

# Sustainability Beliefs: Proposition and Statistical Validation of a Data Collection Instrument

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*Abstract:* - The concept of sustainability beliefs has not been sufficiently researched even in the academic literature and, thus, validated scales to measure this construct have not been observed. In this perspective, the aim of this article is to develop and validate a scale of sustainability beliefs, considering students of the business area. In order to do so, the following research steps were defined: (i) the definition of the object; (ii) the generation of measurement items; (iii) the development and refinement of the scale through exploratory factor analysis; and (iv) the completion of the scale through confirmatory factor analysis. Interviews were conducted for generation of measurement items, 211 valid questionnaires were applied for exploratory factor analysis, and 140 valid questionnaires for confirmatory factor analysis. The final scale had 17 indicators divided into five dimensions, namely: Human Beings and the Planet; Equilibrium of the Planet; Resources Degradation; Environmental Strategies; and Resources Minimization Strategies. This scale has statistical reliability and validity.

*Key-Words:* - Sustainability Beliefs. Dimensions. Exploratory Factor Analysis. Confirmatory Factor Analysis.

## 1 Introduction

Sustainable development is one of the most important social movements of this new century and millennium [1]. There are countless voluntary initiatives related to sustainable development,

endorsed by industry-specific companies such as banks, insurance companies, hotels, chemical industries, with participation of the most important business groups in these sectors [1]. In this sense, sustainability has gained increasing importance

within the current society [2] and, following this importance, several studies have been developed addressing this issue [3-7].

Additionally, many studies have been conducted involving sustainability and future generations [8-10] as sustainability will increasingly affect those generations. However, such studies and research are of no use if organizations (which are largely responsible for the maintenance of resources in the future) do not develop strategies for meeting the principles of this concept. Nevertheless in order to a sustainable strategy to be developed and implemented by a given organization, it is necessary that its managers have a vision based on sustainability. Thus, it is necessary to understand how this concept is being incorporated by the future managers of organizations, in particular the students of the business area.

In this context, these future managers must combine sustainability beliefs so as to develop sustainable strategies for the growth of organizations, which they will manage in the future. From this perspective, the research question of this article is: what are the dimensions of sustainability beliefs? Therefore, the purpose of this research is to develop and validate a scale of sustainability beliefs, considering students of the business area.

This research is justified since there are no validated scales available in the literature that address the topic of sustainability beliefs. Therefore, the theory and methodology gap that this research intends to fill is the absence of a scale of sustainability beliefs that can be used to understand the other attributes of sustainability, for example, consumer behavior.

## 2 Conceptual Aspects Concerning Beliefs

Beliefs is a complex concept [11], and can be described as basis on which lies the human being's foundations [12]. This is an old concept of disciplines such as anthropology, sociology, psychology, and education, and especially of philosophy, which is concerned with understanding the meaning of what is true or false [13].

In this sense, knowing the complexity of this concept, there are several accepted definitions depending on the audience to which it is intended [14]. Opinions, ideas, positioning and experience are among the most different concepts mentioned by several authors who have researched the subject [14].

However, in addition to this uncertainty regarding the terms to define beliefs, still, there are

other attributes that involve them. They can be presented in three different ways: (i) as an opinion; (ii) as, indeed, a belief; and, (iii) as knowledge [15].

When beliefs are presented as opinions, in reality they correspond to probable knowledge. On the other hand, when they are in fact approached as beliefs, the adopted sense corresponds to an adhesion that, despite excluding doubt, is not based on scientific knowledge [14]. Finally, when it is adopted as knowledge, the belief is decidedly assertive, founded on socially recognized knowledge, albeit not always demonstrable [14,16].

Another relevant aspect of beliefs is that, according to some research [16-18], one can be conscious of beliefs or not. The belief may be a disposition for action and can be a behavioral history [16]. Beliefs influence how people organize and define their duties, thus they are strong indicators of how people act [11,19].

