



Calibration of a Questionnaire for Evaluation of Happiness

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Abstract

Safeguarding of the environment towards sustainability is a concept intrinsically tangled to the concept of happiness since all resources and energy come directly or indirectly from the natural capital. However, there is still no agreement on how one can measure happiness. This paper presents a proposal for the calibration of a questionnaire for the evaluation of happiness. The calibration aims at the practicality of the instrument with similar valuation to that obtained by the application of the questionnaire model of the Bhutan Studies Center (BSC). Initially, the BSC model questionnaire was adapted, excluding questions linked to specific cultural aspects of Bhutan, and the open-ended questions were transformed into closed-ended multiple-choice questions. The BSC model questionnaire has 207 questions, which integrate 33 indicators divided into 9 domains. This extensive questionnaire requires considerable time, resulting in little practicality and high application costs. For this reason, from the extensive questionnaire, a reduced questionnaire was formulated with care to maintain the 9 domains (psychological, time use, health, education, cultural diversity, good governance, community vitality, ecological diversity and standard of living). Questions were taken from the extensive questionnaire so that the score resulted in an amount equal to or greater than 70% of the total domain. The reduced questionnaire had 79 questions and 21 indicators. The two questionnaires were then applied (extended and reduced) for two study groups: a group of 6 postgraduate students and the other 6 family heads of a low-income community. In this experiment, the time of application and the level of sufficiency reached in each domain was evaluated. The average application time went from 3 hours (extensive questionnaire) to 30 minutes (reduced questionnaire). However, when comparing the final score scores by domain (sufficiency level) of the extensive and reduced questionnaires, differences (for each study group) were observed in the sufficiency level in some domains. To achieve the same result by using the reduced questionnaire, calibration criteria were developed. The criterion of intervention in the reduced questionnaire was to add questions until a similar value was obtained from the level of sufficiency, and the maximum difference of one level of sufficiency per domain for a single interviewee was tolerated. As a result of the calibration, the student group questionnaire had 111 questions and 26 indicators. In this case, there was intervention in the domains of cultural diversity, well-being and ecological diversity. In the case of the

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interviewees from the low-income community, the questionnaire, after calibration, had 107 questions and 25 indicators, being calibrated the domains of a standard of living, education, community vitality and ecological diversity. The results show that depending on the target population, the domains to be calibrated may vary. The calibrated reduced questionnaire, besides reducing the application time by 6 times, concerning the extensive questionnaire, results in a similar assessment of happiness. A calibrated questionnaire, the result of this research, can contribute to public policies, where they influence people's way of life.

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1 Introduction

The environment, and its preservation to assure sustainability, is strongly tied to the concept of happiness – or quality of life or wellbeing, as a provider of aesthetics, energy and resources required to satisfy humans' needs. The concept of human well-being or quality of life or human happiness has attracted interest from researchers worldwide (Diener et al., 2003; Fujita and Diener, 2005; Tamir, 2005; Boehm et al., 2013). According to Argyle et al. (2007), happiness is the degree to which an individual judge the overall quality of his or her own favorable life as a whole. Satisfaction with the major domains of life can be defined regarding the average level of satisfaction during a specific period (Veenhoven, 2002).

Some researchers relate happiness to external factors such as material goods (Diener and Oishi, 2000; Hagerty and Veenhoven, 2003; Dutt and Radcliff, 2009); others look for internal factors, such as self-realization (Diener and Seligman, 2002). Another approach to happiness is its correlation with demographic characteristics. Stock et al. (1983) described a happy person as one who is young, healthy, well-educated and well-paid, outgoing, optimistic, unconcerned, religious, married, with high self-esteem, high job morale, modest aspirations, and an intelligence. However, this approach has changed when recent studies have shown that happiness goes beyond money, sex and self-esteem, including the state of the job market, employment characteristics, health, leisure, family, social relationships, security, freedom, moral values and many others (Ryan and Deci, 2000; Helliwell and Kahneman, 2007; Easterlin and Sawangfa, 2009).

According to Leamer (2009), Gross National Product (GNP) has become the standard by which a country's size and health are measured, and its negative growth must be closely observed since it means an important symptom of economic disease. In contrast, GNP does not consider the importance of post-material services that transcend goods that come from factors such as family, friends, security, social networks, freedom, creativity, yet these benefits of postindustrial societies do not necessarily increase with the income (Ura, 2008; Stiglitz, 2009).

Happiness information has taken an important position in the debate on how it can be assessed and measured by indicators (Benjamin et al., 2014; Decancq et al., 2015). A systemic indicator has been used with greater force, the indicator of Gross National Happiness (GNH) developed by the Bhutan Studies Center (BSC) under the auspices of the United Nations Economic Development Program, which is based on four pillars: (1) the promotion of sustainable and equitable socio-economic development; (2) the preservation and promotion of cultural values; (3) conservation of the natural environment and (4) establishment of good governance (Carvalho, 2010). The advantages of using GNH is that it represents a new model of progress that provides a unified public policy framework and emphasizes the balance between all the contributing factors of value. According to Brooks (2013), despite Bhutan's socioeconomic problems, quality of life has improved in recent decades, there has been a reduction in poverty and improvements in basic health care, air quality, education, access to safe water and sanitation, as well as improvements in road infrastructure and gender equality, valuing environmental and socioeconomic aspects.

