KMAN PUBLISHING INSTITUTE
Journal Website

Article history:
Received 03 November 2023
Accepted 04 December 2023
Published online 20 December 2023

International Journal of Innovation Management and Organizational Behavior

Volume 3, Issue 5 (Special Issue on Finance and Economics), pp 29-35

IJIMOB International Journal of Innovation Management and Organizational Behavior

E-ISSN: 3041-8992

Presenting an Advanced Model of Women's Entrepreneurship Using Fuzzy Analytic Hierarchy Process

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Ansari Amoli, P., Gholipour Kanani, Y., Bagherzadeh, M. R., & Tabari, M. (2023). Presenting an Advanced Model of Women's Entrepreneurship Using Fuzzy Analytic Hierarchy Process. *International Journal of Innovation Management and Organizational Behavior, 3*(5), 29-35.
https://doi.org/10.61838/kman.ijimob.3.5.4

A B S T R A C T

Objective: The purpose of this research is to identify and prioritize the factors affecting women's entrepreneurship.

Methodology: This study is applied in aim and descriptive in method. To determine the weight of criteria and sub-criteria for this issue, the Fuzzy Analytic Hierarchy Process (FAHP) was utilized. Accordingly, after identifying the criteria and sub-criteria for each, a questionnaire was designed to match them and distributed to experts. In the current issue, the effects of criteria affecting women's entrepreneurship were examined with 20 decision-makers. In the next step, the questionnaires filled out by experts were transferred to Excel software.

Findings: The factors affecting women's entrepreneurship include five criteria consisting of family, personality, economic, social, and cultural criteria. The family criterion has eight sub-criteria, the personality criterion has ten sub-criteria, the economic criterion has seven sub-criteria, and the social and cultural criteria each have five sub-criteria. The results show that among the criteria, the "personality" criterion, with a weight of 0.3071, and the "cultural" criterion, with a weight of 0.1103, ranked first and last, respectively. In addition, the "economic" criteria with a weight of 0.2011, "family" with a weight of 0.1931, and "social" with a weight of 0.1884, are ranked second to fourth, respectively. Moreover, among the thirty-five sub-criteria, the sub-criteria of "extensive social relationships" with a weight of 0.0530, "job satisfaction" with a weight of 0.0462, "institutions and resources" with a weight of 0.0448, "determination and will" with a weight of 0.0444, and "guidance and leadership" with a weight of 0.0428, are ranked first to fifth, respectively. Also, the sub-criteria of "market access" with a weight of 0.0270, "role models" with a weight of 0.0165, "transportation system" with a weight of 0.0165, "role conflict" with a weight of 0.0135, and "marital status" with a weight of 0.0088, respectively rank thirty-first to last.

Conclusion: The research underscores a strong correlation between personality traits and women's entrepreneurship, pointing to the necessity of tailored programs in higher education to foster entrepreneurial inclinations.

Keywords: *Women's entrepreneurship, Family criteria, Personality criteria, Economic criteria, Social and cultural criteria*

1 Introduction

This situation is the result of changes in the value system, the growth of democratic thought, the expansion of public awareness, the increase in women's education, and changes in economic and social structures in recent decades. Employment, from a macroeconomic perspective, is important for various reasons such as income generation, production and entrepreneurship, development of knowledge and technology, etc., and from a social perspective, it provides individuals with dignity, social status, and self-confidence. As the economy goes through the initial stages of development, the share of women in the workforce decreases, and as the economy reaches advanced stages of development, the share of women in the workforce increases. On the other hand, with the advent of machines and equipment that reduce the intensity of household chores, women's leisure time increases, and women can engage in economic activities outside the home. For this reason, women are gradually playing an increasing role in production and entrepreneurship (Karimi Moughari et al., 2013).