Beliefs can influence the behavior of individuals, moreover beliefs can influence the strategies, i.e., they can assist in certain provisions of strategies [20]. Furthermore, regarding other attributes involving beliefs, these are related to knowledge, and beliefs cover all matters for which we still lack certain attested knowledge, providing us with the confidence to act, as well as issues that are accepted as true, as knowledge, which, however, may be questioned in the future [21].

Beliefs are grouped in more central and more peripheral beliefs, and the more central ones are more resistant to change [22]. The central beliefs have four characteristics: (i) they are more interconnected with others and, therefore, communicate more with each other and, as a result, bring more consequences for other beliefs; (ii) they are more related to the identity and the self of the individual; (iii) they are shared with others; and (iv) they are derived from direct experience.

The central beliefs are those which individuals do not abandon easily, and are more connected to the identity and emotion of individuals [23]. There are also peripheral beliefs, which are beliefs about taste, arbitrary, less central and less connected [11].

Thus, considering the exposed definitions and the attributes concerning beliefs presented here, the inexistence of a consensus and a single definition for this term is observed. Therefore, in this research, the following concept was chosen to be used as a definition for the term belief: Ideas and opinions of people, habits, customs and traditions, which are built based on the experiences of these people [23,24].

## 3 Methodology

Initially, an exploratory search was conducted in order to select questionnaires on beliefs in the context of sustainability. No instrument that would address this variable was found, therefore the decision was to develop and validate a new instrument. Bearing in mind, a new exploratory search was conducted to find possible indicators to measure sustainability beliefs, even if belonging to other scales with broader scope. In the literature, the Scale of Environmental Concern (EC) was found – proposed by Straughan and Roberts [25], used by other authors [26-28], which deals with some aspects of sustainability beliefs (however, its main purpose is to measure environmental awareness), and, in this sense, it was not considered complete, because it does not specifically measure the sustainability beliefs.

Thus, using some indicators of this scale, it was decided for developing a new scale of sustainability beliefs. The steps for development of a scale were followed, namely: (i) the definition of the object; (ii) the generation of measurement items; (iii) the development and refinement of the scale through exploratory factor analysis; and (iv) the completion of the scale through confirmatory factor analysis [29].

The first step was to define the object, which in the context of this research is: sustainability beliefs. The second step comprises generating the measurement items. This part of the work began with a literature phase to find more indicators and a qualitative phase that included conducting in-depth interviews to propose new questions to measure this construct. These in-depth interviews were conducted in four different countries: Brazil, Ecuador, Portugal, and Singapore. The interviews were recorded and later transcribed in order to understand the positions and statements of the interviewees on the subject, and then adapt and develop new questions [30]. The primary goal of this phase was to generate indicators to be used in the scale development stage.

These questions were proposed in the form of statements and measured through a Likert-like scale, but using 10 points, instead of 5 points, a fact which tends to minimize problems with answer curves normality [31]. This scale is ascendent, according to the respondent's degree of agreement in relation to the statement presented (with 1 being strongly disagree and 10 for strongly agree). This study used data survey research, since it sought to determine the incidence of certain characteristics and the relationship between them [32]. Thus, it presents as adequate for sectional temporal perspective studies, also known as cross-sectional studies.

## 4 Results

This section focuses on the development of the scale of sustainability beliefs, in order to generate and validate the instrument to measure the construct. As a result, the remaining three steps will be addressed.

### 4.1 Second step: generation of measurement items

This step aims to generate the measurement items for the scale of sustainability beliefs, using previous research and the in-depth interviews carried out. Therefore, there were two (2) in-depth interviews in each country, as follows: one with a professor who worked with sustainability and a student who worked or had contact with the subject. The choice of the first respondent is justified because the beliefs are little explored within the sustainability field, and because of this, the decision was to choose people with a higher degree of knowledge to avoid misunderstanding about the meaning of beliefs.

The interviews were open and unstructured, without a pre-defined planning for the questions. The interview time was not pre-defined and therefore varied according to each interview.

