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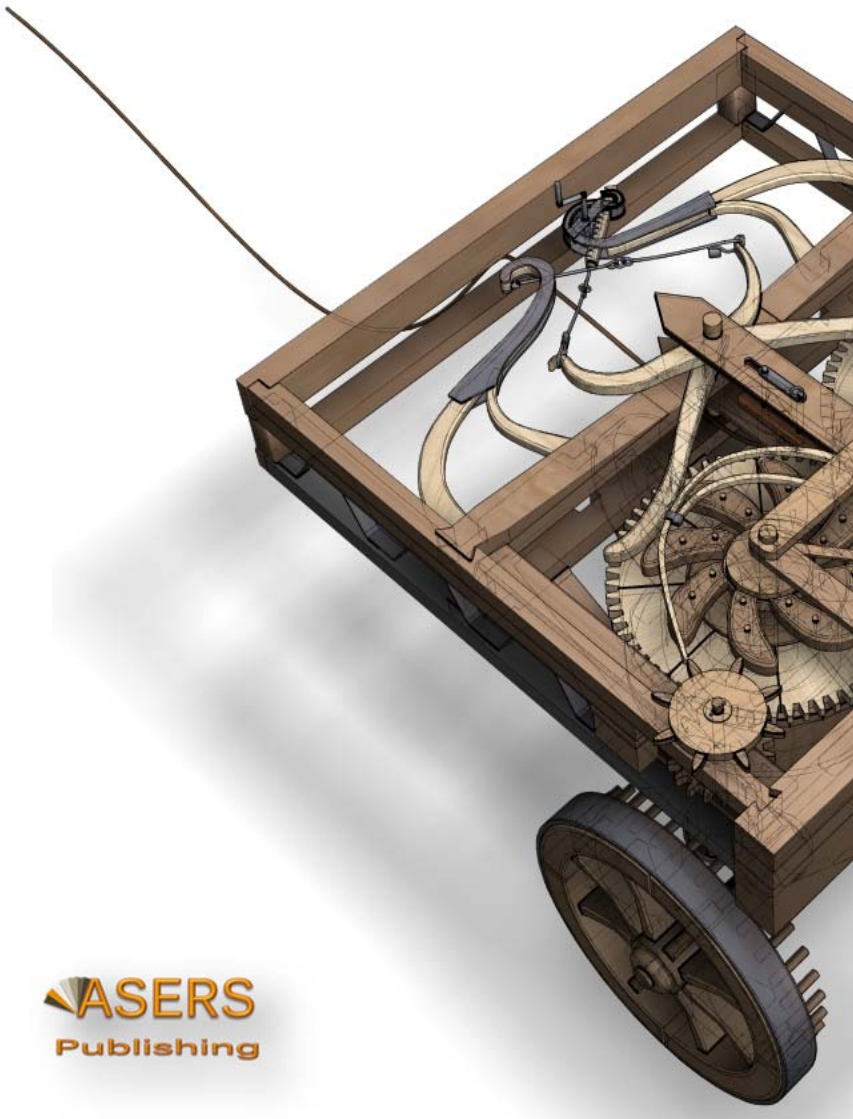

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THE THEORETICAL ASPECT OF DELPHI TECHNIQUES AND AHP METHOD

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Abstract: *Various researchers in Iran, Germany, Central Taiwan, Brazil and U.S have selected to apply the combined Delphi technique and AHP method in their studies. These two techniques have been used to rank and identify factors, elements, importance measurement, expert perceptions of a topic, etc.*

The areas where these studies, and we are based on our analysis, are tourism industry and beverage industry but the focus falls on marketing, social media, content marketing, e-commerce and e-business.

The general purpose of this paper is to address in general terms the Delphi technique and AHP method.

Keywords: Delphi technique; AHP method; factors; experts.

JEL Classification: B40; D78; D81.

Introduction

The Delphi technique functions as a process whereby through this technique to the expert, individually, is required to answer the questions asked for the data and subsequently to be submitted to the Principal Administrator which then will be processed and another questionnaire will be created to respondents and this process continues until the intended consensus is reached. This technique has a characteristic in itself, because the selected experts do not know who the other selected experts are (Grisham 2009). The characteristic of the AHP method is that the extraction of the priority scales is based on the judgments of the experts, a judgment which derives by comparison in pairwise (Saaty 2008).

