Statistical Model of the Assessment of Cultural Sustainable Development in Urban Areas, Case Study: Tehran

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Abstract

In this paper, a statistical model to evaluate cultural sustainable development in urban areas has been developed which is novel, localized for Tehran and applicable and viable for questionnaire based research. Firstly a benchmarking study was performed among available models of sustainable development including culture in different countries and cities around the world. From the managerial point of view to perform a development program; it has been necessary to study historical development trends and the current situation of Tehran and roles and goals of urban management and its cultural missions. Based on these features some new indicators have been developed to evaluate interaction between cultural, social and economic elements of sustainability in urban areas which is specially customized for Tehran. Finally to evaluate the model, based on the developed indicators, main and relevant hypotheses of the research have been created and a questionnaire is developed and verified to be valid and reliable. Random sampling is done from a reference group of people from Tehran. For examining the hypotheses a T test has been used and for ranking the cultural parameters the Friedman Test has been used, based on these the main Hypothesis and 7 relevant hypotheses have been verified and the effective parameters have been ranked.

Keywords: culture, sustainable development, urban management

1. Introduction

Paying attention to cultural dimension of development initiated from Mexico City conference that during that a decade for cultural development was announced under the supervision of UN and UNESCO. According to the final declaration of this conference, since culture is a main part of people's life, therefore sustainable development must have a cultural dimension. Accordingly, culture is not only considered as a factor of development among other factors but also as the main pillar, motivation and final target of development.

There are many interrelated cultural factors that should be analyzed in a development process such as: economic growth, culture and globalization; ethics, democracy and development objectives; ethnic conflicts, indigenous peoples and the rights of minorities; environment and inter-generational ethics; values, customs and gender, culture and the growth of cities; and culture and the information highway [1]. Cultural factors of development include all the social-mental elements that similar to scientific, technological and economic elements may end in improvement of material and spiritual life in society in general and urban areas in particular. Cultural factors occur without any sudden change in life style or way of thinking and at the same time play an essential role in urban, regional and national infrastructure development plans. Urban Human Security which is defined as "to enable [cities'] inhabitants to live under better public health conditions, and live free from potential threats of large-scale disasters and environmental destruction..."[2], could be fostered in the same way.

The United Nations estimates that the urban populations of Africa, Latin America and Asia will double from 1.9 billion in 2000 to some 3.9 billion in 2030, at which point over 60% of the world's population will live in cities [3]. The megacity of Tehran, capital of Iran, is the largest and most populated city in Iran. It has been growing rapidly in recent decades but the infrastructure has not developed at the same rate and the resulting development has not been sustainable. Thus Tehran, like most of the developing Megacities, suffers from environmental, social, economic and cultural problems. Tehran suffers from non-integrated management. For example apart from Tehran's Municipality, more than 28 other entities are engaged in cultural affairs in Tehran because it is not understood in the first instance how culture is related to the sustainable development in Tehran and secondly how it should be managed in connection and interaction with other development dimensions. The first step for better understanding is making a real assessment of cultural development in Tehran. To do this, it is essential to define appropriate cultural sustainable development elements and indicators as well as recognizing the importance of each of these elements. This study fulfils these tasks.

2. Structure

2.1 Main question of Research

The main question of this research is how to build a statistical model to assess the cultural sustainable development in urban areas. This model is customized for Tehran in this case study. To reach to this target the first step is to define all the concepts which are essential in the research such as culture and sustainable development so that the encapsulating framework can be comprehensive and also quantifiable at the same time, so that it enables us to define indicators and perform a statistical survey based on it. For example culture could be defined very broadly as follows. Culture can include economic systems, political ideologies and processes, educational institutions, social programs, the environment, technological systems, recreational practices, artistic and heritage activities, transportation and communication industries, religious and spiritual activities [4]. This may be a very comprehensive definition however it is not readily applicable in this research.

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2.2 Definitions

2.2.1 Culture, as mentioned, in general is a “developed understanding” of literature, art, music and so forth to encompass everything that makes up a “way of life”. This anthropological sense of culture refers to the way people live together, interact, compete and co-operate. That is, it refers to humankind and thus comprises both the individual and the collective dimensions of our lifestyles [5]. Specifically it could be cut down to: culture is creative artistic activity and the goods and services produced by it, and the preservation of human heritage. The final definition that was used in this research is extracted from the following literature review.