The analysis of the interviews was conducted through the transcripts and, based on some findings thereof, some questions were devised. These new questions were designed according to the repetition of the topics in the interviews.

In this context, the initial questionnaire was completed after the qualitative stage of interviews conducted in the countries, that was used for the scale of sustainability beliefs, which, in addition to questions arising from the qualitative stage, had questions used in questionnaires of other studies that addressed similar issues [25-28]. This questionnaire is presented in Chart 1.

Chart 1 - Initial Questionnaire before the Exploratory Factor Analysis

N.	Statement	Source
1	Plants and animals exist, basically, to be used by humans.	[25-28]
2	Mankind was created to dominate nature.	[25-28]
3	Human beings have the right to modify the environment to make it fit their needs.	[25-28]
4	Human beings do not need to adapt to the natural environment because they can adapt the environment to their needs.	[25-28]
5	Humanity is seriously abusing the environment.	[25-28]
6	Human beings should live in harmony with nature in order to survive better.	[25-28]

7	When human beings interfere with nature, it often produces disastrous consequences.	[25-28]
8	Planet Earth has limited space and resources.	[25-28]
9	The equilibrium of nature is very delicate and easily upset.	[25-28]
10	To maintain a healthy economy we will have to develop it so that industrial growth is controlled.	[25-28]
11	We are approaching the limit number of people that Earth can support.	[25-28]
12	There are growth limits beyond which our industrialized society cannot expand.	[25-28]
13	Strategies aimed at minimizing environmental impacts generate costs to organizations	Op
14	The government is prepared to make laws to minimize environmental impacts	Op
15	The maintenance of resources is the most important aspect of sustainability	Op
16	The adoption of sustainable marketing can be used to camouflage reproachable processes	Op
17	Companies that advertise sustainable actions really adopt these actions	Op
18	The social aspect is considered by organizations in the definition of their strategies	Op
19	Social justice is the most important aspect of sustainability.	Op
20	The country's economic development is linked to the sustainable development	Op
21	I know there are laws aimed at minimizing environmental impacts that are imposed on companies	Op
22	I know the laws aimed at minimizing environmental impacts that are imposed on companies	Op
23	I can list at least three certifications aimed at minimizing environmental impacts	Op
24	The environmental aspect is considered by organizations in the definition of their strategies	Op
25	Organizations define social performance goals in their strategies	Op

Source: The authors (2014). Note: Op= Author's original proposition, based on the qualitative step

A pre-test was conducted by applying the questionnaire to three (3) professors and three (3) students of undergraduate courses of the business area of the Pontifical Catholic University of Paraná (PUCPR), a university located in southern Brazil, in order to verify its consistency. No changes were made in the questionnaire after the pre-test.

After this validation, the questionnaire was considered appropriate for preliminary application

with the aim of developing the scale through exploratory factor analysis, which is the third validation step.

### 4.2 Third step: exploratory factor analysis (EFA)

Given the organizational focus of the study and considering the final sample of the survey, students of the Business School of PUCPR were selected to answer the questionnaire and for the exploratory factor analysis. The justification for the choice for this institution is the accessibility to data.

Thus, 247 printed questionnaires were applied personally. Then, these were tabulated in Excel and SPSS. Those that were not fully answered were excluded and, after this filter, a final sample of 211 valid questionnaires was reached, representing 85.45% of the applied ones.

Starting the third step that included the development and refinement of the scale through exploratory factor analysis, this analysis was run using the SPSS software [29]. In this process, the main components analysis was used with the method of Maximum Likelihood. This alternative is consistent because the aim is to synthesize most of the original information, or variance, into a minimum number of factors with a predictive purpose [33]. The analysis was based on matrices correlation and the extraction was based on eigenvalues. Furthermore, the rotation method used was Varimax, since the aim was to achieve a simpler and more significant factor standard [34].

