	143	144	143	144	143	X
Chi-square	218.865	218.131	218.865	218.131	218.16	218.131	X
Weighted Chi-square (χ^2/GL)	1,52	1,53	1,52	1,52	1,52	1,53	lower than 5,00
Root Mean Square Error of Approximation (RMSEA)	0.0308	0.0309	0.0308	0.0309	0.0306	0.0309	Between 0,05 and 0,08
Normed Fit Index (NFI)	0.817	0.818	0.817	0.818	0.818	0.818	Over than 0,90
Non-Normed Fit Index (NNFI)	0.913	0.912	0.913	0.912	0.914	0.912	Over than 0,90
Comparative Fit Index (CFI)	0.927	0.927	0.927	0.927	0.928	0.927	Over than 0,90
Goodness of Fit Index (GFI)	0.962	0.962	0.962	0.962	0.962	0.962	Over than 0,90
Adjusted Goodness of Fit Index (AGFI)	0.95	0.949	0.95	0.949	0.95	0.949	Over than 0,90

Source: [10]

Table 6. Comparison of the Measures of Adjustment of the Model with MLE.

These measures were used as a way to evaluate each construct and the integrated model, because an adjusted model provides a benchmark for the confirmation of the validity of the constructs and the relationships among them, with respect to the complete structural model.

8.5. Evaluation of the integrated model

Several indicators were excluded in an attempt to get the best fitted model resulting in a total of 44, 19 indicators on the scale validated following the guidelines of [90]. Applying the MLE technique to estimate the model with antecedents in the social dimension, we obtained the structural equations, t-values of the estimated parameters and their respective R2, as shown in Table 7 for the estimation of DSO1, the t-values are above to 1.96 for a level of significance of 5%. This demonstrates the significant contribution of the endogenous constructs (conceptions and attitudes) for the Social Dimension (DSO) predictor construct and we have this model as the most adequate, satisfying the theory and our initial hypothesis.

Models	METHOD OF ESTIMATION MLE		
	structural equations	***t-values***	**R^2**
DSO1	ATI = 1.096*DSO	7.708	1.202
	CON = 1.016*DSO	6.220	1.033
DSO2	DSO = 0.116*ATI + 0.764*CON	0.188 e 0.906	0.795
CON1	ATI = 1.109*CON	7.896	1.231
	DSO = 0.880*CON	1.288	0.774
CON2	CON = 4.408*ATI - 3.386*DSO	0.271 e -0.208	1.908
ATI1	DSO = 0.889*ATI	1.354	0.791
	CON = 1.069*ATI	6.348	1.144
ATI2	ATI = - 0.145*DSO + 1.249*CON	-0.151 e 1.327	1.257

Source: LISREL® Software

Table 7. Complete model estimated according to the MLE method.

These results indicate that the model which predicts the other variables is the DSO1.