Advanced countries in past decades and some developing countries in recent decades have paid attention to the effective and positive role of economic entrepreneurs in societal development, utilizing this potential to address issues like recession, inflation, and unemployment. This attention extends to the formulation of strategies, policies, and practical programs for fostering entrepreneurial spirit and behavior, education and counseling, creating a more favorable environment for entrepreneurs in various economic and social fields, removing barriers, and facilitating their access to global markets, which has had significant results (Sheikhan, 2011).

In developing countries, women are seen as the primary hope for improving families and the growth and development of their countries. The success of women entrepreneurs not only results in economic benefits but also creates social and cultural benefits. Women enter entrepreneurship for various reasons, including unemployment, reduced wages, and dissatisfaction with previous jobs. According to recent official statistics, women's employment share is only 10%, and the unemployment rate among women, especially the educated workforce, has significantly increased (Naqvi et al., 2002).

Challenges of social entrepreneurship include interactions with the government or state, private or commercial sector, various organizations and institutions, and the academic sector, leading to the establishment of incentives for tax forgiveness, removal of restrictive regulations, allocation of facilities, discovery of competitive advantages, consideration of environmental and social factors as influential components, support for social innovators, transformation in response to 21st-century challenges, and ultimately benefits in the academic sector in combining social entrepreneurs and education (Arasti & Akbarijokar, 2020; Rosca et al., 2020). The success of women entrepreneurs not only leads to economic profit but also creates social and cultural benefits; however, unfortunately, women in the field of social entrepreneurship in developing countries face challenges such as gender discrimination, work-family conflict, financial limitations, behavioral barriers, cultural and social barriers, and educational and professional obstacles in the field of social entrepreneurship (Arasti & Akbarijokar, 2020; Mordi et al., 2010; Vikelwa Judith, 2017). Nowadays, women are actively present in various fields of economic and social activities and play a significant role in creating businesses (Naqvi et al., 2002; Shahamat Nejad et al., 2020). Also, research findings indicate that the main challenges for women entrepreneurs include racist issues, gender, geographical location, access to finance, education, a supportive cultural-social environment, lack of networks and mentors, and lack of job management skills for starting new investments (Sekatane, 2018).

In the field of social entrepreneurship, previous research shows that women are more suitable for leading social enterprises. However, the gender connection in the field of social entrepreneurship has not been examined and requires further research, which forms the main framework of this study. Through a multi-case study approach employing four companies from two emerging markets - India and Colombia - we analyze how female entrepreneurs participate in social entrepreneurship processes in uncertain base-of-the-pyramid environments and their impact on examining the entrepreneurial journey and decision-making logic used at different stages of investment development. Findings indicate that female social entrepreneurs have high motivation towards social issues. Additionally, female entrepreneurs demonstrate a delicate transition between cause-and-effect approaches during capital formation processes. This study highlights the specific challenges that female entrepreneurs face in emerging markets and the inclusive strategies they employ to enhance socio-economic development (Rosca et al., 2020).

IJIMOB
E-ISSN: 3041-8992

The entrepreneurship process begins with the formation of an idea and proceeds with the selection of appropriate solutions, resource allocation, and overcoming obstacles to implementation. For women to successfully navigate this process, they need to strengthen their cognitive, communicative, and specialized skills. Accordingly, the aim of this research is to present an advanced model of women's entrepreneurship.

2 Methods and Materials

The current research is applied in purpose and descriptive in method. This study uses multi-criteria decision-making approaches (Fuzzy Analytic Hierarchy Process (FAHP)) as the research method. To determine the weight of the criteria and sub-criteria for this issue, the Fuzzy Analytic Hierarchy Process (FAHP) is used. Accordingly, after identifying the criteria and sub-criteria for each, a questionnaire was designed to match them and distributed to experts (decision-makers) on this issue. In this research, the effects of criteria affecting women's entrepreneurship are examined with 20 decision-makers. In the next step, questionnaires filled out by experts are transferred to Excel software. Indeed, the initial pairwise comparison matrices derived from these questionnaires are implemented. In these matrices, criteria and sub-criteria are compared separately with each other. Then, the output results from these matrices will form a merged fuzzy matrix in Excel software. This matrix itself leads to the creation of equations and mathematical formulas in Excel. Finally, in the last step, these equations and formulas are coded in the LINGO software, and ultimately the weight of all criteria and sub-criteria is determined.

