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Promoting consensus in the concept mapping methodology: An application in the hospitality sector ☆

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ABSTRACT

The concept mapping methodology aims to respond to the non trivial task of conceptualising abstract thoughts by means of a focus group composed by experts from the studied domain. The approach defines a set of general steps that allow experts to lead the generation of ideas, group the ideas in a conceptual map of interrelated concepts using clustering multidimensional scaling and clustering techniques, analysing the quality of the conceptual maps and deciding on a final interpretation. In this sense, this final decision is not trivial because clustering techniques provide a set of potentially conceptual maps so experts must select the one that fits best according to their opinion. For this reason, we present the global index of consensus as an indicator for filtering the most suitable clustering solutions using qualitative reasoning. It promotes the consensus of experts opinions and ensures objectivity in the final interpretation. The index outperforms three of the most well-known clustering validation indexes in a case study focused on the meaning of excellence in the hospitality industry.

This work presents the global index of consensus as an indicator for filtering the most suitable clustering solutions using qualitative reasoning that promotes the consensus of experts' opinions, which is one of the key aspects in the concept mapping methodology. The index outperforms three of the most well-known clustering validation indexes in a case study focused on the meaning of excellence in hospitality.

1. Introduction

The concept mapping methodology aims to respond the challenge of guiding a group of experts in the objective representation of thoughts, ideas or abstract concepts based on promoting their agreement regarding what they consider most relevant in consensus [1,35]. Thus, this method is used to offer clarity and develop a model or specify a conceptual framework and it has been successfully applied in education, social research and management science fields to create conceptual frameworks based on specific aspects [26]. The methodology defines a set of general steps using qualitative and quantitative data to determine a conceptual map of interrelated concepts [27]. Giving a specific topic study through a set question, a focus group composed of experts in this domain generate ideas related to this topic using brainstorming. Next, the focus group have to group and weight the ideas in categories based on their point of view. This information is converted into knowledge using data mining techniques [37], which are applied to identify shared patterns between the opinion of the experts using multidimensional scaling and clustering techniques. It is important to highlight that clustering techniques often return more than one possible solution where each one represents a clustering configuration that groups elements in a specific way. Therefore, the last step is to validate and select the most suitable clustering configuration based on the criteria of the group of experts. Although one of the main benefits of this approach is its flexibility and adaptability, the amount of data that has to be analysed may hinder the tasks of experts because the selection of the best clustering configuration is non trivial and they have to review all the results following the subjective premise "does it make sense to you?" [35], which may compromise the objectivity of the approach.

This paper presents the global index of consensus (GIc) to help experts in selecting the most suitable clustering configuration based

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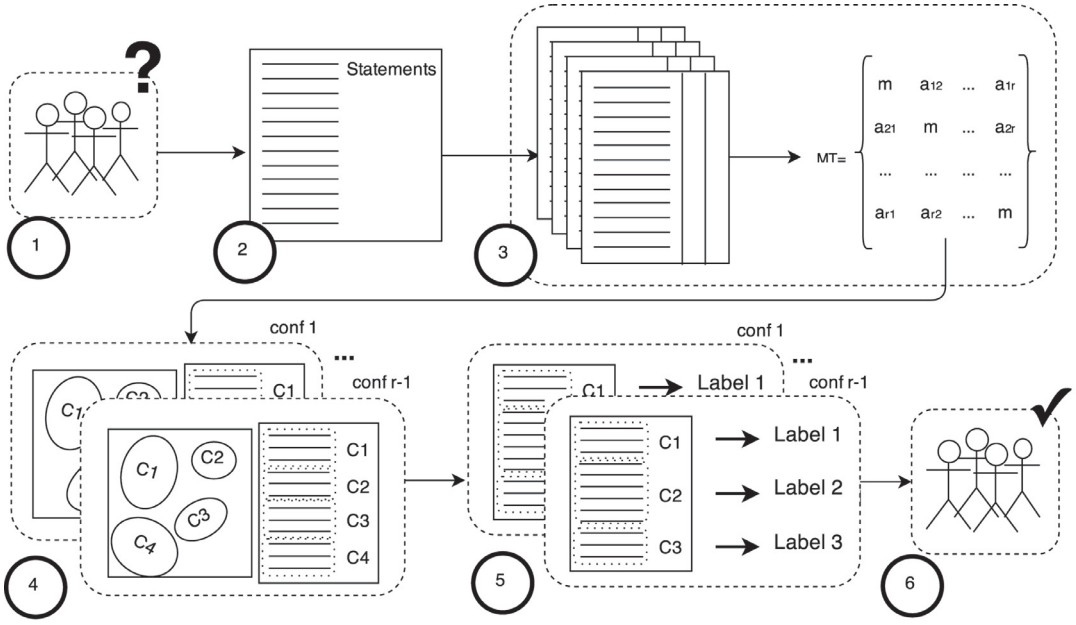