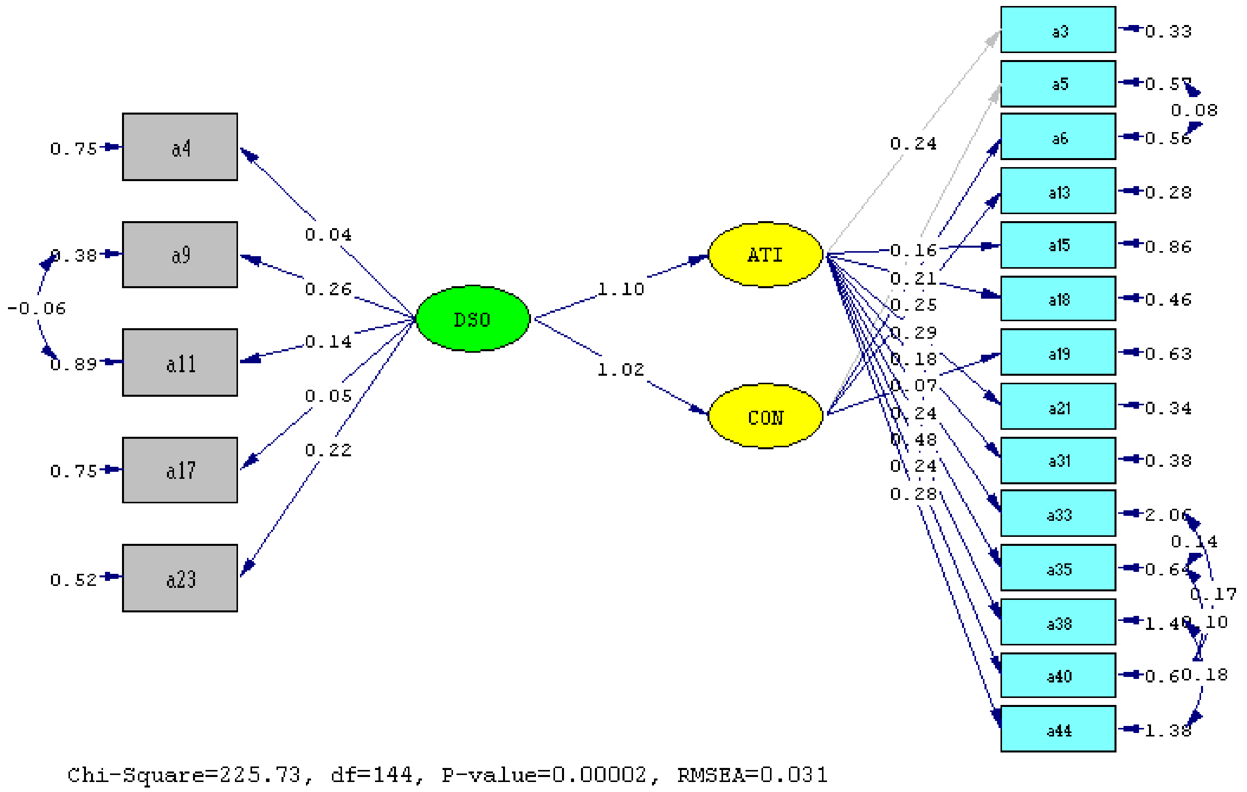
8.6. Presentation of the fitted model

From the observations presented in the previous sections, the best fitted model showed a number of constructs and indicators below the initial, as shown in Table 8 and graphically represented in Diagram 2.

CONSTRUCTS	VARIABLES
SOCIAL DIMENSIONS	DSO 01; DSO 02; DSO 04; DSO 06; DSO 08
CONCEPTIONS OF TECHNOLOGY	CON 01; CON 03; CON 05; CON 07
ATTITUDES TOWARDS THE TECHNOLOGICAL DEVELOPMENT	ATI 01; ATI 05; ATI 06; ATI07; ATI010; ATI 11; ATI 12; ATI 13; ATI 15; ATI 16

Source: [10]

Table 8. Adjusted Model of Measure.



Source: LISREL® Software.

Diagram 2. Path Diagram of the Integrated Model.

In summary, it can be said that the final model proposed was adequate and the various factors, in turn, significant. Thus, it is clear that the social dimension, measured by the DSO construct, can be considered a predictor of the attitudes (ATI) and conceptions (CON) related to the technology and that, by the unadjusted models, the inverse relationships are not true for the sample consulted.

9. Concluding remarks

Seeking an understanding of how elements of society can influence the conceptions and attitudes of individuals concerning the technological development, this research developed a theoretical model from which a research tool was elaborated and applied with undergraduate students.

It was found that all models were adjusted, but only the model DSO1 attested the research hypotheses according to the results previously presented.

The society, in the created model, was represented by different variables which represented specific sectors. Among all possibilities, in a comprehensive manner, the adjusted model showed that the undergraduate students surveyed gave evidence that the government, the research and educational institutions, and also the citizens in general, are the components that best represent, or could represent, the society in processes of technological decision making. Either for the choice of new technologies as for the development of other, with these points in common it is possible to say that undergraduates expect a government position at the same time they feel able to participate in a more active form.