2.2.2 Sustainable Development is defined by the World Commission on Environment and Development as follows:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

The concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and

The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.” [6]

2.2.3 Urban Management and Urban Sustainable Management

Urban Management is a comprehensive management entity which is involved with broad and diverse subjects and phenomena in the urban area. An urban management system is a subdivision of government. So the authority and roles and goals of urban management are defined in line with the whole government so the urban management should follow the national laws and regulations while being independent at some levels. The level of independence is highly related to the level of centralization or decentralization in a country. Based on this, two levels of authority could be defined in a city as follow [7]:

- Urban management as local government with broad responsibilities
- The participation in urban management activities between central government, municipality and other players.

In Iran the second approach has been more dominant however the trend is toward the first approach.

Urban Sustainable Management is to govern and manage a city to meet the citizen's current needs without sacrificing the needs of future generations. To comply with sustainability, the level of authority plays an important role. Without sufficient authority over all the resources and players, meeting sustainability is unreachable for urban management.

3 Literature Review

Applying culture into sustainable development is an emerging trend so currently just a few cases are available to be reviewed, among which three models are reviewed in this section as follows:

- Four-pillar model of sustainability [8]
- Four well-beings of community sustainability [9]
- The medicine wheel approach to sustainability [10].

3.1 Four-pillar model of sustainability

In 2001, Jon Hawkes, a cultural analyst and one of Australia's leading scholars on cultural policy, wrote *The Fourth Pillar of Sustainability: Culture's Essential Role in Public Planning*. Since the book's publication, there has been a growing interest in cultural sustainability and how it can be applied to emerging

community and city planning models [11]. The Fourth Pillar of Sustainability integrates four interconnected dimensions: environmental responsibility, economic health, social equity, and cultural vitality. Hawkes addresses the need for a cultural perspective in public planning and policy by proposing practical measures for integration. In order for public planning to be more effective, Hawkes argues that government must develop a framework that evaluates the cultural impacts of environmental, economic, and social decisions and plans currently being implemented in cities and communities. The four-pillar model of sustainability recognizes that a community's vitality and quality of life is closely related to the vitality and quality of its cultural engagement. This model further demonstrates that the contribution of culture to building lively cities and communities where people want to live, work, and visit plays a major role in supporting social and economic well-being. The key to cultural sustainability is fostering partnerships, exchange, and respect between different streams of government, business, and arts organizations. Culture as the fourth pillar promotes these partnerships and is quickly gaining currency in policy and planning initiatives in Canada, Australia, New Zealand, and Europe.

Figure 1 Four-pillars model of sustainability Adopted from [12]

3.2 Four well-beings of community sustainability

Ministry for Culture and Heritage of New Zealand created a well-being model that includes cultural, environmental, social, and economic dimensions. The model was created considering the Local Government Act 2002 (Section 10) which remarks that local government is responsible for promoting “the social, economic, environmental, and cultural well-being of communities, in the present and for the future” [13]. The Ministry notes “the need for strategic planning, democratic decision-making, and a sustainable development approach that meets all four types of well-being” and emphasizes that sustainable development “will be achieved only if a council deals with all four types of well-being” [11]. Similar to the other models, this one looks at cultural, social, environmental, and economic well-being as interrelated. The Ministry for Culture and Heritage has illustrated the relationship between the four well-beings in a diagram (see Figure 2). The main points of the diagram are:

- Well-being is at the centre;
- Well-being is enhanced when the four equidistant types of well-beings-social, cultural, economic, and environmental - move efficiently around the centre; and,
- All of the four well-beings are interdependent and equal in ‘weight’. [11]

Figure 2 Four well-beings of community sustainability
Source: [11]

The New Zealand Ministry for Culture and Heritage has defined cultural well-being as:

The vitality that communities and individuals enjoy through:

- Participation in recreation, creative and cultural activities; and
- The freedom to retain, interpret and express their arts, history, heritage and traditions

3.3 The medicine wheel approach to sustainability

Nathan Cardinal and Emilie Adin [14] use the medicine wheel as a framework to determine categories and indicators for exploring and documenting the state of Aboriginal life in and around Vancouver (see Figure 3).