1. Delphi Method

This technique originated in the early 1950s, which Rand Corporation had used as a predictive tool for the army. The main purpose of this technique is to get answers from a group of trusted experts on a particular dilemma or problem (Erffmeyer et al. 1969; Stitt-gohdes and Crews 2004).

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The Delphi method is characterized by four main features:

- Anonymity - the research participants are anonymous to each other. They are known only to researchers. Participants have no pressure from other participants regarding their opinion and the responses they give;
- Repeatability - provides the experts with the opportunity to change their views based on the findings of the group at a later stage;
- Controlled feedback - informs participants about the views of other experts and provides an opportunity to clarify and change their opinion;
- Statistical processing / aggregation of group responses allows for quantitative analysis and interpretation of data (Rowe and Wright 2001).

This method is accomplished by three consecutive operations, such as:

- Selecting a group of experts;
- Preparation of the questionnaire,
- Method administration

Individuals who have a global view of the problem and who usually combine multiple sources of information should always be given priority. Functional safety is thought to increase with group size and average errors decrease with decreasing group size. The questionnaires contain a mix of open-ended and closed-ended questions, so they are extensive and require deep reflection and personal judgment by experts. What makes this method more original is the fact that experts review their judgments many times, so we are dealing with an iterative process. It is important to maintain the anonymity of individual judgments: no expert knows exactly how the other responded (Ceku and Kola 2011).

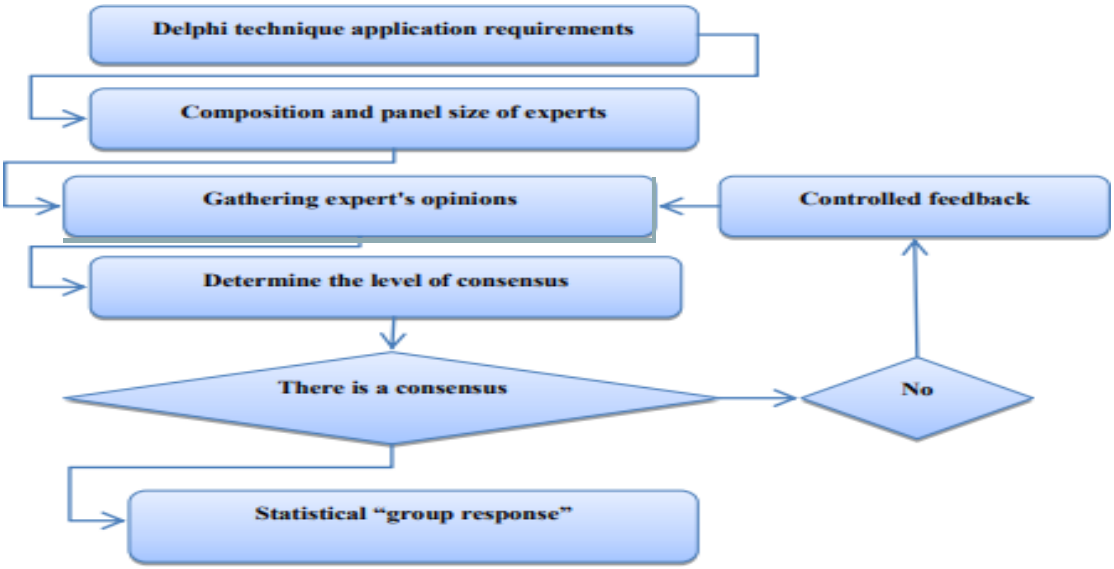
The success of a research applying the Delphi technique is on the careful selection of the expert panel Stitt-gohdes and Crews (2004), it is also thought that judgments made by multiple experts are more accurate than judgments by individual experts (Rowe and Wright, 2001). Qualitative research applies this technique, as we mentioned earlier, which is used to get expert opinion when there is not much information on a particular problem or field. This technique is considered simple in application because it also allows for interaction, but the fact is that this technique takes a long time to apply (Giannarou and Zervas, 2014).