Machado Junior (2018) and Pereira et al. (2013) relates social and environmental aspects to a more sustainable context. Jugend and Figueiredo (2017) affirm the need to associate environmental and social aspects of sustainability. In addition, sustainable development seeks a balance between increases in society and the econ-

omy and diminishing ecological and environmental marginality, benefits that emerge for the development of economic benefits and social justice (Opschoor, 2011; Vojnovic, 2014). However, it is difficult to include social aspects of sustainability and to know the degree of the well-being of individuals. For this, measuring instruments are required that can be easily applied and controlled. An example is the case of Bhutan's original questionnaire that contains 249 questions plus the strong influence of religion on the spirituality of its people. Researchers seek to reduce the number of questions and adapt them to the environment of communities, cities, regions, countries and companies. These modified questionnaires have original domains of the Bhutanese questionnaire, but the number of indicators can range from 29 to 200.

It was not evidenced in the literature a calibration methodology for the happiness questionnaires to calculate the GNH, providing its reduction and speed in the application, sustaining scientifically the rigor used in the questionnaire of Bhutan. Calibration as a way of creating new questionnaires for the scientific community is characterized as a theoretical gap and rapid way of application in data collection, a practical gap. This research addresses the two gaps highlighted.

The questionnaire applied in this research is not a simple tool for calculating the indicator of GNH, that is, administering the same questionnaire within an area for people who share different problems and resources could generate different results, which in turn would be practically useless to mobilize collective social change. Happiness also depends on people's interests and socioeconomic, environmental and cultural characteristics, as will be shown in this paper.

The present work uses data collected from postgraduate students and a community in the city of São Paulo, Brazil, with the purpose of proposing a methodology for calibrating the questionnaires for the calculation of the indicator of Gross National Happiness. The calibration allows evaluating different systems using the same domains developed by the Bhutan Studies Center and, thus, makes it possible to integrate the indicator of GNH into sustainability assessments.

2 Method

Initially, understanding the concepts of happiness was necessary to identify the gap in this research. Papers were selected in the Web of Science and Scopus databases. Keywords used to choose the papers were happiness and wellbeing, evidence in the literature a similarity of concepts.

The questionnaire used for this research that of the Bhutan Studies Center is recognized by the scientific community and used as the basis for the elaboration of other questionnaires. Thus, it justifies the choice of this instrument. The following is detailed the method for calibration of the questionnaire easy application in different communities.

2.1 Extended questionnaire - EQ

First, a new version of the BSC original questionnaire was created, excluding questions linked to religiosity, as well as open-ended questions that were transformed into closed-ended, multiple-choice questions. Also, the same nine domains, 33 indicators and the weights of the questionnaire were maintained, resulting in 207 questions. A scale of 3, 6 and 9 was used indicating respectively a very poor, good and optimal state.

The nine domains of the GNH (standard of economic life, governance, education, health, community vitality, environmental resilience, access to culture, balanced time management and psychological well-being) will be maintained since they are the same factors that contribute to happiness human by means of diverse cultures, according to hedonic science (the science of happiness). Some cultures may place more or less emphasis on different indicators, but they are universally common. In Bhutan, these domains are evaluated mainly to verify the conditions that the individual has to be happy. How much he has of conditions for happiness in every domain.

2.2 Reduced questionnaire - RQ

The extensive questionnaire modified in addition to long demanded a lot of time and high application cost, which on average took 3 hours in its execution. Thus, a reduced questionnaire was formulated, maintaining the same 9 domains and the indicators with the greatest weight, which together were of equal or greater importance to 70% of the total domain, with 21 indicators and 79 questions, eliminating the subjective indicators that have a lower weight.

The weighting of indicators seeks to preserve accuracy and prevention of future GNH indexes being affected by changes in the referral frame or changes in aspiration of people that may affect their subjective or self-reported indicators. The weights were updated with each survey since the weights are subject to changes over time. It was necessary to recalculate them due to the elimination of indicators from the original questionnaire. The criterion used was the same, so that the sum of the weights of the indicators in each domain was equal to one. The domains that had two indicators had equal weights because they were considered of equal importance. For domains with more than two indicators, a percentage was applied depending on the objectivity or subjectivity of the indicator by the criterion of Bhutan. In the case of the standard of living indicator, it has three indicators, evenly distributed in the health domain 11% was applied for the self-reported health indicator because it was considered a subjective indicator.