Figure 3 Medicine wheel model
Source: [14]

The medicine wheel illustrates four traditional directions: north (environmental), south (social), west (economic), and east (cultural). The four elements are crosscut by various segments of Aboriginal society which influence, and are in turn influenced by each of the elements. These four segments represent different groups and viewpoints in Aboriginal society: male, female, children & youth, adults & elders. Each of these four segments is critical to forming the context for measuring the overall well-being

of the Aboriginal community. Surrounding the medicine wheel is a development planning process, designed to guide the development and maintenance of the framework and its subsequent categories and indicators.

4 Historical Background and Current Situation in Tehran

4.1 Historical Development of Tehran

Tehran, the capital of Iran is the largest and most populated city of Iran. Even though Iran's civilization is as old as thousands of years, Tehran, at least as an important city, is not nearly so old. Historically, Tehran was a very small village near the ancient city of Rey. After a wide and wild devastation of Rey by the Mongols in the 14th century, Tehran started flourishing, but it still took around 4 centuries till the time that it was selected as the capital of Iran in 1795 when the Qajar king Agha Mohammad Khan was crowned in the city. It remains the capital to this day.

4.2 The demographic trend in Tehran

Soon after Tehran was selected as capital its population was estimated to be around 30,000 including soldiers and court's residents. Since then Tehran has been developing continuously and at a much faster rate compared to the rest of country. According to the last national census done in 2011 by the Statistical Center of Iran; Tehran's population was around 8,500,000 compared to the 30,000 in 1806 shows a growth of around 283 times over 205 years (Table 1) Iran's population has grown around 10 times, so Tehran's growth rate has been drastically larger than average for the country. This growth was higher during the 50s to 70s, and the jump in the trend was triggered by the start of industrialization in Iran during the Pahlavi era that was mainly focused in Tehran. New factories and companies needed more and more workers that could not be supplied by the local workforce so a flood of immigrants flowed toward Tehran. The infrastructure of Tehran was not ready to accept such a huge population in a short period. This started up a progression of unsustainability in all aspects of development in Tehran. The density of population near industrial areas formed ghettos around the city. A dense and poor population was a source of crime, violence and social deviance. [15] Geographically, socially and economically Tehran divided into two different cities a well-developed rich north and an undeveloped poor south and suburban area. Even though the growth rate compared to the country slowed after the 80s, this change in trend did not change the unsustainable development of Tehran. During this period the Megacity of Tehran which includes Tehran and the suburban area, developed sharply. In table 2 the population growth rate of city of Tehran, Tehran megacity and the megacity without central Tehran has been compared. As could be seen the immigrant's destiny has changed from Tehran city to the suburban areas [16]. These suburban areas almost possessed the minimum requirements for a normal life and their role was just as a dormitory for Tehran inhabitants who did not have enough income to afford accommodation within the city of Tehran. This duplicated the challenge of social and economic polarization in Tehran. Moreover it was a great burden for the local organizations to provide minimum infrastructures in those areas. The population density in Tehran megacity which is around 800 persons per square kilometre compared with the country average of 45; has also caused substantial environmental unsustainability. Traffic congestion and air pollution, devastation of green area for development of residential area, challenge of waste materials and recycling and supplying healthy water are some of the main barriers for a sustainable development in Tehran.

Table 1 Adapted from statistical centre of Iran

Year	Population Iran	Tehran Population	Tehran to Iran Proportion
1806	7654000	30000	0.39
1891	8124000	160000	1.97
1931	11185000	210000	1.88
1941	12833000	600000	4.68
1946	14159000	700000	4.94
1956	18954704	1512083	7.98
1966	25788722	2000000	7.76
1976	33708744	4530223	13.44
1986	49445010	6046375	12.23
1991	55837163	6475537	11.60
1996	60055488	6758845	11.25
2006	70495782	7975679	11.31
2011	75149699	8500000	11.31

Figure 4 Population Growth of Tehran 1806-2011**Table 2** Population Growth Rate in Tehran and Megacity