According to Jolson and Rossow (1971) the validity and reliability of the subjective judgment method should be evaluated compared to the available alternatives.

The disadvantage of this technique is the lack of a theoretical framework, but in general a large number of scholars acknowledge that the methodology of this technique is not uniform in application, given the uncertainty about panel size, panel selection. and Delphi stages (Habibi *et al.* 2014).

Also, in his study, Habibi *et al.* (2014) presented a framework for applying the Delphi technique to qualitative decision making, which will presented in Figure 1:

Figure 1 Theoretical framework of Delphi technique in qualitative research

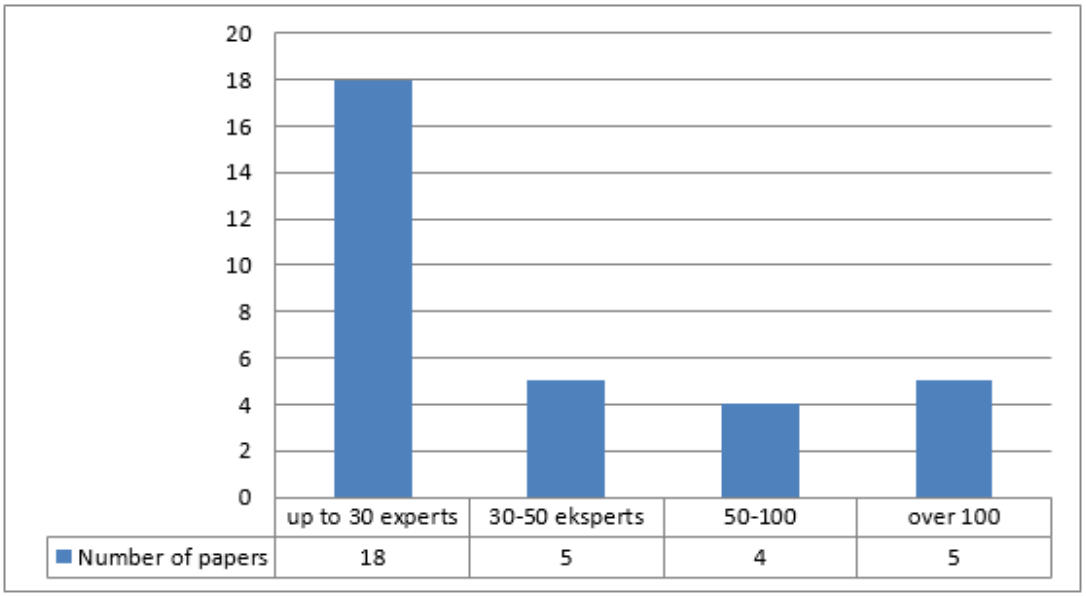


Source: Habibi *et al*. 2014

This framework clearly explains the application and principles of this technique to qualitative research.

In their research Giannarou and Zervas (2014) analyzed the previous 32 studies that applied the Delphi method to elaborate the differences between the number of participants, the number of rounds, and the Likert scale. The following is a summary of the general statistics in Figures 2, 3 and 4, which we derived from this empirical study, with the very fact that there is uncertainty as to panel size, panel selection, and stages in the Delphi technique.