2.3 Calculation of the level of sufficiency of happiness

The sufficiency threshold shows how much a person needs to enjoy sufficiency in each of the 33 indicators. He asks how much is enough to be happy based on personality and aspiration as well as material, climatic and social circumstances. To calculate the level of sufficiency of happiness for each interviewee assumed 66.7%. The level of sufficiency for each domain will be used to compare whether the reduced questionnaire responds to the same levels of sufficiency among those interviewed with the EQ.

The level of happiness sufficiency for each indicator represents the percentage of the total sum of the respondents' answers and the maximum answer by the number of questions in each indicator.

The level of sufficiency for each domain was calculated as the ratio between the sum of the respondents' responses and the maximum expected response in their respective domain and can be represented by the equation:

$$SHD = \frac{I_s}{M_s} \quad (1)$$

where;

SHD , is the sufficiency of happiness by domain

I_s , the interviewee's score, where:

$$\sum_{i=1}^n \text{Answers}(i), \text{weight}(i) \quad (2)$$

M_s , maximum score, where:

$$\sum_{i=1}^n \text{MaxAnswers}(i), n^2 \text{answers}(i), \text{weight}(i) \quad (3)$$

2.4 Calibration of a questionnaire - CQ

If the levels of the sufficiency of the interviewees in the reduced questionnaire do not show the same levels of sufficiency as the modified extensive questionnaire, it will be necessary to calibrate the reduced questionnaire. We considered as a criterion for the calibration of the domain a difference in the level of sufficiency of happiness among the interviewees in the questionnaires applied to a population of six people.

In case of finding more than one difference, an individual analysis of all the interview sheets of the interviewees will be carried out in the modified extensive questionnaire. We sought there the answers excluded in the

reduced questionnaire that conditioned the differences of results that we observed. In the case that in the reduced questionnaire the interviewees were insufficient and in the extensive questionnaire sufficient, the excluded questionnaire was added to the reduced questionnaire with a value of 9. If not, it was added with questions with the minimum qualification and say 3. If it were not possible to reduce the differences in the levels of the sufficiency of happiness, the domain would be equal to the extensive questionnaire maintaining the same weights. It is observed that the RQ presents the minimum amount of questions that can be asked, adding the procedure applied to the questions and indicators eliminated.

The calibrated questionnaire (CQ) was considered when the difference between the levels of happiness sufficiency for each domain between the two questionnaires did not differ more than one among the interviewees.

2.5 Calculation of the gross national happiness index

The methodology used to calculate Gross National Happiness was according to the United Nations (UN) report. Gradients of happiness were developed. The equation for the calculation of the GNH is:

$$GNH = 1 - (Hn \times An) \quad (4)$$

where;

GNH = Gross National Happiness,

Hn: is the fraction of people still not happy of the population. An example would be 5 out of 10, where 5 people are still not considered happy in a population of 10 people, resulting in a *Hn* of 0.5,

An: is the intensity of the still not happy. It is the fraction of average dissatisfaction for each person still not happy. Example of 5 people still not happy of a population, of which these people was evidenced a sum of 15 unanswered domains out of a total of 50 domains that should be taken care of. The *An* would be 0.3.

2.6 Population selection for calibration

Since the ultimate goal of the *GNH* process is not just to measure reality but to transform it, the two questionnaires were applied to a group of six students in a postgraduate program (four men and two women) and to six family heads (three women and three men) from the happiness community, in the state of São Paulo, Brazil. The age range of respondents is between twenty-five and fifty-five. The selection criterion was based on the fact that the level of happiness has differences regarding gender, age, professional training, among others.

2.7 Data processing

The data collected from the interviewees were organized in a Microsoft Excel spreadsheet, is for the RQ and EQ. In another worksheet, results of the answers of the questionnaires were inserted, calculated by the formulas the sufficiency levels for each of the dimensions. Thus, it was possible to compare the domains sufficiency results for each of the interviewees.

Statgrafic Centurium XVI was used for the statistical processing, verifying the existence of significant differences in the means of the domains.

3 Results and discussion

3.1 Structure of the questionnaires

Appendix A presents the structure of the two questionnaires applied, which will be recognized as the EQ and the RQ. As can be seen, the lower weight indicators in the RQ were eliminated and recalculated the weights again. The reduced questionnaire included 79 questions, 21 indicators and 9 domains, and the application time was reduced to 30 minutes, reducing application costs by 6 times.

Table 1 Comparison of EQ and RQ for the population of postgraduate students.