The first run of the exploratory factor analysis, with all the items, resulted in 7 dimensions and obtained, through the Kaiser-Meyer-Olkin (KMO) test, an initial value of 0.714. The variable 14 presented commonality of 0.356, therefore it was the first to be removed; thus, the model was run again, but without this variable. With this configuration, the new KMO calculated was 0.719 with the same seven dimensions. Thus, no variable was dispersed between the dimensions. Table 1 illustrates the variances of each dimension, as well as the accumulated variance of the dimensions.

Table 1 - Variances of the Scale of Beliefs with Seven Dimensions

Dimension	Variance (%)	Accumulated Variance (%)
1	17.355	17.355
2	12.481	29.837
3	7.009	36.845
4	6.558	43.403

5	5.376	48.779
6	5.226	54.005
7	4.358	58.363

Source: The authors (2014).

In Table 1, it is observed that the dimensions 5, 6, and 7 have small variances, i.e., they help little in explaining the final model. Table 2 illustrates the loading for the seven dimensions.

Table 2 - Scale of Beliefs with Seven Dimensions

Variable	Dimensions						
	1	2	3	4	5	6	7
VAR07	.745						
VAR08	.672						
VAR09	.672						
VAR06	.581						
VAR10	.516						
VAR02		.817					
VAR03		.814					
VAR01		.769					
VAR04		.605					
VAR12			.722				
VAR16			.662				
VAR19			.607				
VAR11			.568				
VAR13				.730			
VAR21				.668			
VAR15				.564			
VAR18				.515			
VAR22					.829		
VAR23					.749		
VAR24					.605		
VAR20						.653	
VAR25						.563	
VAR17							.845
VAR05							.525

Source: The authors (2014).

No variable was dispersed through the dimensions. Thus, the decision was to keep all the variables. Table 3 illustrates the commonalities of the variables of the dimensions presented above.

Table 3 - Commonalities

	Commonality
VAR01	.651
VAR02	.725
VAR03	.751
VAR04	.472
VAR05	.536
VAR07	.667
VAR08	.603
VAR09	.617
VAR11	.511
VAR12	.615
VAR13	.583

VAR16	.584
VAR18	.556
VAR19	.622
VAR21	.578
VAR22	.734
VAR23	.607
VAR24	.625
VAR25	.688

Source: The authors (2014).

Upon analyzing the commonalities, it was observed that the variable 4 has a value lower than 0.5. When an indicator shows commonality lower than 0.5, it must be removed, because it does not help explain the variable or the dimension to which it belongs [34]. Thus, this indicator was removed and the model was run again with the same premises. With this new configuration, no commonality is lower than 0.5, and the decision was to finish the runs of the exploratory factor analysis with the indicators in Table 3. When analyzing the content of the indicators within their respective dimensions, titles were assigned to these dimensions. They were called: (1) Equilibrium of the Planet; (2) Human beings and the Planet; (3) Resources Degradation; (4) Environmental Strategies; (5) Environmental Impacts; (6) Economic Development; and (7) Marketing. These titles were proposed by the authors.

Analyzing the contents of all questions and all dimensions, dimensions 6 and 7 have questions that differ in relation to the main content and, moreover, have only two questions. Bearing in mind that the statistical literature states that dimensions with only two questions should be avoided [34] and that, in this case, an analysis of the content of these is needed, both dimensions were removed.

In addition, question 19: “Social justice is the most important aspect of sustainability”, which was in the dimension “Resources Degradation”, addresses a matter that escapes the topic of all the other questions of the dimension. Therefore, for reasons of content, this question was also removed.

Finally, question 18, “The social aspect is considered by organizations in the definition of their strategies”, is in the dimension “Environmental Strategies” and, as it addresses a subject of social aspect, escapes the subject of the dimension and, also due to the same justification, was removed. Afterwards, the questionnaire was sent to two professors with knowledge on the subject for verification in order to have the titles of the dimensions analyzed, and they were considered adequate.

Then, after the exploratory factor analysis and all aforementioned refinements, the scale was defined with 18 questions, which are presented in Chart 2.

