Enhancing the Delphi method in Health decision-making: Designing a Methodology to get Insights from Participants' Text Answers

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Abstract

There are several ways of engaging health stakeholders in the process of decision making, one of them is the Delphi Method. In this method, worldwide participants can advocate for their points of view and discuss them. However, in the traditional Delphi that encloses a first open round, the analysis of the participants' answers is very time consuming and prone to numerous biases in the analysis as it is usually performed manually by analysts without any form of automatizing, which leaves scope for improving. This thesis proposes a methodology to automatically process answers from a Delphi which will ultimately enhance participation and collaboration in Health decision-making. The EURO-HEALTHY project that aimed for the development a Population Health Index (PHI) the construction of scenarios to inform the evaluation of policies, was used as a case study. The methodology of this dissertation has four phases and was based in the case study; first the gathering of information from the Web-Delphi and to define the criteria to be a driver, after to perform automated insights using NVIVO, a software of qualitative analysis, to obtain potential drivers, filtering the data and refine the clusters and last to analyze the results obtained. Following the methodology described on this thesis 9 themes emerged with 218 drivers associated, compared with 6 themes and 178 associated drivers derived from the EURO-HEALTHY package. Three of these themes were the same in this dissertation an in the case study namely Economic, social and environmental. In this work, it was possible to automatically gather results without the bias of the analysts while decreasing the time of analysis.

Keywords: Methods of Data Collection, Delphi, Content Analysis, NVIVO, EURO-HEALHTY;

1. Introduction

There are a lot of different participation methods: individual and group participations methods. The problems of individuals methods are that the input comes from only one person and with that the diversity of opinions decrease (Jorm, 2015). In the group participation methods, there are different opinions that comes from different heads. These type of methods are presential and to join a group of people in the same room at the same time is quite difficult (Jorm, 2015).

Health participation is a topic that has been gaining traction and consists on individuals being entitled to participate in the health decisions that directly affect them, including the design, implementation, and monitoring of health interventions (Cook et al., 2018). Deciding for a treatment, for a hospital or

even for a doctor are problems that can be reduced if patients have the necessary knowledge on the field. If this happened, patients are empowered to manage their own health and health care as well as the health of their families. Patient participation, redistribution of power and acknowledging the patients competency regarding this topic are the main topics of patients empowerment (Kvæl, Debesay, Langaas, Bye, & Bergland, 2018, p.3).

This master thesis intends to enhance participation and collaboration in Health decision-making through the development of a methodology to get insights from participant's answers obtained within the context of implementing the Delphi method; The methodology is developed for the context of a study about Health inequalities across Europe. For that, the information generated in a previous research study developed in the context of the EURO-HEALTHY research project is used and a process of content analysis will be made (Alvarenga et al., 2019).

2. Literature Review

The Delphi method consists in gathering specific and complex information from experts that work in different fields (Renzi & Freitas, 2015). In the Delphi method, each participant will fill a questionnaire that was previously made by the researchers of the study and then return it to the facilitator. After this, the experts will receive feedback with the whole set of responses. After this feedback, and in another round, they fill the questionnaire again and have the opportunity to revise their initial beliefs or provide the other members of the Delphi

panel with better explanations on their own point of view. This process will be repeated as many times as needed; however, the stopping criteria is usually defined at the start of the process to know when to finish the study. The goal is that the entire group can benefit from the different fields of expertise of the panel. Thus, in most Delphi processes the amount of consensus increases from round to round (Slocum, 2003).

Content analysis is defined by Shannon as a "research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Shannon,2005, p.1278.). Through this technique is possible to make replicable and valid inferences from the data, provide understanding of the subject and as an outcome categories describing the phenomenon (Elo & Kyngäs, 2008). The conventional content analysis is mostly used in open-ended questions and interviews. In this case, the coding categories are directly obtained from the text data. (Shannon,2005).

3. Case-study

3.1- Overview of the Case-study Methodology: The EURO-HEALTHY Study

The EURO-HEALTHY project stands for 'Shaping EUROpean policies to promote HEALTH equitY' and proposed "a multicriteria Population Health Index (PHI) as a tool to help reflecting upon the future of PH inequalities and to assist policy evaluation" (Alvarenga et al., 2019, p.3). To meet this objective the EURO-HEALTHY project had the aim of developing a

Population Health Index (PHI) and after building the PHI a construction of scenarios to inform the evaluation of policies (Alvarenga et al., 2019). The EURO-HEALTHY methodology to build scenarios for population health inequalities can be divided into three main steps: the identification of the drivers- from experts' and stakeholders' views of drivers-, the generation of scenarios structures- from drivers to scenario structures- and the validation- from scenario structures to scenario narratives. Since the focus of this work is the link between the first round and the second round of the Web-Delphi an explanation of the Methodology for the manually identification of drivers is showed below.