Interviewee	Use of time		Good governance		Ecological diversity		Life standard		Psychological well-being		Education		Cultural diversity		Community vitality		Health	
	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ
I1	74%	96%	77%	100%	73%	57%	78%	86%	48%	96%	82%	100%	62%	56%	82%	73%	74%	74%
I2	85%	83%	73%	72%	66%	48%	73%	81%	45%	70%	84%	100%	64%	56%	80%	87%	60%	60%
I3	85%	100%	78%	89%	76%	71%	75%	86%	54%	85%	84%	100%	73%	44%	88%	87%	81%	81%
I4	82%	88%	72%	78%	54%	50%	73%	47%	54%	78%	97%	100%	69%	78%	62%	33%	88%	88%
I5	82%	88%	77%	89%	63%	55%	75%	86%	52%	78%	82%	100%	65%	67%	89%	80%	96%	96%
I6	74%	83%	86%	83%	49%	43%	75%	76%	46%	78%	83%	100%	75%	67%	75%	53%	83%	83%
Average	80%	90%	77%	85%	64%	54%	75%	77%	50%	81%	85%	100%	68%	61%	79%	69%	80%	80%

Table 2 Comparison of EQ and RQ for the population of heads of families of the community of São Paulo

Use of time	Good governance		Ecological diversity		Life standard		Psychological well-being		Education		Cultural diversity		Community vitality		Health			
	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ	EQ	RQ		
I1	82%	92%	67%	78%	69%	64%	67%	86%	76%	93%	81%	33%	64%	56%	59%	88%	67%	
I2	87%	92%	70%	89%	55%	40%	61%	62%	73%	85%	79%	67%	64%	56%	72%	60%	79%	90%
I3	95%	92%	71%	83%	56%	48%	57%	48%	81%	96%	76%	50%	67%	56%	67%	47%	77%	75%
I4	77%	79%	77%	94%	74%	76%	63%	71%	93%	89%	79%	33%	55%	44%	77%	60%	82%	98%
I5	90%	96%	69%	78%	69%	57%	67%	81%	76%	89%	81%	83%	64%	56%	72%	67%	88%	95%
I6	95%	88%	64%	72%	63%	52%	65%	76%	73%	78%	87%	83%	65%	56%	57%	82%	82%	77%
Average	88%	90%	70%	82%	64%	56%	63%	71%	79%	88%	80%	58%	63%	54%	67%	50%	83%	84%

The next step was to compare whether RQ has similarity to EQ. For this, the sufficiency of happiness per domain was compared for each of the interviewees. Table 1 presents the domains of psychological well-being and cultural diversity, where they have more than one difference between the interviewees of the postgraduate students.

The psychological wellbeing domain highlights the level of insufficiency, with values lower than 66.7% in the EQ with a mean of 50% of respondents, while the RQ shows happiness level with higher values and an average of 81%. In this domain, the questions of spirituality and satisfaction with life have been reduced as well as the indicators of positive and negative emotion in the RQ that influence in the levels of the sufficiency of happiness of the people.

In the case of the domain of cultural diversity, there are two differences. It is noted that the interviewees' averages in these domains also show different levels of sufficiency, 68% in the EQ and 61% in the RQ as the average of the interviewees.

Comparing the results with the reduced questionnaire applied in the community in São Paulo, Table 2, it can be observed that domains that have more than one difference in respondents' answers are not the same ones that were analyzed for the postgraduate students. For the questionnaire applied in the community domains that present differences greater than one in the level of sufficiency of happiness were the ecological diversity, standard of living, education and community vitality.

The results show that administering the same reduced questionnaire within an area for people who share different problems and resources could produce different results, which in turn would be practically useless to mobilize collective social change since happiness also depends on the interests and socio-economic, environmental and cultural characteristics.

3.2 Reduced questionnaire calibration applied to postgraduate students

In the elaboration of RQ, questions such as spirituality, visits to temples or churches, time spent with the family on topics of spirituality, satisfaction with the environment and indicators of positive and negative emotions were eliminated. To calibrate the RQ was added questions with value 3 that were common to all respondents to turn the RQ to sufficiency level of still not happy and go comparing with the EQ to reach a difference of one.

The other domain that was calibrated in this population was the cultural diversity that presented two differences between levels of the sufficiency of happiness. The average level of happiness sufficiency in the EQ was 68%; however, the EQ showed an average of 61%, which shows a degree of comfort in the questions taken from EQ as indicators of native language, etiquette and conduct, such as the importance of participating in cultural activities. In order to calibrate this domain, questions with EQ value 9 that were common to all respondents were added to RQ. The other domains did not need to be calibrated, as they showed the same levels of sufficiency.

Table 3 presents the result of the calibrated questionnaire, maintaining the originality of the questionnaire. It is proposed to use the new calibrated questionnaire that had 111 questions, 21 indicators and 9 domains for a larger population of postgraduate students, where the issues addressed are closer to the interests and characteristics of this population.

3.3 Calibration of the reduced questionnaire applied to heads of families of the community of São Paulo

The difference between postgraduate students and community residents are differences in the responses between EQ and RQ in the domains of ecological diversity, the standard of living, education and community vitality, according to Appendix A. The criteria for calibration of the questionnaires are the insertion of questions that represent indicators in the domain that do not reach the same level of sufficiency, and when the same level of sufficiency cannot be reached if the questions to evaluate the indicators are maintained.