3 Findings and Results

To determine the weight of the criteria, it is first necessary to design a pairwise comparison matrix from the comparison of each of these criteria with one another and then complete this matrix based on the opinions of experts. This matrix is presented in Table 1.

Table 1

Identified Concepts, Axial Categories, and Main Categories

Less Important Criterion	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	More Important Criterion
Familial			1		4	1	3		1		2		5		3			Personality
Familial			4		2		1			1	4		4	1	2		1	Economic
Familial	2		1	1	3		2		2		4		2		3			Social
Familial	1		6		3		5	1			1		2		1			Cultural
Personality			3		7		2				4		2		2			Economic
Personality	3		2		4		4				3	1	2		1			Social
Personality	2		6	1	4		3				2		2					Cultural
Economic	1		1		4		3		1		4		3		2		1	Social
Economic			4		3	1	4				3		2		3			Cultual
Social			3		5		3				4		4		1			Cultural

1 to 9: Equally Important; Between; Slightly More Important; Between; Relatively More Important; Between; Much More Important; Between; Absolutely More Important.

As can be seen from the matrix (Table 1), the criteria of the current issue are compared separately in each row. The data in the cells of this table are filled based on the opinions of 20 decision-makers. The columns of this table are divided into two sections, right and left columns, according to the criteria of each row. The results from the initial matrix (Table 2) are formed into a Fuzzy Paired Comparison Integrated Matrix (Table 3) in Excel software. Below, the matrix in question is presented based on the five sub-criteria in this issue.

Table 2

Identified Concepts, Axial Categories, and Main Categories

	Familial			Personality			Economic			Social			Cultural		
Familial	1	1	1	0.6888	0.8600	1.0683	0.5603	0.6940	0.8913	0.8931	1.0891	1.3403	1.9548	2.5375	3.1467
Personality	0.9360	1.1628	1.4517	1	1	1	1.1722	1.4767	1.8612	1.3985	1.7744	2.2296	2.4336	3.0312	3.7052
Economic	1.1220	1.4409	1.7847	0.5373	0.6772	0.8531	1	1	1	0.7450	0.9308	1.1684	1.0627	1.3526	1.7007
Social	0.7461	0.9182	1.1197	0.4485	0.5636	0.7150	0.8558	1.0744	1.3422	1	1	1	0.9799	1.2462	1.5878

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E-ISSN: 3041-8992

Cultural	0.3178	0.3941	0.5116	0.2699	0.3299	0.4109	0.5880	0.7393	0.9410	0.6298	0.8024	1.0205	1	1	1

Table 3

Identified Concepts, Axial Categories, and Main Categories

Criterion	Weight	Rank
Familial	0.1931	3
Personality	0.3071	1
Economic	0.2011	2
Social	0.1884	4
Cultural	0.1103	5

Each of these criteria has sub-criteria. Therefore, for the current issue, a total of thirty-five sub-criteria have been designed; such that, the family criterion has eight sub-criteria, the personality criterion has ten sub-criteria, the economic criterion has seven sub-criteria, and the social and cultural criteria each have five sub-criteria. To determine the weight of the sub-criteria, as with the criteria, the Fuzzy Analytic Hierarchy Process (FAHP) approach is used. Therefore, the same approach used to determine the weight of the criteria is followed. Thus, after designing the questionnaire, it is provided to 20 selected decision-makers, and their opinions are used. Accordingly, based on the questionnaires, an initial pairwise comparison matrix for the sub-criteria related to each criterion must be formed in Excel software. Then, a Fuzzy Paired Comparison Integrated Matrix is formed for these initial matrices. In the next step, this matrix itself leads to the creation of mathematical equations. These equations are coded in LINGO software so that the weight of the sub-criteria will be calculated at the end.