Period	Megacity	Tehran	Megacity excluding Tehran
1956-66	3.78%	4.17%	1.30%
1966-76	4.37%	4.95%	3.95%
1976-86	4.27%	2.82%	10.28%
1986-96	3.20%	1.31%	7.00%

4.3 Culture and development in Tehran

Iran is an ancient country with a rich history and cultural background. This background has made a set of distinctive cultural features which has originated from Iran and distributed to the neighborhood countries. Among these are the Persian language, Shi'ah branch of Islam, rich art, music and literature, special foods and clothing and so on. Despite these unifying elements, Iran has also several sub-cultures which through the history have been integrated within the main culture while keeping their identity with a minimum of conflict compared with similar countries [17]. Among the main 21 Muslim countries Iran is the most non-homogenous country and in the world Iran is among the top ten most diverse countries [18]. Tehran, which has been

mainly developed by immigrants, therefore, is a mixture of all the sub-cultures in the country. It reflects the image of the whole country in a single image which is called Tehran. So these diversities along with the unifying elements of Iranian culture make Tehran very special both in Iran and in the Muslim world. In the world maybe very few cities in North America and Oceania have a similar situation. Moreover as a political, economic and educational center, Tehran has always been the pioneer of modernization and change specially enforced by young educated middle-classed inhabitants. The conflict of tradition and modernity has been more challenging especially after Islamic revolution in Iran. Central government has always supported religious traditions while the middle-class people are looking for a modern life and at the same time keeping ancient non-Islamic values. This conflict has made a sort of anomy especially among young generation. Another special cultural characteristic of Tehran is the formation of creoles. These creoles are in the form of religion, language, music, architecture, fashion and behaviors. These numbers of creoles are not available in other cities of Iran [19]. These diversities, which are a duplicated diversity, if well managed could be a source of development, but if not properly managed would be a source of conflict and unsustainability in Tehran. Regarding all these special characteristics of Tehran, managing culture in Tehran is not only related to the development of Tehran but also is an indispensable national affair [20]

4.4 Current Cultural Management in Tehran

As mentioned before; Tehran from the cultural point of view suffers from non-integrated management. Except Tehran's Municipality, more than 28 other entities are engaged in cultural affairs in Tehran including the ministry of Culture and Islamic Guidance while no one is responsible as a main decision maker and no organization is liable for the current situation.

Regarding the continuous growth of Tehran and assuming the continuation of this trend, any improvement in cultural indicators will be difficult to achieve. In spite of the fact that urban management has a limited authority over culture in Tehran, it is expected that by stepping forward toward an integrated urban management system as well as spending more resources on culture, that even in the current situation there are lots of areas for improvement. In the last strategic plan of Tehran's Municipality issued in 2005 [21], the cultural mission of Tehran's Municipality is summarized as follow:

- Creating an appropriate cultural atmosphere including cultural research and study, policy making and planning, providing enough facilities.
- Management of cultural activities including development of religious culture, developing Islamic Revolution values.
- Developing national culture including development of Persian language and literature, developing national ceremonies and events, respecting cultural heritages, respecting national heroes and celebrities, national history and developing the folkloric culture of ethnic groups.
- Education activities to develop cultural knowledge and skills
- Developing artistic activities including strategic planning, providing appropriate spaces and management of performing and conceptual arts.

5 Research Methodology

5.1 General Overview

This research could be classified as applied research however based on research goals and data acquisition, it could be classified as a field surveying research. A benchmarking study is also done as was described in the literature review. Therefore, this is hybrid research that integrates the benchmarking studies, modeling and

surveying. The case study results are descriptive of the current situation of Tehran. After a wide benchmarking study, a model has been developed based on the special characteristics of Tehran and its social and cultural background moreover, based on the urban management authority roles and goals in Tehran. Then the main elements that are important to assess cultural sustainable development in Tehran have been developed, and based on these elements the hypotheses of research are defined and then related quantifiable indicators are generated which enable us to evaluate the hypotheses. Next, a questionnaire was designed and verified, a field survey was performed and finally the statistical analysis was done to verify the hypotheses.

