**World Bank Indicators Country Index Hierarchy Management**

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**Abstract:** The paper represents results of conceptual analysis and construction of World Bank data indicators. There are more than 500 factors which help for developing countries hierarchy that experienced banking crises in the period 1980-2014. The analyzed data are World Bank indicators having all factors in the periods before the onset of crises. The work is done by qualitatively and conceptual analysis and calculation of all future factors into main six sub factors from those which are controlling countries overall economy.

This will allow for more systematic and integrated approaches to addressing economy as well as long-term development. In order to minimize unintended harm to the natural resource base of these countries economic, social, environmental, science, trade and commerce, agricultural issues should be addressed and developed together.

Key words: Indicators; Factors; AHP analysis; Saaty’s table; Conceptual hierarchy; Country index.

**I. PROBLEM STATEMENT**

Multiple index profiles of World Bank data are converted into single index profile using multi-criteria decision making.

**II.** **INTRODUCTION**

If we try to find out how a country is progressing then the factors which define the country index are too many. One has to identify important factors that contribute towards economic growth of a country. World Bank has provided data for all these factors over 34 years, in some cases 50 years, for 201 countries.

Through this paper, an attempt is made to identify important factors which contribute towards economic growth of a country. Analytical hierarchy process (AHP) is used to classify these factors into various groups. A hierarchy is derived for all these factors and weight age of each factor is identified using Saaty’s procedure.

**III. LITERATURE REVIEW**

* The analytical hierarchy process consists of the following basic steps(1)

I) Problem formulation – the ultimate goal of the AHP is defined. In this paper, it is the determination of country index based on world bank data .Contributing factors are then identified. These factors are further divided into sub factors. The major factors and sub factors responsible for deriving country index are identified based on their weightages.

II) Facility segmentation – The data indicators are divided into different sections based on their peculiar similarities. The different sections are the alternatives of the decision making process. Collection of information required is divided into physical data, construction data, operational data and inspection data.

III) The next step is the development of a hierarchy structure.

* When we evaluate or classify certain objects, we often use a conceptual hierarchy which has various items (concept) at its nodes. If the target of the evaluation/classification has more complicated features, we need a more complicated conceptual hierarchy. And currently most conceptual hierarchies are constructed qualitatively. (2)
* There are three ways to build a conceptual hierarchy. The first one is to draw a hierarchy directly from a person’s mental image for that person has a deep knowledge of the problem area and is accepted as an expert. Another way is to draw a hierarchy by reaching consensus through a panel discussion which consists of a group of experts in the problem domain. The third method is to derive a hierarchy from a database which contains primitive knowledge about the conceptual elements of the problem domain. If the database renders the application of knowledge discovery techniques such as data mining, factor analysis, clustering, and so on.(2)
* AHP model is a multi level hierarchical structure, and according to the difference of the objectives and function of the objectives and function of the aim, the hierarchy is divided into target layer, rule layer and guidelines for different levels of layers. The World Bank data having indicators as a target level of output indicators, and take the relevance efficiency, effectiveness and sustainability indicators as a content of rule level.(3)
* The AHP and its use of pair wise comparisons has inspired the creation of many other decision-making methods. Since the early days it became apparent that there are some problems with the way pair wise comparisons are used and the way the AHP evaluates alternatives.(5)
* The princeple and philiosophy of the theory are summarized giving general background information of the type of measurement utilized, its properties and application.(6)
* Papers are categorized according to the identified themes, areas of applications. The references have also been grouped region-wise and year-wise in order to track the growth for AHP applications. To help readers extract quick and meaningful information, the references are summarized in various tabular formats and charts. Some key and basic steps involved in this methodology are: State the problem, Broaden the objectives of the problem or consider all factors, objectives and its outcome, Identify the criteria that influence the behavior, Structure the problem in a hierarchy of different levels constituting goal, criteria, sub-criteria and alternatives.(7)
* The AHP consists of three main operations, including hierarchy construction, priority analysis, and consistency verification. First of all, the decision makers need to break down complex multiple criteria decision problems into its component parts of which every possible attributes are arranged into multiple hierarchical levels. After that, the decision makers have to compare each cluster in the same level in a pair wise fashion based on their own experience and knowledge. (8)
* Analytical hierarchy process is a structured technique to manage complex decisions. AHP is used in various fields. It is used worldwide in the fields such as government, commerce, industry, health and education. It has been used in many decisions in the field of economy, energy management, environmental, transport, agriculture, industry and the military ones.*(9)*
* The Analytic Hierarchy Process (AHP) is a multi-criteria decision making (MCDM) method that helps the decision-maker facing a complex problem with multiple conflicting and subjective criteria.(10)