3.2- Methodology for the manually identification of drivers

In this work, the drivers are collected directly from the reasons presented in participants' answers to use in the scenario building. Step one was the gathering of information in a Web-Delphi Study; Step two define the criteria do be a driver; Step three to identify the reasons through the search of coordinating conjunction; step four search for redundancy between the reasons previously identified; step five cluster drivers into PESTLE categories.

3.2.1- Gathering of information in a Web-Delphi Study

The gather of the information happens during the first of two rounds of a Web-Delphi process. The first round had a question protocol followed by an answer analysis and has as an output a list of

reasons that need to be afterwards analyzed to see if it is a list of potential drivers.

3.2.2- Define the criteria to be a driver

To extract drivers from the information extracted from participants, researchers defined four criteria for a driver (Santana, 2017): address a specific issue, to be non-redundant, simple and understandable,

3.2.3-Identify the reasons through the search of coordinating conjunction

After defining the criteria to be a driver, researchers moved to analyze the data and try to identify possible drivers. Three analysts during the EURO-HEALTHY project did this process manually, reading all the text and organizing in an excel file. First, this process was performed by each one of the investigators followed, by an aggregation of the three different results and consequently a discussion of the same subject. The researchers looked for the reasons that the participants gave during the answers of the first round of the Delphi.

3.2.4-Search for redundancy between the reasons previously identified

It is important to look if there was any redundancy between the set of reasons obtained. That is, if the list of reasons has the same reasons but presented in different forms then it should be clustered or discarded. Also, it was checked if the list of drivers followed the criteria to be a driver.

3.2.5-Cluster drivers into PESTLE categories

In the last phase of this methodology the investigators manually assigned categories according to the PESTLE taxonomy. From

the 178 drivers, there was 24 Political, 37 Economic, 76 Social, 12 Technological, 11 Legal and 18 Environmental and that was the input for Round 2. It was important to try to automatize the processing of participants' answers in survey and Delphi contexts since in this case study this step took a lot of effort to the analysts to perform the analysis. For that, one of the purposes of this thesis was to decrease the time consumed at this phase.

4. Methodology

4.1- Proposed General Methodology: A Content Analysis Approach

This work methodology contains a different set of techniques to develop a general methodology that can be used in this case - the EURO-HEALTHY Study- but also in different contexts. In the figure, it is a scheme of a general proposition of the methodology that uses the principles of content analysis refereed in the previous chapter (Shannon,2005).
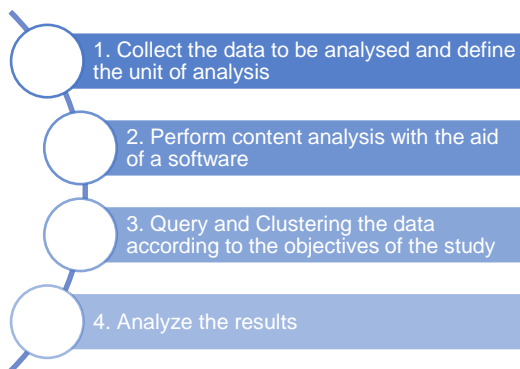

Figure 1- Proposed Methodology based in CA (Shannon,2005)

There are different steps that need to be made to extract insights from the participant's answers. Firstly, step one need to be made and for that data must be in text format, otherwise content analysis can be performed in the next step. In this step there is also a need to know what is going to be analyzed and with what level of detail in order to be able to analyze this data, to code and to identify patterns. For that the unit of analysis is defined, that could be word, sentence or paragraph level which should be chosen according to the aim of the study. In step two a CA is made with the aid of a software for qualitative analysis for example the R Studio, Python or NVivo. The coding categories are directly obtained from the data. The data is clustered according to some similarities between the drivers. Last step is to analyze the results according to the aim of the study. This last analysis is performed by the analyst to reduce some errors or redundancy that could come from the process of CA.