5.2 Main Cultural Elements, Indicators and Hypothesis

The summary of main cultural elements is depicted in table 3. Based on these elements and indicators, one main hypothesis and eight secondary hypotheses were defined as follow:

The main hypothesis:

The total cultural elements influence on sustainable development of Tehran.

Eight secondary hypotheses:

1. Identity, as a cultural element, influences economic development of Tehran.
2. Identity, as a cultural element, influences social development of Tehran.
3. Engagement in culture, as a cultural element, influences economic development of Tehran.
4. Engagement in culture, as a cultural element, influences social development of Tehran.
5. Social cohesion, as a cultural element, influences economic development of Tehran.
6. Social cohesion, as a cultural element, influences social development of Tehran.
7. Economic output of culture, as a cultural element, influences economic development of Tehran.
8. Economic output of culture, as a cultural element, influences social development of Tehran.

Based on these, finally a questionnaire was prepared with 25 questions.

5.3 Statistical Assumptions

5.3.1 Statistical Population and Samples

In any research, the population is the group of phenomena about which the researcher is interested in some of their characteristics. The population in this research is defined as people who have been living in Tehran for at least two years. To collect data in a population one may either study whole the population or just sample among the population. The second method was the only practical way in this research. The sampling method used is probability random sampling. To calculate the appropriate quantity of samples, equation 1 is used.

$$n_{71} \cong \left(\frac{z \frac{\alpha}{2} \times \partial}{\varepsilon} \right)^2 \quad (1)$$

n_{71} is the sample number of people who should be surveyed by questionnaires.

Table 3 Main Elements of Culture and Related Indicators

Main Element	General Indicator
Identity	National, religious and citizenship identity; Urban landscape complying with dominant culture; Prevention of heritage
Cultural Engagement	Books and Reading; Participation in cultural and artistic activities, Access to artistic spaces and events, Facilities
Social Cohesion	Holding ceremonies and events properly; Improving social diversity; Improving social capital; Fair distribution of Information
Economic Output of Culture	Tourism; Employment in creative and cultural businesses, Income from creative and artistic jobs, Income from jobs indirectly related to culture

5.3.2 Validity and Reliability of Questionnaire

The validity of content of a questionnaire depends on whether the questionnaire has enough questions to evaluate the topic of research. In this research in addition to the methodology that is applied to develop the model, indicators, hypothesis and finally the questionnaire, the final questionnaire was approved by some of the statistics experts at the University of Tehran.

The reliability of a questionnaire relates to the tool used in the research, and at what level it can generate similar results. A reliability coefficient is defined to evaluate the reliability of the tool. The reliability coefficient is a number between 0 and 1. It could be defined as in equation 2.

$$r = \frac{j}{j-1} \left(1 - \frac{S_j^2}{S^2} \right) \quad (2)$$

That in it:

j : number of questions;

S_j^2 : variance of j_{th} sub-test;

S^2 : variance of total test

In this research SPSS software is applied to calculate the reliability coefficient and the result is 0.68 which is in an acceptable range.

6 Statistical Analysis and Results

The data collected from field surveying is analyzed by the appropriate tools of the SPSS software. The summary of results follows.

6.1 Analysis of Main Hypothesis

As shown in table 4 the level of significance is 0.000 and this number is less than acceptance error (5%) therefore, H_0 hypothesis is failed by 95% and the alternative hypothesis is approved. As a result the average of answers to the questions related to the influence of culture on sustainable development is 2.88 and is higher than 2.5 which is the average score (any question has 5 choices from 1 to 5), so the cultural parameters are indicated to influence sustainable development in Tehran.

Table 4 Average Test for the Main Hypothesis

Critical Levels		Average Diff.	Level of Significance	DOF	Test Statistic
Low Level	High Level				
0.3202	0.4497	0.3849	0.000	169	11.735

Note: (DOF: Degree of Freedom)

6.2 Analysis of Secondary Hypotheses

The summary of results of testing secondary hypotheses is shown in tables 5 and 6. In all the tests except one, the level of significance is 0.000 and lower than the acceptance error (5%) therefore, the null hypothesis is failed in all hypotheses, except one, by 95% of probability and the alternative hypothesis is passed.

