Alternatives Open to Working Mothers for Baby Care – a Mathematical Model using Neutrosophic Sets

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ABSTRACT

Neutrosophic set is a new mathematical tool for dealing with uncertainties. It plays a dominant role in solving real life problems. In this article, the authors attempted to develop a mathematical model using neutrosophic sets to identify the best alternative open to working mothers for caring their babies.

KEY WORDS: *Neutrosophic set, soft set, neutrosophic soft set.*

I.INTRODUCTION

Decades back most of the women were homemakers and they lived in a joint family. So they brought up their children without any difficulty and it was not an issue at that time. But now a days joint families are rare and majority of the women are working to manage the increased cost of living. Though they earn money, caring their babies while they are away from home for work is a major challenge to them. There are many alternatives available to care their babies depending on the family, place of living and nature of work.

Here the researchers have attempted to develop a mathematical model using neutrosophic sets to identify the best alternative open to working mothers for caring their babies

II. BASIC DEFINITIONS

Definition: 1

A **neutrosophic set** A on the universe of discourse X is defined as A={ <x, $T_A(X), I_A(X), F_A(X)$ >, x ∈ X} where T,I,F : X →]⁻0,1⁺[define respectively the degree of membership, the degree of indeterminacy, and the degree of non-membership witrh the condition ⁻0 ≤ $T_A(X)+I_A(X)+F_A(X)$≤ 3⁺.

Definition: 2

Let U be an initial universe and E be a set of parameters. Let P(U) denotes the power set of U, and let A⊆ E. A pair (F,A) is called a **soft set** over U, where F is mapping given by F:A→P(U).

In other words, a soft set over U is a parameterized family of subsets of the universe U. The soft sets (F,A) is also denoted as F_A.

Definition: 3

Let U be an initial universe set and E be a set of parameters. Consider A⊂B. Let N(U) denotes the set of all neutrosophic sets of U. The collection (F,A) is termed to be the **neutrosophic soft set** over U, where F is a mapping given by F : A→N(U).

III. APPLICATION OF NEUTROSOPHIC SETS

To identify the best alternative available for working mothers to care their babies, the researchers collected opinion from fifty working mothers belongs to five different categories, ten from each category, residing in Coimbatore city. The details of which are given below:

M_1 - Mothers working in Educational institutions.

M_2 - Mothers working in Government offices.

M_3 - Mothers working in Private concerns.

M_4 - Mothers working in Software companies.

M_5 - Mothers working as Entrepreneurs.

Following are the alternatives identified for caring the babies:

A_1 - Paid servent maid.

A_2 – Crèches / Play schools

A_3 - Friends and Relatives

A_4 - Elder family members

A_5 – Baby care centers at office premises.

To apply neutrosophic sets consider the five alternatives as the universal set $U=\{A_1, A_2, \ldots A_5\}$ and $E=\{M_1, M_2, \ldots M_5\}$ is the five categories of working mothers.

Based on the opinion of the respondents the neutrosophic soft sets are framed and are given in a tabular form.

In this table, the entries e_{ij} corresponds to the alternative A_i and the working mothers category M_j, where

$$C_{ij} = (T_{ij}, I_{ij}, F_{ij})$$

Here T_{ij} (respectively I_{ij}, F_{ij}) stands for the ratio between the number of working mothers in the category M_j who gave favorable response (respectively moderate response, unfavorable response) to the alternative A_i and the total number of respondents in that category M_j.

The tabular representation is

U	M_1	M_2	M_3	M_4	M_5
A_1	(0.6,0.3,0.1)	(0.4,0.3,0.3)	(0.7,0.2,0.1)	(0.8,0.1,0.1)	(0.5,0.3,0.2)
A_2	(0.8,0.1,0.1)	(0.7,0.2,0.1)	(0.7,0.2,0.1)	(0.9,0.05,0.05)	(0.8,0.1,0.1)
A_3	(0.7,0.2,0.1)	(0.3,0.5,0.2)	(0.6,0.3,0.1)	(0.8,0.1,0.1)	(0.4,0.5,0.1)
A_4	(0.7,0.1,0.2)	(0.3,0.3,0.6)	(0.5,0.3,0.2)	(0.6,0.2,0.2)	(0.5,0.3,0.2)
A_5	(0.8,0.1,0.1)	(0.4,0.3,0.3)	(0.6,0.2,0.2)	(0.5,0.4,0.1)	(0.6,0.3,0.1)

Comparison matrix:

It is a matrix whose rows are labeled by $A_1, A_2, \ldots A_5$ and the columns are labeled by $M_1, M_2, \ldots M_5$. The entries e_{ij} are calculated by $e_{ij} = a + b - c$, where 'a' is the integer calculated as 'how many times T_{ij} exceeds or equal to T_{kj}', for $i \neq k, \forall A_k \in U$, 'b' is the integer calculated as 'how many times I_{ij} exceeds or equal to I_{kj}', for $i \neq k$, $\forall A_k \in U$ and 'C' is the integer 'how many times F_{ij} exceeds or equal to F_{kj}', for $i \neq k, \forall A_k \in U$.

The comparison matrix is given by,

U	M_1	M_2	M_3	M_4	M_5
A_1	1	3	4	2	1
A_2	4	4	4	4	2
A_3	2	4	4	2	2
A_4	0	0	0	0	1
A_5	2	3	0	1	4

Score of an object:

The score of A_i is S_i and is calculated as $S_i = \sum_j e_{ij}$.

The score matrix is

U	Score(S_i)
A_1	11
A_2	18
A_3	14
A_4	1
A_5	10

Here, the maximum score is 18.

According to this study "Crèches / Playschools" is the best alternative for working mothers to care their babies.

IV. CONCLUSION

In this article, the authors developed a mathematical model using neutrosophic sets to identify the best alternative open to working mothers for caring their babies while they are away from home for work.

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