Table 4

Identified Concepts, Axial Categories, and Main Categories

Sub-criterion	Weight	Rank
Family's viewpoint and support	0.1508	3
Role conflict	0.0697	8
Role models	0.0852	7
Support and backing from spouse and children	0.1847	1
Work experience	0.1325	4
Balancing life and business	0.1586	2
The extent of financial aid from the family	0.1118	5
Spouse's belief and trust	0.1067	6

As can be seen in Table 4, among the family criteria, the sub-criterion "support and backing from spouse and children" with a weight of 0.1847 and the sub-criterion "role conflict" with a weight of 0.0697 are ranked first and last, respectively. Additionally, sub-criteria "balancing life and business," "family's viewpoint and support," "work experience," "the extent of financial aid from the family," "spouse's belief and trust," and "role models" are ranked second to seventh, respectively.

Table 5

Identified Concepts, Axial Categories, and Main Categories

Sub-criterion	Weight	Rank
Commitment	0.0890	7
Creativity	0.1283	4
Marital status	0.0288	10
Level of education	0.0442	9
Guidance and leadership	0.1394	2
Self-confidence	0.1139	5

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E-ISSN: 3041-8992

Future-orientation	0.0836	8
Independence	0.0982	6
Determination and will	0.1447	1
Risk-taking	0.1299	3

According to the information in Table 5, among the personality sub-criteria, "determination and will," "guidance and leadership," and "risk-taking" are ranked first to third, respectively, with weights of 0.1447, 0.1394, and 0.1299. Also, sub-criteria "future-orientation," "level of education," and "marital status" are ranked eighth to last, respectively, with weights of 0.0836, 0.0442, and 0.0288. Additionally, sub-criteria "creativity," "self-confidence," "independence," and "commitment" are ranked fourth to seventh, respectively, with weights of 0.1283, 0.1139, 0.0982, and 0.0890.

Table 6

Identified Concepts, Axial Categories, and Main Categories

Sub-criterion	Weight	Rank
Financial support and assistance	0.1208	6
Equipment and facilities	0.1446	3
Institutions and resources	0.2227	1
Market access	0.1343	5
Transportation system	0.0832	7
Income and expenses	0.1523	2
Technology and communication	0.1421	4

As can be seen in Table 6, among the economic sub-criteria, "institutions and resources" with a weight of 0.2227 and "transportation system" with a weight of 0.0831 are ranked first and last, respectively. Also, sub-criteria "income and expenses," "equipment and facilities," "technology and communication," "market access," and "financial support" are ranked second to sixth, respectively, with weights of 0.1523, 0.1446, 0.1421, 0.1342, and 0.1208.

Table 7

Identified Concepts, Axial Categories, and Main Categories

Sub-criterion	Weight	Rank
Extensive social relationships	0.2813	1
Job satisfaction	0.2452	2
Dynamic and active environment	0.1763	3
Demand for new product	0.1454	5
Intensity of competition	0.1518	4

According to the information in Table 7, among the social sub-criteria, "extensive social relationships" with a weight of 0.2813 and "demand for new product" with a weight of 0.1454 are ranked first and last, respectively. Also, sub-criteria "job satisfaction," "dynamic and active environment," and "intensity of competition" are ranked second to fourth, respectively, with weights of 0.2452, 0.1763, and 0.1518.

Table 8

Identified Concepts, Axial Categories, and Main Categories

Sub-criterion	Weight	Rank
Gender discrimination at work	0.1840	3
Traditional societal thoughts	0.1554	5
Status and value of entrepreneurship	0.2651	1
Acceptance and approval of economic activity	0.2125	2
Entrepreneurial parents	0.1830	4

IJIMOB
E-ISSN: 3041-8992

According to the information in Table 8, among the cultural sub-criteria, "status and value of entrepreneurship" with a weight of 0.2651 and "traditional societal thoughts" with a weight of 0.1554 are ranked first and last, respectively. Also, sub-criteria "acceptance and approval of economic activity," "gender discrimination in work," and "entrepreneurial parents" are ranked second to fourth, respectively, with weights of 0.2125, 0.1840, and 0.1830.