Table 3 Calibrated questionnaire for the population of postgraduate students

Interviewee	Use of time		Good governance		Ecological diversity		Life standard		Psychological well-being		Education		Cultural diversity		Community vitality		Health	
	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ
I1	74%	96%	77%	100%	73%	67%	78%	86%	48%	52%	82%	100%	62%	62%	82%	73%	74%	74%
I2	85%	83%	73%	72%	66%	59%	73%	81%	45%	44%	84%	100%	64%	64%	80%	87%	60%	60%
I3	85%	100%	78%	89%	76%	78%	75%	86%	54%	85%	84%	100%	73%	73%	88%	87%	81%	81%
I4	82%	88%	72%	78%	54%	61%	73%	38%	54%	47%	97%	100%	69%	69%	62%	33%	88%	88%
I5	82%	88%	77%	89%	63%	65%	75%	86%	52%	44%	82%	100%	65%	65%	89%	80%	96%	96%
I6	74%	83%	86%	83%	49%	56%	75%	76%	46%	44%	83%	100%	75%	75%	75%	53%	83%	83%
Average	80%	90%	77%	85%	64%	64%	75%	76%	50%	53%	85%	100%	68%	68%	79%	69%	80%	80%

Table 4 Calibration result for the community population.

Interviewee	Use of time		Good governance		Ecological diversity		Life standard		Psychological well-being		Education		Cultural diversity		Community vitality		Health	
	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ	EQ	CQ
I1	82%	92%	67%	78%	69%	67%	67%	65%	76%	93%	81%	70%	64%	56%	59%	88%	67%	67%
I2	87%	92%	70%	89%	55%	44%	61%	61%	73%	85%	79%	89%	64%	56%	72%	79%	90%	90%
I3	95%	92%	71%	83%	56%	51%	57%	55%	81%	96%	76%	83%	67%	56%	67%	77%	75%	75%
I4	77%	79%	77%	94%	74%	78%	63%	65%	93%	89%	76%	78%	55%	44%	77%	82%	98%	98%
I5	90%	96%	69%	78%	69%	60%	67%	67%	76%	89%	81%	94%	64%	56%	72%	88%	95%	95%
I6	95%	88%	64%	72%	63%	56%	65%	65%	73%	78%	87%	94%	65%	56%	57%	82%	77%	77%
Average	88%	90%	70%	82%	64%	59%	63%	63%	79%	88%	80%	85%	63%	54%	67%	83%	84%	84%

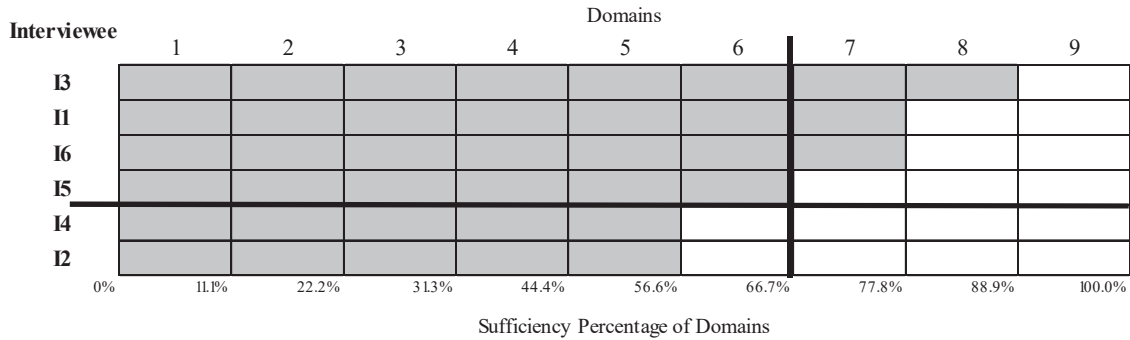


Fig. 1 Gradient happiness of the EQ of postgraduate students.

One of the domains to be calibrated is ecological diversity, which shows two differences, even if the mean level of sufficiency is less than 66.7%, both in EQ and RQ. In this case, the RQ has added a weight question 9 to be able to calibrate the questionnaire because the level of sufficiency of the EQ is greater than the level of sufficiency of RQ.

Another domain to be calibrated is the standard of living, with two differences, and the mean EQ respondents’ responses are 63% and the RQ is 71%, indicating that the RQ should go to a level of sufficiency considered not yet happy. In this case, the RQ was added with common questions of value three, but it was not possible to reduce the differences and the same EQ questions were maintained, adding questions of ownership and rent impairment in the income that was initially eliminated.

In the case of the education domain, the two indicators of educational attainment and level of education that were evaluated reduced the sufficiency level to 58%, due to illiteracy and low education levels of the population, also with a degree of discomfort in the answers. Subsequently, indicators of values and knowledge were added with questions that the respondents attributed weight 9. The domain of community vitality for EQ showed a sufficiency level with an average of respondents’ response of 67%. However, the RQ showed the level of insufficiency. In order to calibrate the RQ, the questions related to the community relations and the family were included.