Fig. 1. The concept mapping process is split into 6 steps: (1) A set of experts is selected for finding out the meaning of a specific concept; (2) A list of r ideas is generated through a Brainstorming process; (3) Ideas are evaluated by the experts and this information is used to build a matrix $MT_{r\times r}$; (4) A multi dimensional scaling and a clustering technique are applied over the matrix to project the information in a 2D space. The result is a set of r-1 possible cluster configurations; (5) Experts analyse all the configurations and they label each one of the clusters based on their items; (5) Experts agree on selecting the best concept representation based on the subset of concepts identified (6).

on two of the main premises of the concept mapping methodology: objectivity and consensus. Thus, the knowledge discovery process is drastically improved because experts have to focus only in useful configurations characterised for containing ideas in which the experts agree are similar and with the same relevance. This index is based on qualitative reasoning techniques and the concept of entropy [30]. Qualitative reasoning is a sub area of artificial intelligence that seeks to understand and explain human beings' non numerical evaluations and it also permits to handle with non numerical data preserving the principle of relevance, i.e., each variable can be valued with the level of precision required [33,34]. Finally, GIc is successfully evaluated and compared with respect to other approaches for tackling one of the challenges of the tourism sector: 'what are the main factors that lead to excellence in hospitality?'

This article is structured as follows. Section 2 describes the concept mapping methodology and how quantitative validation index can be used for selecting the most suitable patterns. Section 3 proposes the global index of consensus and describes its bases. Section 4 applies the concept mapping methodology for discovering the meaning of excellence in hospitality, and it also show how this index outperforms the results provided by some of the most well-known quantitative index. Finally, Section 5 ends with the conclusions and further work.

2. Framework

This section summarises the concept mapping methodology and some of the most well-known validation indexes used for the selection of the most suitable clustering solution.

2.1. Concept mapping methodology

Concept mapping was developed by [35] to respond to the conceptualisation needs based on the objectification of opinions and ideas from a group of experts. It uses a methodology which incorporates statistical techniques, such as multidimensional scaling and cluster analyses, and its applications are based on six main steps as indicated in Fig. 1: preparation, generation of statements, structuring statements, representation of statements, interpretation of maps and utilisation of maps.

1. **Preparation**. The aim of the preparation step is twofold. On one hand, clarify the construct for research. On the other, choose the focus group members who will participate in the process. For the best results, the group should contain up of 8–15 participants who are as diverse as possible in order to have different points of view reflected [19].
2. **Generation of statements**. Upon finishing the first step, the participants are invited to offer their ideas regarding on the main topic at hand using a brainstorming session. The development of this phase usually counts on the collaboration of an expert team specialised in group dynamics in order to obtain the best results possible [1,4].
3. **Structuring of statements**. The purpose of this step consists in determining how the different statements raised in the previous process are related. For this, the participants are asked to, firstly, evaluate each of the statements mentioned during the brainstorming session and, secondly, each member had to group the different statements according to their own criteria. For the first part, the focus group members are asked to rate the list of statements using a Likert scale from 1 to 5 [1] according to the degree of adjustment of the statement towards the concept set out. For the second part, participants have to group the list items according to their own criteria and a label that represents the main concept of each group they considered. Once the participants have rated the items and grouped them, a similarity matrix S_{rxr} for each of the participants is created where r represents the total number of statements generated during the brainstorming session. In each intersection, a '1' was introduced if a person in the group had put both items in the same group; otherwise, a '0' was introduced. Next, each individual's matrix is added to create a general grouping matrix as shown in Fig. 1. In the central diagonal there is the total number of participants, and the number of each intersection shows the number of people who put both corresponding statements in the same group independently of their meaning or the criteria used [4].