Chart 2 - Scale of Beliefs after Exploratory Factor Analysis

Dimension	N.	Statement
(2) Human beings and the Planet	1	Plants and animals exist, basically, to be used by humans.
	2	Mankind was created to dominate nature.
	3	Human beings have the right to modify the environment to make it fit their needs.
	4	Human beings do not need to adapt to the natural environment because they can adapt the environment to their needs.
(1) Equilibrium of the Planet	6	Human beings should live in harmony with nature in order to survive better.
	7	When human beings interfere with nature, it often produces disastrous consequences.
	8	Planet Earth has limited space and resources.
	9	The equilibrium of nature is very delicate and easily upset.
	10	To maintain a healthy economy we will have to develop it so that industrial growth is controlled.
(3) Resources Degradation	11	We are approaching the limit number of people that Earth can support.
	12	There are growth limits beyond which our industrialized society cannot expand.
	16	The adoption of sustainable marketing can be used to camouflage reproachable processes
(4) Environmental Strategies	13	Strategies aimed at minimizing environmental impacts generate costs to organizations
	15	The maintenance of resources is the most important aspect of sustainability
	21	I know there are laws aimed at minimizing environmental impacts that are imposed on companies
(5) Environmental Impacts	22	I know the laws aimed at minimizing environmental impacts that are imposed on companies
	23	I can list at least three certifications aimed at minimizing environmental impacts
	24	The environmental aspect is considered by organizations in the definition of their strategies

Source: The authors (2014).

After the step of exploratory factor analysis, the calculation of Cronbach's Alpha for the dimensions was carried out. First, the Alpha for dimension 2 was calculated, which addresses "Human Beings and the Planet". The value of Alpha was 0.765. If variable 4 is removed, the Alpha value increases. Analyzing the content of variable 4, which is: "Human beings do not need to adapt to the natural environment because they can adapt the environment to their needs", the decision was to remove it; therefore, the dimension "Human Beings and the Planet" has 3 variables, namely: 1, 2, and 3, with Alpha value of 0.785.

Then, the analysis of the dimension "Equilibrium of the Planet" was carried out, whose initial Alfa was calculated as 0.744. If any indicator is removed, there is no increase in the Alfa. Thus, these 5 indicators for the factor remain. In this sense, these are the final 5 indicators for exploratory factor analysis and Cronbach's alpha for the dimension "Equilibrium of the Planet". Then, the analysis of the dimension "Resources Degradation" was carried out. The Alfa with all the indicators was 0.701.

It is observed that if any indicator is removed, the Cronbach's Alpha does not increase. Thus, the 3 indicators remain. The next dimension addressed is titled "Environmental Strategies" and had Alpha of 0.667 with all indicators. If any indicator is removed, there is no increase in Alpha. Even with an Alfa considered low (0.667), due to the content and the judgment of the importance of this dimension, the decision was to keep it. The fifth and last dimension is "Environmental Impacts" and had Alpha of 0.681.

If any indicator is removed, there is no increase in Alpha. Even with an Alfa considered low (0.681), as in the previous dimension, due to the content and the judgment of the importance of this dimension, the decision was to keep it.

With this, the step of exploratory factor analysis and Cronbach's Alpha of the data collection instrument was finished. Then, the third step is completed [29]. Thus, the scale of sustainability beliefs, after the exploratory factor analysis and Cronbach's alpha, is the same previous scale, except for question 4, which was excluded on Cronbach's Alpha. The next step, which is the fourth, involves the confirmatory factor analysis, which is discussed in the next section [29].

#### 4.3 Fourth step: confirmatory factor analysis (CFA)

The fourth step is the finalization of the scale through confirmatory factor analysis [29]. This step

is based on the refined structure, obtained through the EFA.