**V. METHODOLOGY:**

World Bank data indicator consists of more than 500 factors for 34 years and some cases more than 34 years of 201 countries. Hierarchical network models are iterative algorithms for creating [networks](http://en.wikipedia.org/wiki/Complex_network) which are able to reproduce the unique properties of the [scale-free](http://en.wikipedia.org/wiki/Scale-free_network) [topology](http://en.wikipedia.org/wiki/Network_topology) and the high [clustering](http://en.wikipedia.org/wiki/Clustering_coefficient) of the [nodes](http://en.wikipedia.org/wiki/Node_%28graph_theory%29) at the same time. All these factors are divided into six most important contributing factors those are agriculture, social, science, finance, trade and commerce and environment according to their contribution for growth of economy in each sector. These factors are further divided into sub factors using conceptual analysis of qualitative analytical hierarchy process (AHP) for data formulation and segmentation according to their similarities in nature of data.

It is impossible to display all factors in the hierarchy. All the factors are represented in coded form just for the sake of simplicity. Main factors are coded as A, B, C, D, E, F and next level of sub factors are coded as per clustering of factors at their node.

**IV. DATA COLLECTION**

For studying country index most contributing factors which have been identified for statistical analysis are in Fig. (1) . These factors are broadly classified into six major factors:

Fig. (1)

All future factors including most contributing factors also some cases repeated

factors are there as shown below in the form of hierarchy in Fig. (2),

**VI. HIERARCHICAL TREE OF WORLD BANK INDICATORS:**

Fig. (2)

**A. HIERARCHY TREE FOR AGRICULTURAL FACTORS**

All future indicators of country agriculture having 90 factors which are again divided into main two sub factors i.e. agriculture values and arid effectiveness. Sub factors are arranged as per relational similarities and conceptual analysis of factors which are land area, crop production, raw material, official flows, life expectancy, employability using AHP model towards their main factors which shown in fig. (3).

Fig. (3)

**B. HIERARCHY TREE FOR SOCIAL FACTORS**

Social factors consist of more than 200 factors which divided into main six main factors. Which are further sub divided into next level of hierarchy according to conceptual data analysis of factors like social development (rural + urban development), gender, health, education, literacy rate etc. All factors cluster together in one node as per relational data base similarities within the factors shown in fig. (4).

Fig. (4)

**C. HIERARCHY TREE FOR SCIENCE RELATED FACTORS**

Science consists of 22 future indicators which developed using conceptual analysis of clustering data in one node. First science divided into two main factors of energy and mining, science and technology which further divided into 22 sub factors as per inter relational similarities within factors using multi criteria decision making like energy production, energy consumption etc which shown in fig. (5).

**Fig. (5)**

**D. HIERARCHY TREE FOR FINANCE RELATED FACTORS**

Finance has main three factors economy and growth, external debt and finance sector which clustering at one node by taking 92 sub factors. All factors are aligned as per their conceptual similarities using Saaty’s method in AHP which shown in fig. (6).

**Fig. (6)**

**E. HIERARCHY TREE FOR TRADE and COMMERCE FACTORS**

Trade and commerce consists four main factors which again sub divided into 109 sub factors of all future indicators. These factors are arranged according to qualitative analysis of data similarities using AHP displayed in fig. (7).

Fig. (7)

**F. HIERARCHY TREE FOR ENVIRONMENTAL FACTORS**

In figure (8) Environmental factor consists of main two factors environmental effects and climate change which clustering in one node taking 97 sub factors as per their relational and conceptual similarities within the factors using AHP.

Fig. (8)

**VII. CONCLUSION:**

The data available on World Bank site is enormous and it is very difficult to derive any conclusion from it. In this paper all the factors which are responsible for identifying growth of a country are classified into groups. A hierarchy is derived for all these data. The hierarchy thus derived will be useful in identifying country index and economic growth of any country.

**VIII. FUTURE SCOPE:**

* This hierarchy helps for getting each country data easily from this newly made single index profile comparing to current multiple index data indicators of World Bank data.
* It also helps for taking decision of factors which are mostly contributed for countries economy growth.
* From this hierarchy we can further sort data using qualitative and quantitative methods which decides countries position comparing to other countries.

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