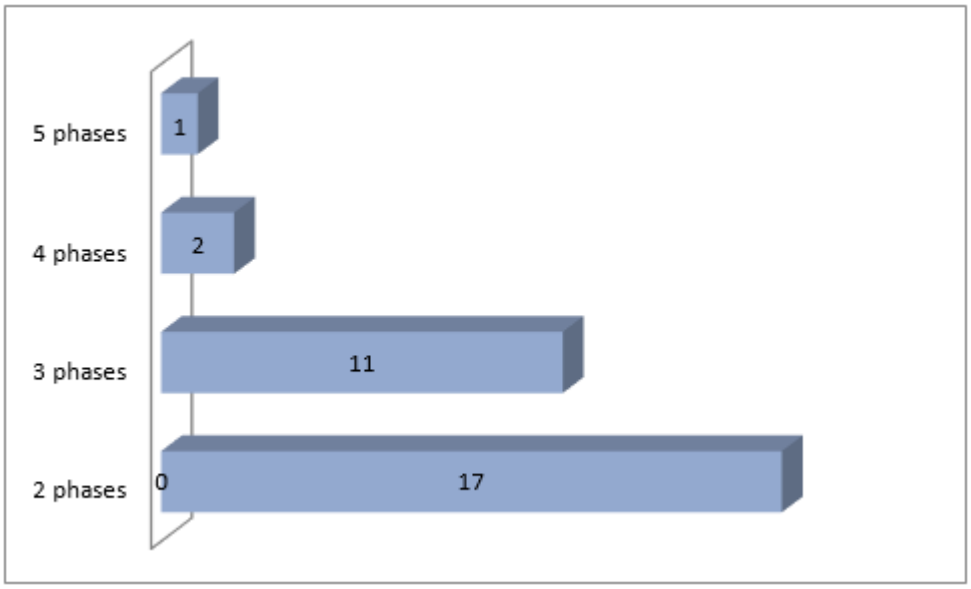
Figure 2. Results of empirical research with Delphi technique for number of experts



Source: Adopted according to the author based to (Giannarou & Zervas, 2014)

From this summary of 32 researches it can be seen that 18 papers have selected no more than 30 experts, 5 papers 30-50 experts, 4 papers 50-100 experts and 5 others have made part of the study of over 100 experts.

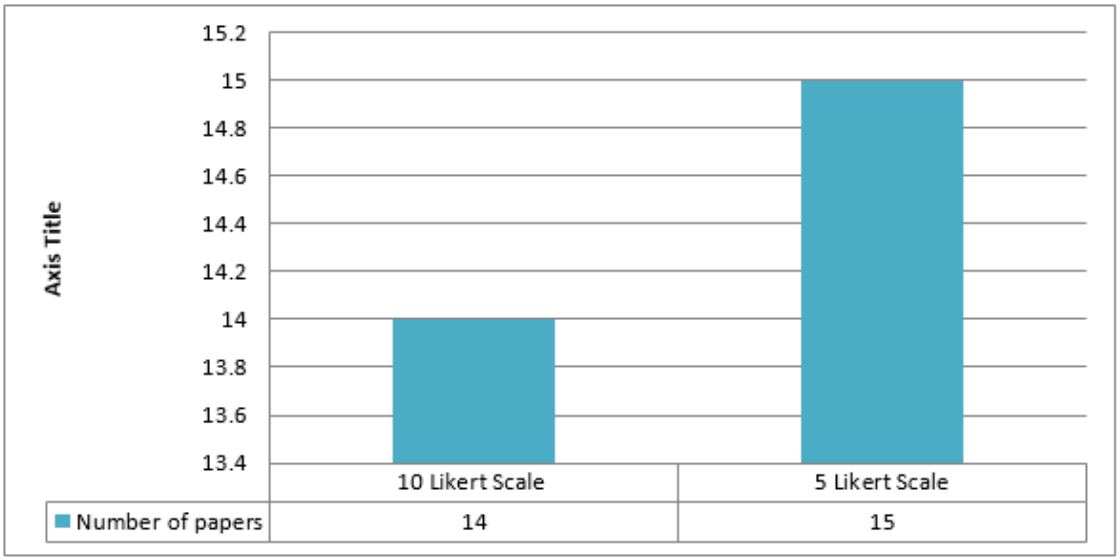
Figure 3. Results of empirical research with Delphi technique for number of research stages



Source: Adopted according to the author based to Giannarou and Zervas (2014)

Regarding the phases of the research, a large percentage have done the research in 2 and 3 phases, and a smaller percentage in the phases 4 and 5.

Figure 4. Results from empirical research with the Delphi technique for Likert scales



Source: Adopted according to the author based to Giannarou and Zervas (2014)

In all the researched works, following the results from the first phase, the questionnaires for the other stages were formulated according to the Likert scale, where 10 and 5 scales were used. The Delphi method functions as a process and is composed of several stages of research, a fact that increases the importance of this technique to be applied by many researchers (researchers in different fields).