4.2- Adapting the general methodology to this dissertation

To fit the goals of this thesis the steps shown in the previous section need the following adaptations concerning the EURO-HEALTHY: The first step - "Collect the data to be analysed and to define the unit of analysis" corresponds to the Gathering of information from the Web-Delphi to the NVivo software and to define the unit of analysis. The Second step – Perform content analysis with the aid of a software- was made with the aid of the software NVIVO using the automated insights tool. The third step – Query the data according to the objectives of the study and clustering the data- corresponds to the filtering of the data in NVIVO using specific queries. The last step- consist in the final analysis of the data.
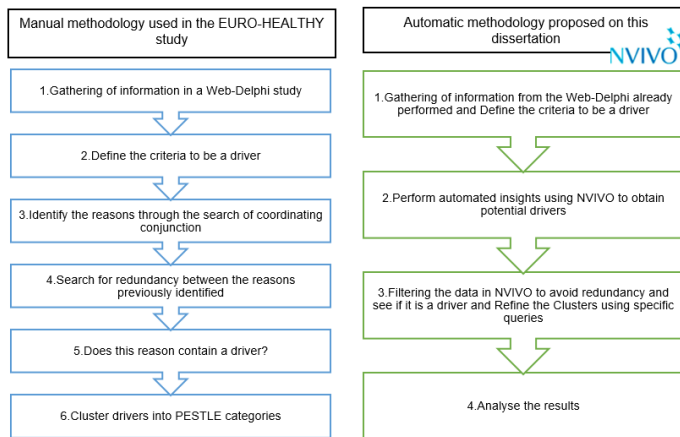
4.3- Methodology applied to the Case-study

Figure 2 - a) and b) Comparison between the methodology for the manually identification of drivers (left side a)) and the proposed methodology to automatically identify the drivers (right side b));

Since one of this dissertation goals is to automate the answers processing of the first round of a Delphi in the EURO-HEALTHY, the methodology used in this dissertation was not only based in the process of CA but also taking into account the case study methodology explained in the case study chapter.

In the figure 2 is an overview of the proposed methodology in comparison with the methodology for the manually identification of drivers defined in the EURO-HEALTHY

4.3.1- Gathering of information from the Web-Delphi already performed and Define the criteria to be a driver

The first step of this procedure consists in importing the data that is going to be analysed from the Web-Delphi platform to NVivo. It is essential to define if the questions posed are in an open or closed format because the closed format corresponds to attributes in the model and the open ones the nodes. The participant's answers were withdrawn from the Web-

Delphi and were codified like an open answer. This field will be a node in the model. The cases in NVIVO were created according to the area of concern referred in the questionnaire which correspond to 9 areas of interest.

4.3.2- Perform automated insights using NVIVO to obtain potential drivers

The results obtained from the automated insight feature are represented in a hierarchical structure correspondent to the nodes of the data that are the themes that emerged from the content analysis. After all this process and analysis, the references from the results will be the drivers found in this study. Because of that, there is a need to check if all the references are drivers and confirm if there is no redundancy.

4.3.3- Filtering the data in NVIVO to avoid redundancy, see if it is a driver and Refine the Clusters using specific queries

This step was performed using queries and filters from the NVivo to study for example, if it has the same references more than one time and if there are references that are the same but written in different ways. In this step, it was also necessary to analyze the themes that emerged from the previous step. Since it was performed CA, it was necessary to understand what words were more common in all the questionnaire independent of the area of concern. For that, the tool automated insight from NVivo was used to determine the word frequency to discover distributions, patterns and to code the themes from the data.

4.3.4- Comparison between this thesis methodology and the EURO-HEALTHY

In this dissertation case, the methodology was reduced from six steps to four. When analysing figure 2 a) and b) it is noticed that the first step is almost the same: gathering the information from the Web-Delphi. In the case of the EURO-HEALTHY package the analysts retrieve the data from the Web-Delphi to an excel file. Step two of the automatic methodology was the main change between the two. This step is the performance of content analysis with the aid of the software NVIVO instead of manually looking for the reasons, the software can identify the main themes of the data acquired, at the same time while identify themes the software is clustering the data. The search for the redundancy was made in the automatic version by filtering the data in the software instead of manually looking for differences between the drivers. Last step is to analyse the data. The results output in Euro-Healthy case and here was the same: a list of phrases with the potential drivers.

5.Results

5.1 - Results from the Content Analysis using NVivo – Step 1 and 2 of the Methodology

The data was collected from the EURO-HEALTHY platform. Then, the data was imported to the NVivo, the unit of analysis was selected, and the feature named automate insights was used to perform content analysis. After performing this, a hierarchical structure was produced according to the relationship between the themes assigned and the references of the themes. The hierarchical structure is node-

that is a theme, sub-node – that is a sub-theme- and references- that are the drivers in this dissertation.