Table 5 Result of Secondary Hypotheses

No.	Critical Levels		Level of Significance	Average Diff.
	Low Level	High Level		
1	0.2699	0.5164	0	0.39314
2	0.047	0.283	0.006	0.156
3	0.542	0.728	0	0.635
4	0.102	0.183	0.631	0.035
5	0.176	0.435	0	0.314
6	0.251	0.497	0	0.374
7	0.156	0.365	0	0.26
8	0.7476	1.0524	0	0.9

Table 6 Result of Secondary Hypotheses (continue)

No.	DOF	Test Statistic	Result
1	169	6.297	Pass
2	169	2.77	Pass
3	169	13.48	Pass
4	169	0.481	Fail
5	169	4.49	Pass
6	169	6.01	Pass
7	169	4.92	Pass
8	169	11.656	Pass

6.3 Ranking of Elements of Cultural Sustainable Development

The Non-parametric Friedman Test is used to rank effective cultural elements of sustainable development.

6.3.1 Ranking of Influential Cultural Elements of Economic Sustainable Development

In table 7 the test statistic is 23.93 and degree of freedom is 3 and since the level of significance is 0.000 and this number is smaller than acceptance error (5%) therefore, the null hypothesis is failed in all hypotheses. This clarifies that the ranking of elements will be different.

Table 7 Significance of Friedman Test

Test Statistic	23.93
DOF	3
No.	170
Level of Significance	0.000

As shown in table 8 cultural engagement has the highest impact on sustainable development of Tehran and social cohesion has the lowest impact.

Table 8 Ranking of Influential Elements - Economic

Element	Ranking
Identity	2.53
Social Cohesion	2.23
Cultural Engagement	2.87
Economic Output	2.72

6.3.2 Ranking of influential Cultural Elements of Social Sustainable Development

Similar to the economic elements, the same procedure has been undertaken for social elements - the difference is proven then the ranking of elements is shown in table 9. According to this table among socially effective elements, economic output has the highest impact on sustainable development of Tehran.

Table 9 Ranking of Elements - Social

Element	Ranking
Identity	2.27
Social Cohesion	2.49
Cultural Engagement	2.11
Economic Output	3.13

6.3.3 Ranking of Cultural Indicators of Sustainable Development

Finally the same method is applied to rank the cultural indicators of sustainable development. The results are shown in table 10. According to this table the highest impact belongs to the economic output of cultural influence on social development of Tehran and the lowest belongs to Identity influence on social development of Tehran.

Table 10 Ranking of Cultural Indicators

Indicator	Ranking
Economic output of culture influence on social development of Tehran	5.8
Engagement in culture influence on economic development of Tehran	5.63
Engagement in culture influence on social development of Tehran	4.93
1.1.1. Identity influence on economic development of Tehran	1.1.2. 4.58
1.1.3. Social cohesion influence on social development of Tehran	1.1.4. 4.57
1.1.5. Social cohesion influence on economic development of Tehran	1.1.6. 4.22
1.1.7. Economic output of culture influence on economic development of Tehran	1.1.8. 4.07
1.1.9. Identity influence on social development of Tehran	1.1.10. 3.91

7. Summary and Conclusion

In this research a model to assess cultural development in Tehran has been developed and as a result some hypotheses were made and tested through a questionnaire and statistical analysis. The main results of this research could be summarized as follow:

Customized and localized indicators were developed that were compliant with historical background and current situation in

Tehran which could be used to monitor the current situation anytime as a managerial tool.

The connection between different dimensions of sustainable development and culture was demonstrated by testing related hypotheses. The results confirmed 7 out of 8 secondary hypotheses as well as the main one. This result indicates that sustainable development in Tehran needs to be integrated. The cultural policy should be compliant with social and economic policies to be efficient and effective. Therefore it should be an integrated urban management policy instead of the current fractured one.

Ranking the developed elements and indicators based on their level of impact on sustainable development of Tehran. The results could be used as a guideline for urban management in Tehran to prioritize its resources toward more efficient planning and management to achieve a sustainable development. This should not only consider the importance of culture but also maintain that no development is meaningful without respecting the cultural heritage.

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