Table 4 presents the new calibrated questionnaire, with the same reality of the extensive questionnaire for the community population. Thus, it is proposed to use the new calibrated questionnaire that was characterized by 107 questions, 25 indicators and 9 domains.

Appendix B summarizes the domains, indicators, weights, and question numbers for application with the population to be evaluated. These results confirm the hypotheses that each community should be applied questionnaires that adjust to the socioeconomic and cultural interests and conditions. Differences were observed in the number of indicators and their weights for two calibrated questionnaires. After the extensive questionnaire is applied, differences between populations are identified, which for the reduced questionnaire eliminates the indicators below 70%. The calibration will adjust in the increase of indicators for the domains that have not reached the level of sufficiency. Each population has different interests and relevant aspects, which ends up influencing a questionnaire for evaluating happiness.

3.4 Gradients of happiness and GNH Index

A gradient of happiness is elaborated, presenting the percentage of the sufficiency of the domains of the interviewees. It was assumed that the respondents who obtained 66.7% are considered happy and those below this percentage, considered not yet happy. In the study of the postgraduate student’s population, Fig. 1, in the EQ, four interviewees showed sufficiency level with at least six domains attended, while two did not obtain the minimum of sufficiency.

Comparing the happiness gradient of Fig. 1, with the gradient obtained from CQ analyzes, Fig. 2, the same

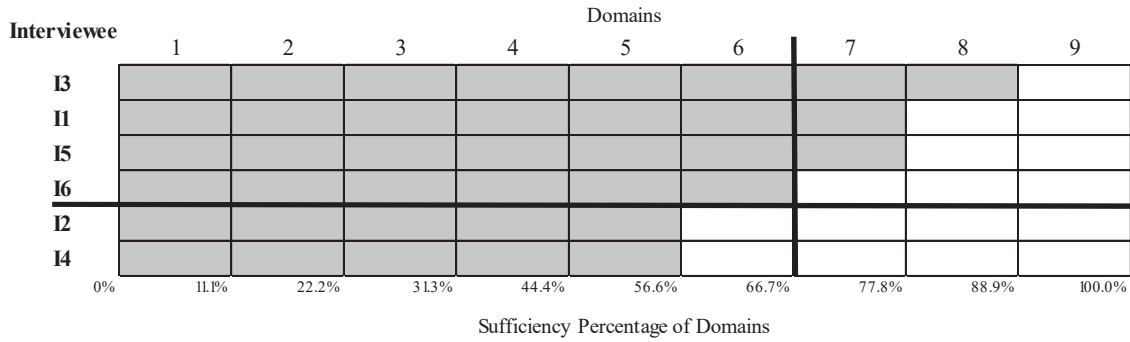


Fig. 2 Gradient of CQ happiness of postgraduate students.

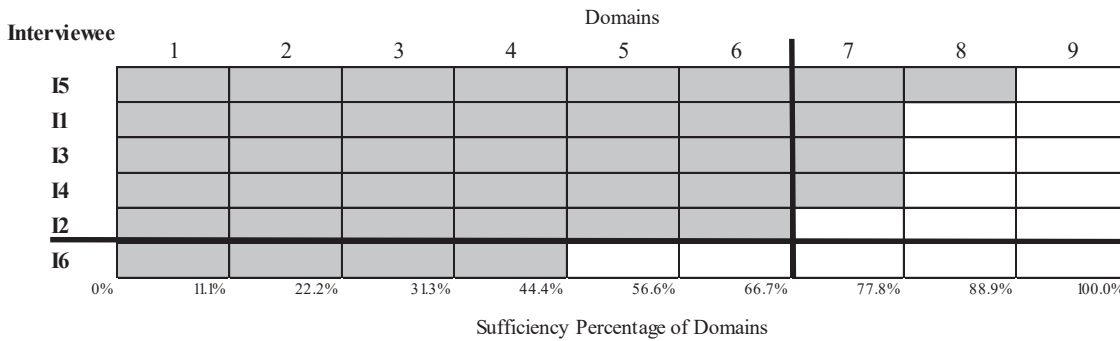


Fig. 3 Gradient of RQ of postgraduate students.