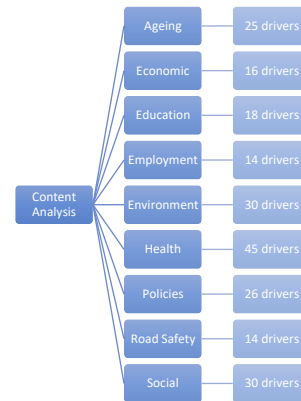### 5.2- Hierarchical Structure produced with the Software NVivo derived from Step 2

Figure 3- Results from the Content Analysis – Nodes and number of drivers

The data was clustered into 9 nodes using the tool automated insights from NVivo that were identified in figure 3. Each theme has drivers associated with a total of 218 drivers. The search for the redundancy was also performed in this step reducing the drivers from 250 to 218. The references in this case were the drivers of this work. The obtained drivers will be compared with the ones obtained from the EURO-HEALTHY Study.

5.3- Comparison between the results from the EURO-HEALTHY Study and the Results from this Dissertation

In the manual process of the identification of the drivers, they were separated by the PESTLE taxonomy. From this process it was extracted 24 Political factors, 37 economic, 76 social, 12 Technological, 11 Legal and 18 environmental from a list of 178 potential drivers the investigators narrow down in the second round of the Delphi to 49 drivers. In the case of this master thesis the data was clustered according to word frequency which

lead to a total of 9 nodes. The nodes obtained here, in some cases, correspond to the area of concern in the EURO-HEALTHY questionnaire. The themes founded corresponds to 5 of the 9 nodes obtained which can mean that the area of concern defined in the beginning is related to the themes emerged in the end of the process and it can lead to the conclusion that in a next Delphi the themes defined in the beginning of the process can define the clusters made in the end. So, it is crucial to be careful in the choice of the areas of concern. The time consumed performing the analysis of the Delphi in this dissertation is lower than in the manual way. The automatic part and some preliminary analysis were made in three weeks and it was performed by one analyst instead of three. It is noticed that there are three themes that are the same in this dissertation and in the EURO-HELAHTY that are Economic, Social and Environmental. The results from these three nodes can be directly compared.

5.3.1- Comparison between the node Economic

The node economic in the EURO-HEALTHY has 37 potential drivers while in this work has 16 which gives 43% of the drivers. From the 16 drivers found in this work and directly comparing with the case study it is noticed a correspondence of 68% between the drivers. These divergences could come from the number of nodes existents in each study and consequently the different themes; In the EURO-HEALTHY study there were some drivers concerning employment in the Economic node but in this work, there is a node that is Employment, so the correspondent drivers are mostly at this

node. The principal considerations having here in both the EURO-HEALTHY and here are almost the same. There is a significant preoccupation with the healthcare since economic conditions affect the healthcare efficiency especially in economically vulnerable countries; Financial crisis and the worsening of economic conditions; income distribution will be worsening and its gap widening; Increase of life expectancy that increases the unemployment in late ages; A general increase in unemployment rates in Europe;

5.3.2- Comparison between the node Social

The node Social in the EURO-HEALTHY has 76 potential drivers while in this work has 30 potential drivers this correspond to 40% of the drivers. From the drivers found in this work and comparing directly with the EURO-HEALHTY it as noticed that 60% were the same. The principal considerations having in both the EURO-HEALTHY and here were a little different since the social node in the EURO-HEALHTY package has more drivers and was a lot more general while in this dissertation there were other nodes the had these drivers such as employment, education, policies and road safety. Nevertheless, there were some drivers that were the same: Increase in smoking among women in Europe; Health problems that comes from obesity like diabetes and hypertension; Inequalities in the access do education; Problems concerning health access; Higher concentration of people at risk of poverty and social exclusion

5.3.3- Comparison between the node Environmental

The node Environmental in the EURO-HEALTHY has 18 potential drivers while in this work has 30 potential drivers. Some considerations from here were a little different since in this work some drivers from the politics from the EURO-HEALTHY appeared in this node. However, there were similar points that were: The green agenda and the green economy; increased concern with the natural resources' efficiency; Decrease in the quality of the built environment

6-Discussion

6.1- Comparison between the manual methodology and NVivo

Since the methodology used in the EURO-HEALHTY was performed manually by three analysts, bias occur. And here was a scope for improving that was to produce a methodology that automatize answers analysis; For that, and to promote transparency in data analysis it was performed content analysis to the answers extracted from the Web-Delphi using NVivo. Using NVivo allowed to extract insights from participants answer without the bias that comes from analyst itself and that are inherits in being a human being. Another difficulty in this work was that the participants were not English native speakers and didn't use formal language; besides that, they were from different fields of study which can lead to even more different opinions ant type of language. The analysis of this type of answer is harder since it didn't follow any pattern. This type of language originates a problem in this thesis that is redundancy which was partially resolved in this work. On the hand, with the aid of queries it was

possible to reduce the redundancy but in the other side a final analysis was necessary by the analyst. The software allowed to perform content analysis and to obtain drivers from the data. It also allowed the decrease of the analysis time in relation to the time that was needed in the case study.