To perform the confirmatory factor analysis, a new primary data collection was conducted. Thus, 165 questionnaires were applied to students of the Business School of PUCPR. Of these, 140 questionnaires were valid and complete. This application occurred personally, with printed questionnaires, which were later tabulated in Excel and SPSS. The model was designed in AMOS, which is an SPSS add-in, which was the software used to run the confirmatory factor analysis.

The dimensions represent the second order variables that are not directly observable. They can be measured by means of indicators, which are the questions proposed in the questionnaire, which are directly observable. Table 4 shows the results of this analysis, illustrating the loading of each indicator, the composite reliability, and the average variance extracted.

Table 4 - Results of Confirmatory Factor Analysis of the Scale of Sustainability Beliefs

		L	R	A
Human Beings and the Planet	Plants and animals exist, basically, to be used by humans.	0.709**	0.8004	57.40 %
	Mankind was created to dominate nature.	0.849*		
	Human beings have the right to modify the environment to make it fit their needs.	0.706*		
Equilibrium of the Planet	Human beings should live in harmony with nature in order to survive better.	0.712**	0.8670	56.76 %
	When human beings interfere with nature, it often produces disastrous consequences.	0.783*		
	Planet Earth has limited space and resources.	0.855*		
	The equilibrium of nature is very delicate and easily upset.	0.703*		
	To maintain a healthy economy we will have to develop it so that industrial growth is controlled.	0.702*		
Resources Degradation	We are approaching the limit number of people that Earth can support.	0.721**	0.8181	60.04 %
	There are growth limits beyond which our industrialized society cannot expand.	0.797*		

	The adoption of sustainable marketing can be used to camouflage reproachable processes	0.804*		
Environmental Strategies	Strategies aimed at minimizing environmental impacts generate costs to organizations.	0.755**	0.7814	54.41 %
	The maintenance of resources is the most important aspect of sustainability.	0.693*		
	I know there are laws aimed at minimizing environmental impacts that are imposed on companies.	0.763*		
Environmental Impacts	I know the laws aimed at minimizing environmental impacts that are imposed on companies	0.748**	0.8295	61.99 %
	I can list at least three certifications aimed at minimizing environmental impacts	0.736*		
	The environmental aspect is considered by organizations in the definition of their strategies	0.871*		

X<sup>2</sup>=127.36; gl= 109; X<sup>2</sup>/gl= 1.168; CFI=0.941; NFI=0.914; TLI=0.926; RMSEA=0.035.

Notes: L= Loading; R= Composite Reliability; A= variance extracted.

\*p<0.01 and \*\* non-calculated significance (because coefficient was fixed as 1, according to the illustration of the model).

Source: Research data (2014).

The estimation method of maximum likelihood was used. The significance of the first indicator of each dimension was not calculated due to the need of fixing at least one indicator by dimension (principle of the confirmatory factor analysis). The loading indices for each indicator were calculated, as well as the composite reliability of each dimension, and the average variance extracted of each dimension. The loading of the indicators are all above 0.6, the variance extracted of all dimensions are all above 50%, thus confirming a consistent scale according to the literature [31,33,35].

Furthermore, both the validity indicators of the five dimensions were calculated and had results above 0.5, as well as the reliability results (calculated) above 0.7 [34], values considered as

acceptable for a data collection instrument to be valid and reliable to measure a certain construct.

The CFI, NFI, and TLI indices were all above 0.9, the RMSEA was below 0.05, and chi-square divided by the degrees of freedom was below 5, which represents good adjustment of the model as previously explained. Thus, the validity and reliability of the proposed scale of sustainability beliefs was confirmed. Now, in order to confirm the discriminant validity, correlations between the latent variables were evaluated, which can be verified in Table 5.

Table 5 - Correlations between the Dimensions of the Scale of Sustainability Beliefs

Correlated dimensions (pairs)			Correlation
Human Beings	<-->	Equilibrium of the Planet	0.063*
Human Beings	<-->	Degradation	0.520*
Human Beings	<-->	Strategies	0.066*
Impacts	<-->	Human Beings	0.066*
Equilibrium of the Planet	<-->	Degradation	0.825*
Equilibrium of the Planet	<-->	Strategies	0.893*
Impacts	<-->	Equilibrium of the Planet	0.153*
Degradation	<-->	Strategies	0.823*
Impacts	<-->	Degradation	-0.002*

\*p<0.01.