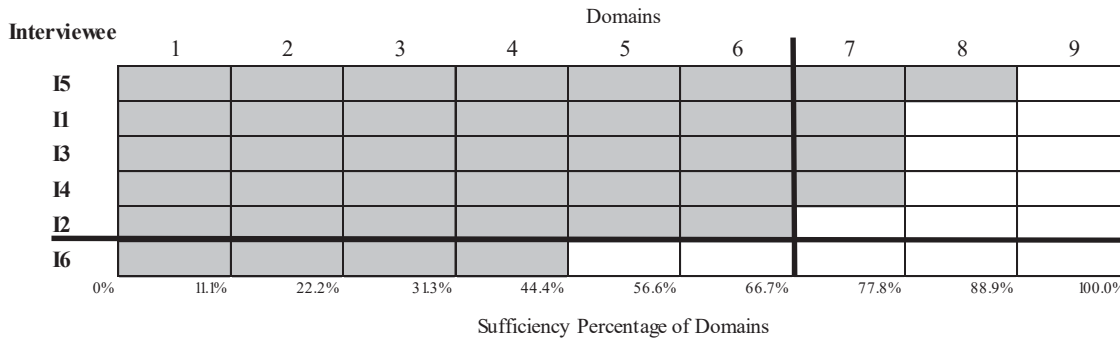


Fig. 4 Gradient of EQ happiness of community heads of household.

trend of four interviewees considered to be happy is evidenced. However, the RQ, Fig. 3, presents five interviewees with a level of sufficiency of happiness and only one of them is considered not happy yet. This result confirms the need for calibration of the questionnaire.

With Fig. 4 and Fig. 5, it is possible to compare the happiness gradients for the community population. The EQ and the CQ show that five interviewees reached levels of happiness sufficiency, whereas in the RQ only three interviewees reached a sufficiency level, according to Fig. 6.

Table 5 presents the GNH calculation for the EQ, RQ and CQ questionnaires, applied to the two study populations.

The difference between the GNH of the EQ and CQ for the population of postgraduate students was 3%, and in the case of the community, population was 2%. However, when comparing EQ and RQ, this difference increased to 8% in the postgraduate student’s population and 12% in the community population.

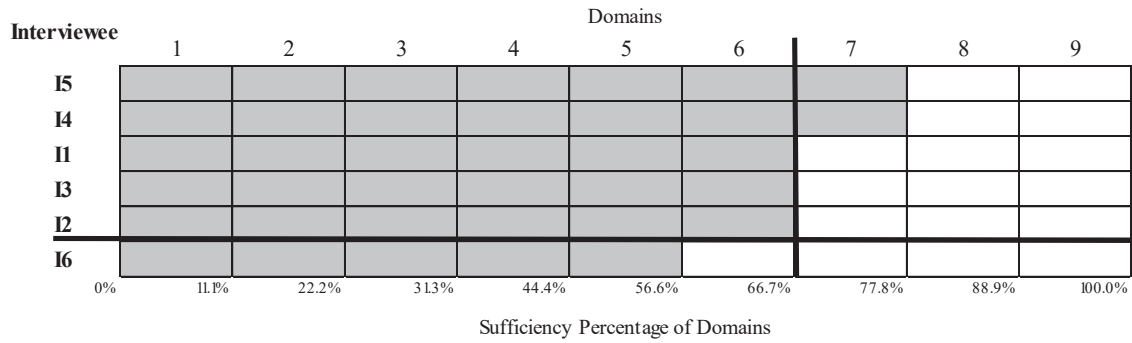


Fig. 5 Gradient of CQ happiness of community heads of household.

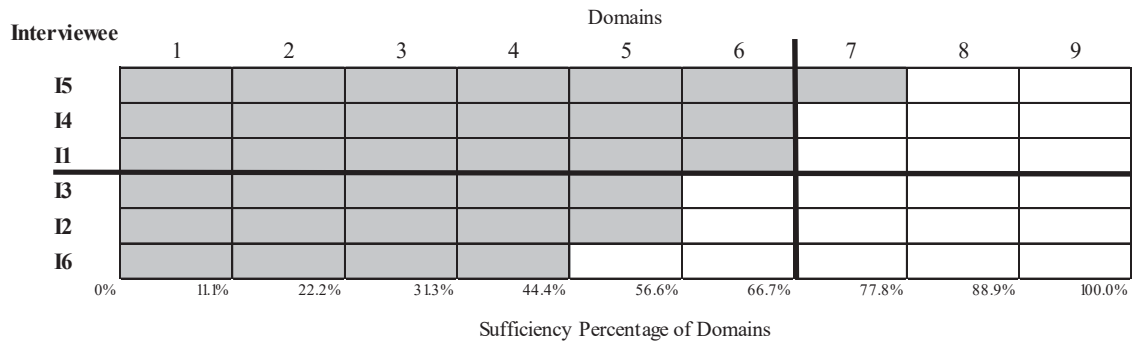


Fig. 6 Gradient of RQ happiness of community heads of household.

Table 5 Calculation of GNH for each questionnaire

Type of Questionnaire	Postgraduate Students	Community heads of household
Extensive questionnaire	0,86	0,91
Reduced questionnaire	0,93	0,76
Calibrated questionnaire	0,83	0,93

4 Conclusion

For this calibration proposal, it was evidenced that the target population influences the variations of the domains that must be calibrated. The calibrated reduced questionnaire proposed for data collection proved to be not only faithful to the original questionnaire, but also practical, since it is possible to reduce the data collection time by 6 times compared to the extensive questionnaire.