The following figure illustrates the process of the research stages according to the Delphi method:

Figure 5. The Delphi method process in the general context

Source: Adopted according to the author and based to Hsu and Sandford (2012)

Researchers, in the first phase of creating the questionnaires, may use an alternative method by directly administering a structured questionnaire. The design of the questionnaire may be based on individual interviews from research conducted or extensive literature review of the topic of interest. In the second phase, subjects are required to review, analyze, and rank information extracted from the first phase of the research. Also, in the third phase they receive a third questionnaire where they are asked to review their previous evaluations to give justifications and rank the statement points (Hsu and Sandford 2012).

2. AHP Method

According to Saaty and Vargas, (2012) AHP is composed by seven pillars:

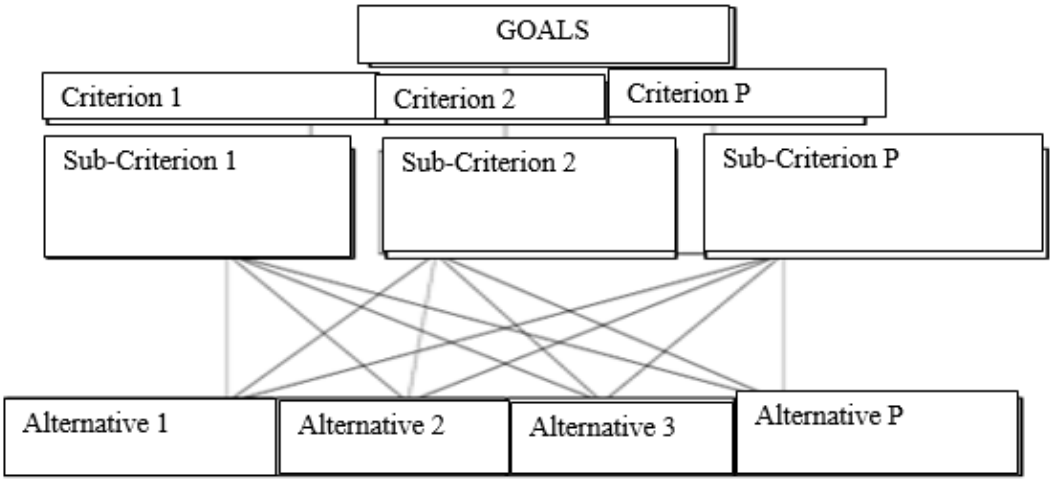
1.Calculation of the report, proportionality and scale normalized ratio
2.Mutual paired comparisons
3.Direct self-vector sensitivity
4.Homogeneity and aggregation,
5.Dependent synthesis and reactions,
6.Maintaining and changing rank,
7.Group decisions (T. Saaty and Vargas 2012) .

The following explains the AHP methodology in six steps:

The first step of this method - The problem is analyzed into a hierarchical structure where at the top level the main goals are set, at the second level the criteria are set and at the third level the sub-criteria, if any, and alternatives at the lower level. This is the most creative and important part of decision making (Bhushan and Rai 2004).

This general hierarchical structure is illustrated in Figure 6 by the AHP method.

Figure 6. Overall hierarchical structure of the AHP method



Sources: Bhushan and Rai (2004)

Describes the relationship between the elements of one level and the elements of another level which is below it. So each element is indirectly related to the other (Bhushan and Rai 2004).

The second step of this method is to determine the relative importance of different attributes / criteria in relation to goals. The basic scale of the AHP method is shown in the table 1.

A scale that determines how many times one element is more important or dominant over another than the criterion or property with which they are compared. This scale has the properties of the ratio scale which is composed of 9 points.

If attribute A is evaluated as absolutely more important than the other attribute B where it is evaluated with 9, it will turn out that attribute B will be absolutely less important than attribute A where it will be evaluated with 1 (Mousavi 2012).

Step Three builds a set of two-sided comparative matrices as ratios (Shrestha *et al.* 2004) .

In the step four the relative weight of the various criteria and sub criteria that are also compared to the evaluations of the alternatives is determined, an importance which is defined through the main eigenvalue (Bhushan and Rai 2004; Hamidi 2016) .