Source: Research data (2014).

A correlation is considered high when the score is higher than 0.9 [34], and this means that the dimensions are measuring the same thing and, therefore, there is no discriminant validity. In Table 5, it is observed that none of the correlations presented between the dimensions is considered high, above 0.9, which shows that the dimensions are different and that the discriminant validity is confirmed. The correlation between the dimensions “Equilibrium of the Planet” and “Strategies” was the highest correlation found, but it does not reach the maximum limit and, therefore, does not affect the instrument’s statistical consistence. Thus, the final questionnaire obtained is presented in Chart 3.

Chart 3 - Final Questionnaire of the Scale of Sustainability Beliefs

Dimension	Statement
Human Beings and the Planet	Plants and animals exist, basically, to be used by humans.
	Mankind was created to dominate nature.

	Human beings have the right to modify the environment to make it fit their needs.
Equilibrium of the Planet	Human beings should live in harmony with nature in order to survive better.
	When human beings interfere with nature, it often produces disastrous consequences.
	Planet Earth has limited space and resources.
	The equilibrium of nature is very delicate and easily upset.
	To maintain a healthy economy we will have to develop it so that industrial growth is controlled.
Resources Degradation	We are approaching the limit number of people that Earth can support.
	There are growth limits beyond which our industrialized society cannot expand.
	The adoption of sustainable marketing can be used to camouflage reproachable processes
Environmental Strategies	Strategies aimed at minimizing environmental impacts generate costs to organizations
	The maintenance of resources is the most important aspect of sustainability
	I know there are laws aimed at minimizing environmental impacts that are imposed on companies
Environmental Impacts	I know the laws aimed at minimizing environmental impacts that are imposed on companies
	I can list at least three certifications aimed at minimizing environmental impacts
	The environmental aspect is considered by organizations in the definition of their strategies

Source: The authors (2014).

Having the final questionnaire, the step of content validation was initiated. With this objective, this final questionnaire was translated into the languages: English (for validation in Singapore), Spanish (for validation in Ecuador), and Portuguese adapted to the context of Portugal (for validation in that country).

Thus, the questionnaire was sent to professors and students of undergraduate courses of the countries focused by this research, in their language, in order for them to evaluate whether the questionnaire and its questions were appropriate for what it was intended to measure. In Brazil, it was sent to two students and one professor and it was considered appropriate.

In Ecuador, it was sent to one professor and one student, who also deemed that the questionnaire fitted the purpose. In Portugal, it was sent to two



undergraduate students and one professor, who judged the questionnaire ready for application.

In Singapore, the translated content of the questionnaire was presented to a group of professors and researchers in the area of sustainability and later to a group of undergraduate students in Business. Concerning the content and the quality of translation, there were no suggestions of alteration, neither by professors and researchers nor by students.

## 5 Conclusion

The aim of this paper was to develop and validate a scale of sustainability beliefs. The construction of this scale began with the proposition of a questionnaire, with reference questions of previous works and new questions proposed based on a qualitative step. Then, the exploratory factor analysis was used, and the validity and reliability of the instrument was tested through confirmatory factor analysis.

The final scale comprised 17 indicators, divided into five dimensions, namely: (i) Human Beings and the Planet; (ii) Equilibrium of the Planet; (iii) Resources Degradation; (iv) Environmental Strategies; and (v) Resources Minimization Strategies. The reliability and validity of the scale were satisfactory, which led to the accomplishment of this objective.

The sole purpose of this study was to propose and validate a scale for the sustainability beliefs. Within this perspective, it is suggested, for future studies, that this scale is used and applied, and, later, that a new confirmatory factor analysis is conducted with, for example, students from other areas such as, for instance, Engineering.

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