This type of research instrument can be used as a subsidy for public and private agents, enabling individual, community and, especially, government actions that positively interfere with the happiness of communities.

As a theoretical contribution, new questionnaires can be elaborated for application in different situations or different communities using this calibration method. This will provide greater robustness to the search. In addition, as a practical contribution, the application of this calibration method may be useful for reducing a questionnaire when appropriate. Applying reduced questionnaires to certain audiences can be an opportunity to increase the efficiency of collecting information.

Calibration allows the evaluation of different populations, both in nature and in size, using the same domains developed by the Bhutan Studies Center and, thus, makes it possible to integrate happiness measure to sustainability assessments and / or combine these measures with capital use assessments necessary to ensure resources,

energy for the well-being of human beings.

This research was limited to population and sample. In addition, it is limited to the use of happiness questionnaires with the GNH analysis. Future research may be performed for calibration based on other happiness questionnaires, as well as applied to another population with different sample sizes.

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APPENDIX

Table A1 Comparison of questionnaires of the extensive and reduced questionnaire.

Domains	Indicator	Number of question - EQ	Weight EQ	Number of question - RQ	Weight RQ	Difference
Use of time	A1 - Work	9	50%	5	50%	4
	A2 - Sleep	4	50%	3	50%	1
	B1 - Basic services	6	40%	4	50%	2
Good governance	B2 - Political participation	4	40%	2	50%	2
	B3 - Government performance	11	10%	-		11
	B4 - Fundamental rights	6	10%	-		6
Ecological Diversity	C1 - Urban themes	14	40%	8	50%	6
	C2 - Damage to wildlife	9	40%	6	50%	3
	C3 - Ecological themes	5	10%	-		5
	C4 - Environmental responsibility	5	10%	-		5
Life standard	D1 - Income	2	33%	2	33%	0
	D2 - Goods	7	33%	2	33%	5
	D3 - Housing	8	34%	3	34%	5
Psychological well-being	E1 - Spirituality	5	40%	3	50%	2
	E2 - Satisfaction with life	7	40%	6	50%	1
	E3 - Positive emotion	7	10%	-		7
	E4 - Negative emotion	9	10%	-		9
Education	F1 - Schooling	1	30%	1	50%	0
	F2 - Degree of instruction	1	30%	1	50%	0
	F3 - Knowledge	11	20%	-		11
	F4 - Value	21	20%	-		21
Cultural diversity	G1 - Manual skills	1	30%	1	50%	0
	G2 - Cultural participation	3	30%	2	50%	1
	G3 - Native language	1	20%	-		1
Community vitality	G4 - Etiquette and conduct	7	20%	-		7
	H1 - Donation	2	30%	2	50%	0
	H2 - Safety	4	30%	3	50%	1
	H3 - Community relationships	5	20%	-		5
Health	H4 - Family	6	20%	-		6
	I1 - Healthy days	2	30%	2	30%	0
	I2 - Deficiency	1	30%	1	30%	0
	I3 - Mental health	14	30%	13	30%	1
	I4 - Self-reported health	9	10%	9	10%	0
Total		207	1	79	1	128

Table A2 Comparison of calibrated questionnaires for graduate students and community heads of household.

Domains	Indicator	Number of questions - postgraduate students	Weight	Number of questions - community heads of household	Weight
Use of time	A1 - Work	5	50%	5	50%
	A2 - Sleep	3	50%	3	50%
Good governance	B1 - Basic services	4	50%	4	50%
	B2 - Political participation	2	50%	2	50%
Ecological Diversity	C1 - Urban themes	9	44%	8	50%
	C2 - Damage to wildlife	6	44%	7	50%
	C3 - Ecological themes	3	12%		
Life standard	D1 - Income	2	33%	2	33%
	D2 - Goods	2	33%	7	33%
	D3 - Housing	3	34%	8	34%
Psychological well-being	E1 - Spirituality	5	40%	3	50%
	E2 - Satisfaction with life	7	40%	6	50%
	E3 – Positive emotion	7	10%		
	E4 - Negative emotion	9	10%		
Education	F1 - Schooling	1	50%	1	30%
	F2 - Degree of instruction	1	50%	1	30%
	F3 - Knowledge			4	20%
	F4 - Value			2	20%
Cultural diversity	G1 - Manual skills	1	30%	1	50%
	G2 - Cultural participation	3	30%	2	50%
	G3 - Native language	7	20%		
	G4 - Etiquette and conduct	1	20%		
Community vitality	H1 - Donation	2	50%	2	30%
	H2 - Safety	3	50%	3	30%
	H3 - Community relationships			5	20%
	H4 - Family			6	20%
Health	I1 - Healthy days	2	30%	2	30%
	I2 - Deficiency	1	30%	1	30%
	I3 - Mental health	13	30%	13	30%
	I4 - Self-reported health	9	10%	9	10%
Total		111	1	107	1