While in the fifth step assess the order of the order matrix n. In this method the comparisons made are subjective so AHP tolerates discrepancies through the amount of redundancy in access (Bhushan and Rai 2004; Hamidi 2016).

Table 1. Rate report

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
2	Weak	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity *i* has one of the above nonzero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*	A reasonable assumption
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining *n* numerical values to span the matrix

Source: Saaty and Vargas (2000)

In step six the evaluation of each alternative is multiplied by the weights of the sub-criteria and collected to obtain local estimates for each criterion. Then, local estimates are multiplied by the weight of the criteria and collected to get global estimates (Bhushan and Rai 2004, Hamidi 2016).

3. Review of the Literature on the Application of the Delphi Technique and the AHP Method

In his research Mousavi (2012), applied a combination of the Delphi technique and the AHP method, selecting 30 experts to identify the influencing elements that influence the e-marketing strategy in tourism, which extracted many variables which were then summarized into three factors, in third stage, to make the ranking.

The AHP method and the Delphi method have been used to evaluate the strategy formulation for the nine recreational areas in central Taiwan. This research provides information on competitiveness assessment in different recreational areas (Lee and Liu 2011). In their studies Chen and Wang (2010), have subsequently selected AHP and Delphi for proposing a comprehensive framework, with specific business elements, highlighting the six performance indicators in adapting the business strategy.

The Delphi method has been selected by researchers (Palazzo and Vollero 2015), in order to create an overall picture of content marketing.

A triple-blind study, based on the Delphi method, was conducted to identify and evaluate factors related to the use and interventions in internet (Brouwer *et al.* 2008).

In his study Pagani (2009) included 40 leaders in the US and Europe, aimed at tackling the uncertainties arising in the wireless 3G industries. The findings have identified the underlying trends and useful uncertainties in the development of corporate or business strategy. Also, in order to identify and evaluate the factors that influence the skills gap in the field of digital marketing, in their study Ghotbifar *et al.* (2017), as the most appropriate, have selected the Delphi method. In their research Bakhshimazdeh and Alikhasi (2015), have selected the Delphi and AHP method to identify and rank strategic and organizational factors. Also Varini K., (2006), to see how experts perceive the impact of ICT on hotels to maximize the contribution achieved,

specifically, from the sale of their rooms have applied the Delphi method. Their study, since it was among the most important motivational factors that influence the selection of commercial sites by consumers (users) to buy online, Delphi method has been used as most appropriate for this nature of the study (Klaiber *et al.* 2015).

To reach consensus on the proposed objectives, strategies and key performance indicators in their research (Helmink 2013), they conducted the research in two rounds using the Delhpi method. Whereas, Safa *et al*. (2013), to identify the main problems faced by horticultural products during the implementation of e-commerce, conducted the study in four rounds according to the Delphi method by panel members.

Likewise, to design an e-marketing framework in the beverage industry, Maniyan *et al.* (2015) have used the Delphi method, selecting populations from faculty members and managers working in the beverage industry. beverages in Iran. From this study it emerges that the main criteria in implementing e-marketing are business strategy, e-marketing planning, and consumer interpretation.

In their study Serra *et al.* (2013) using the Delphi method, interviewed 12 specialists to understand how firms in Brazil in 2015 will use social media to achieve their goals. Also, in their paper Mejía Trejo (2017), applied the Delphi and AHP method over a 4-month period and included 200 business experts to determine the key variables of e-Business Innovation (eBusiness) for SMEs, since 2016.

Conclusion

There are four features of Delphi method characteristic: participant anonymity, repeatability, controlled responses and statistical processing / collection. This method is also carried out through three operations by selecting a group of experts, preparing the questionnaire and administering the method. Experts have the opportunity to review their opinions many times through the iterative process.

The AHP method is considered to be one of the most important decision-making methods by which the report rates from paired comparisons are derived. The ratio scale is derived from the main Eigen vector and the sustainability index is also derived from this vector. This scale is made up of 9 points by which it is more important to determine an element than another element in relation to the criterion to which it is compared.