Complementing the scenery, the indifference presented regarding the environmental non-governmental institutions may not mean a lack of opinion, but tend to show that issues of sustainability and preservation of the planet must be taken into consideration. This will be evident in the analysis of the attitudes that will be made in future paragraphs.

Summarizing these statements we can say that government, people, academic and educational sectors should join forces for better choices and technological decisions. This statement shows that all the literature indicated in Section 4 is consistent with the fitted model. Thus, these considerations show the reflex of the society in the attitudes of people in their technology choices and it can also be said that this reflex is also present in the way they understand the technology.

In the case of the conceptions, for one of the dependent constructs, we can infer that the undergraduates surveyed show three basic aspects that commonly appear as indicators of common sense of the interpretation of technology. More generally, one can say that the research has shown that technology is understood by the great majority of undergraduates as being intellectualistic and synonymous of science, as well as neutral and instrumentalist.

This way, the research shows that understanding technology as a practical knowledge derived from scientific theoretical knowledge, or even mistakes it with science, is a strong indicator. This means that a deeper reflection about the production process of technology and all of its real reasons of conception are not present in the majority of respondents. The instrumentalist conception supports this conclusion significantly. If the process is not considered, there remains only the product. And the use of this product is sole responsibility of the person who acquires it, not reflecting, this way, the interests of the developers. This statement is supported by the neutral view of technology also present in the model.

In general, even the concept of technology can be somewhat limited, its direct dependence on social factors is a good indicator and raises good evidence that undergraduates expect that influential sectors of the society act jointly in the development process of technology.

Regarding the attitudes (ATI), the second construct dependent on the social background (DSO), three points are possible to identify in a more comprehensive way: the awareness of the need to ensure the sustainability of the planet, consuming appropriate technologies, the use of technologies to socialize information and keep informed, and the practical manifestation of the instrumentalist conception. By taking again as a starting point the social dimension, we can infer that the students surveyed believe that jointly, government, teaching and research institutions and the population in general, can combine efforts to the pursuit of sustainable development. Thus, progress is possible if, and only if, political, social and economical efforts, are gathered in the search of a growth able to preserve the natural and material resources to ensure the well being of people.

With a differentiated education, new educational public policies may be developed in order to point to a sustainable world, whose maintenance of the life forms and inanimate resources can only be achieved through the joint action of all sectors of society. With an efficient technological education it is possible to educate for the consumption in a conscious and not so materialistic way, as pointed by some attitudes of the model. With a conscious technological education and with the use of all socializing and educational potential of technology, it is possible to manage and generate gradually an educational system solid and participatory.

Finally, it is possible to establish a contrast with the idea of consumption that also appeared, which indicates that the economic sector of society, which aims at maintaining a competitive market structure, also exerts influence. Even so, the adjusted model showed that the attitudes (or intentions) of undergraduates show evidence of change of attitude in college students that, even in a subjective way, give evidence that it is necessary to create a social mechanism where the holders of the technical knowledge must meet with the representatives from all sectors of society to decide which new technological systems should be adopted, since it does not harm the environment.

We emphasize that it was found that undergraduate students surveyed have a limited conception of technology, and this, as showed in the survey, is a reflection of the society in which they are inserted. Another point to be considered is the social reflex in the attitudes of the individuals facing the technological development. The study showed that there is a sustainable awareness, but also showed that some key variables of technological advances presented in the research model does not appear so striking in the way the students surveyed are positioned. These two observations open up space for a last important point: society, in general, need a technological reeducation, so that the citizens within it start to understand the process of technological decision making in a more comprehensive way and become capable to reflect about the different aspects related to the social environment in which they belong.

Thus, speaking in rethink the public policies in education is to propose the use of technological knowledge in education. And that does not mean simply perform tasks for training or specialization in new technologies, but to ensure to the students a solid foundation that helps them to manage and generate, in the future, the demands placed on society. The integration means of the individual in society, as well as their formation, more critical and more human.

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