4 Discussion and Conclusion

The entrepreneurship process begins with the formation of an idea and proceeds through the selection of appropriate solutions, resource allocation, and overcoming obstacles to implementation. The aim of this research is to present an advanced model of women's entrepreneurship using the Fuzzy Analytic Hierarchy Process (FAHP) technique. For women to successfully navigate this process, they need to strengthen their cognitive, communicative, and specialized skills. Realistically accepting the natural differences between women and men, avoiding unnecessary comparisons that lead to decreased self-esteem, trusting one's talents and abilities, goal-orientation and selecting logical programs, developing rational thinking, integrating reason with emotion, being sensitive to the changes over time, and participating in social activities, especially in non-governmental professional organizations, collectively enhance women's entrepreneurial skills.

Despite the increasing importance of women's entrepreneurship, this approach is not studied sufficiently, and the scarcity of research on the phenomenon of women's entrepreneurship is well established. In this regard, after reviewing studies in this field and also utilizing expert opinions, criteria and sub-criteria affecting women's entrepreneurship were identified and introduced. The proposed issue consists of five criteria: family, personality, economic, social, and cultural. Each of these criteria has its sub-criteria; the current issue has a total of thirty-five sub-criteria. Specifically, the family criterion has eight sub-criteria, the personality criterion has ten sub-criteria, the economic criterion has seven sub-criteria, and the social and cultural criteria each have five sub-criteria. In this study, the Fuzzy Analytic Hierarchy Process (FAHP) approach was used to determine the weights of the criteria and sub-criteria. The findings indicate that among the criteria, the "personality" criterion, with a weight of 0.3071, and the "cultural" criterion, with a weight of 0.1103, ranked first and last, respectively. Moreover, the "economic" criteria with a weight of 0.2011, "family" with a weight of 0.1931, and "social" with a weight of 0.1884 are ranked second to fourth, respectively. Among the thirty-five sub-criteria, sub-criteria such as "extensive social relationships" with a weight of 0.0530, "job satisfaction" with a weight of 0.0462, "institutions and resources" with a weight of 0.0448, "determination and will" with a weight of 0.0444, and "guidance and leadership" with a weight of 0.0428 ranked first to fifth, respectively. Additionally, sub-criteria like "market access" with a weight of 0.0270, "role models" with a weight of 0.0165, "transportation system" with a weight of 0.0165, "role conflict" with a weight of 0.0135, and "marital status" with a weight of 0.0088 are ranked from thirty-first to last.

Based on the results, a strong relationship between personality and women's entrepreneurship is observed, highlighting the need for appropriate programs to encourage individuals with education towards entrepreneurship programs in higher education institutions. Considering the output results, it can be stated that economic discussions have had a subsequent impact on creating job satisfaction among women entrepreneurs. Therefore, strengthening this aspect can have the most significant effect on women's entrepreneurship and better performance in encouraging women in society towards entrepreneurship. In terms of family support for entrepreneurs, based on the descriptive results of the data, most entrepreneurs have engaged in entrepreneurial activities with family support.

The social dimension, among women, has had the most significant impact among the research variables on women's entrepreneurship. Creating an appropriate environment in social and work settings among women can significantly influence their inclination towards entrepreneurship. Regarding the position of the cultural criterion with social women's entrepreneurship, which ranks last among the different criteria, it can be considered that cultural development to create job satisfaction among women entrepreneurs has had the least impact on entrepreneurship. Therefore, it can be stated that strengthening this dimension can have a significant effect on women's entrepreneurship and better performance in encouraging women in society towards entrepreneurship.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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