Based on empirical research we conclude that Delphi technique, together with AHP method, is applied in combination when researchers aim at: identifying specific elements and strategic factors, measuring the importance of factors, evaluating strategy formulation, observing expert perceptions of a topic and reaching consensus on objectives, strategies and performance indicators, etc.

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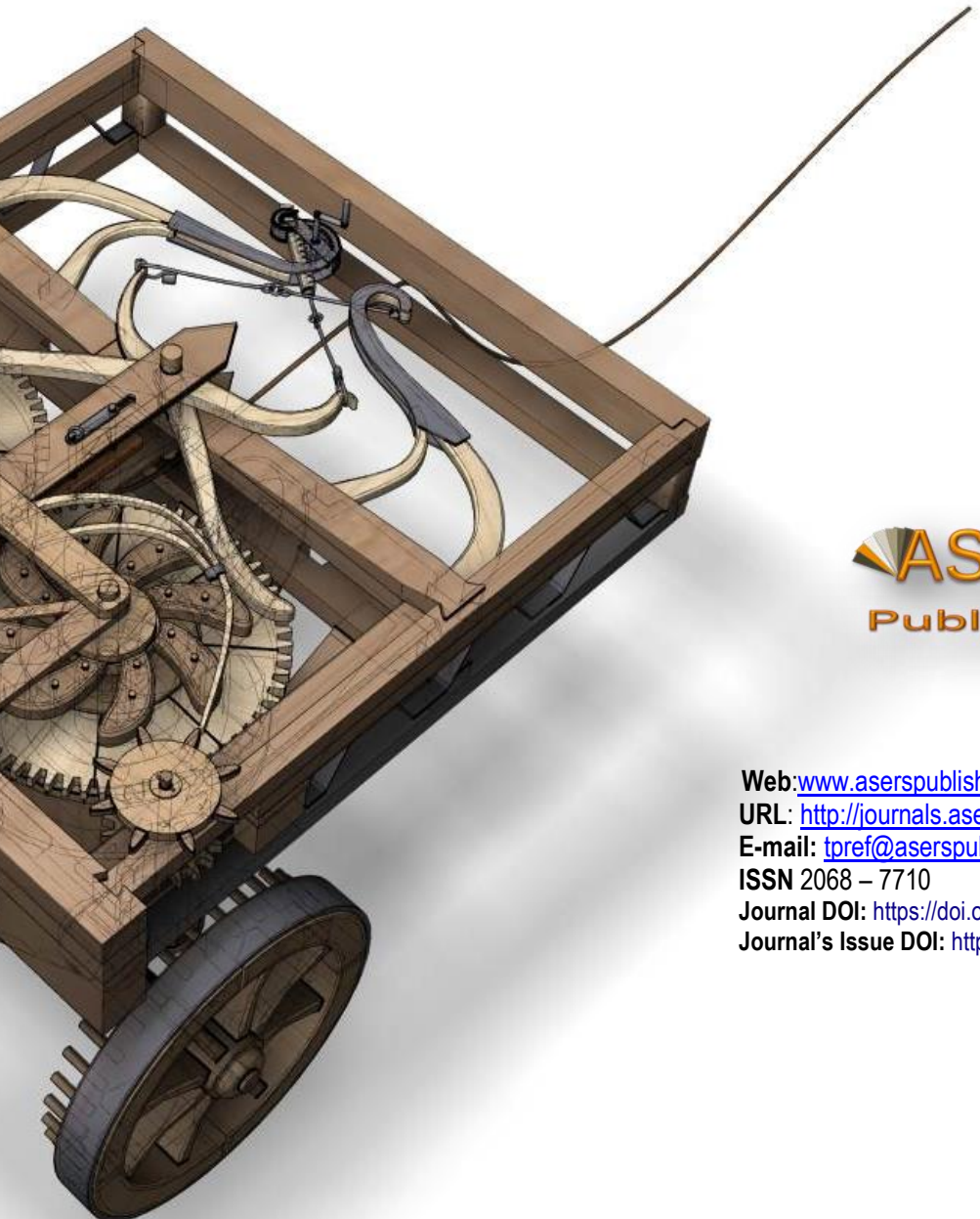

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