6.2- Nvivo Pros and Cons

One limitation is most of commands in NVivo must be accomplished individually without the possibility to give a general command and apply it to multiple dimensions. Another disadvantage is that it isn't free. On the other hand, NVivo is time efficient, transparent and multiplicity; is able to capture quantitative and qualitative data (Dollah, Abduh, & Rosmaladewi, 2017). One example of the use of this software is a study about the consensus research priorities for paediatric status epilepticus where the answers should be analysed using grounded theory, content analysis and open coding to categorize items into themes and finally, the answers are revised and included in the next round of the Delphi (Furyk et al., 2018).

6.3- Comparison between the EURO-HEALTHY Clustering and the Clustering from this dissertation

In this methodology the clustering is made in the beginning of the process while in the EURO-HEALTHY the clustering was performed in the end. The fact that the clustering was made first reveals to be appropriate since the results converge to a total of nine themes that were the same number that the number of areas of concern defined in the questionnaire. This reveals that the area defined in the beginning of the study will influence the themes that emerged

in the clustering. This finding can lead to the conclusions that the area of concern of the study should be well defined in the begging.

6.3 - Time used by the investigators

For the EURO-HEALTHY study it was necessary three investigators dedicating their time to the project for one month only to the first part of their work. In this dissertation the work was done by one investigator using NVivo. It was necessary not only to learn NVivo but to learn the process of CA and how to aggregate in a methodology the Web-Delphi, CA and scenarios structures what was a complex process. The time consumed in the process of CA itself decreased from one month to three weeks and with only one analyst.

6.4-Level of Detail of each investigation

The case study participants were not English native speakers and didn't follow a particular vocabular; because of that answer analysis is harder since the answers didn't follow any pattern. This fact can lead to redundancy. In the manually investigation to find the drivers from the answers, the investigators look for a coordinate conjunction in a phrase. In this case the search for the drivers was made through word frequency so it didn't necessarily implied causality. To compare the drivers can be difficult because of this difference. Since the drivers were found according to word frequency, it was noticed that it is possible to have the same driver associated with different themes what leads to some redundancy.

7. Conclusions and Future Work

When developing the EURO-HEALTHY project, the investigators found that the work was really time consuming and thought in a way of automatizing this process to decrease this problem. Another issue found by the investigators was the language; Since dealing with qualitative data implies dealing with linguistic and the EURO-HEALTHY participants were not English native speakers, the type of vocabular used didn't follow any pattern which lead to redundancy and to a exhilarating analysis.

The aim of this dissertation was to find the drivers with only one investigator, performing in less time that in the case study and to automatically process the answers from the Web-Delphi. The methodology developed in this dissertation allowed to find the drivers that were needed to go to next round of de Delphi with only one investigator performing the automation phase for less time with the aid of the software of qualitative analysis named NVivo. It was necessary a deep knowlegde of the case study as well as the methodology used and the tecnhiques associated. The types of participation methods were studied in particular the Delphi Method and Scenarios since it was the one used in the EURO-HEALTHY package. It was necessary to study how can a work using a Web-Delphi be automatize and for that a study of methods of text processing was needed. At this stage, it was choosen the Classical Content Analysis as the method to perform qualitative analysis. After that, is was necessary to study how to merge these methods: Web-Delphi, Classical Content Analysis and Scenarios. A study of the methodologies associated to this type of approach were also studied so a final methodology using all of these approach was created. That was one of the

difficulties founded in this work; to study all of these methods and to create a methodology using all of the concepts according to rules associated with each one.

The results that were found in this work were similar to the ones found in the manual work. The themes that arise from the automatic analysis were different from the ones from the EURO-HEALTHY and were similar to the areas of concern defined in the beginning of the questionnaires which can lead to the thought that the areas of concern defined in the begging should be careful defined to help in the analysis afterwards and to help in the definition of the drivers.

This methodology can contribute to other works because it is replicable and easy to follow. It can be used not only by applying the Delphi method but in other methods of data collection like questionnaires. An example where this method can be used is in Census studies promoting a faster analysis of the answers. Using NLP can help when dealing with aspects like redundancy since it is a more advanced way to approach the problem using programming. It can be also another way of finding the drivers instead of using word frequency it can be used NLP to search for the drivers. In general, this thesis achieves the goals of finding the drivers reducing the number of investigators and the time consumed in the anaysis.

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