Decision Making in Mass Media Using Fuzzy Soft Sets

Abstract

Mass Media is the 3rd largest emerging industry of Pakistan. It involves so many decision making in regard to selection of shows, anchors, lighting and technical equipment. The problem becomes ambiguous as most of the channel owners are investors and seldom know about the complications and technicalities of this industry. Solutions given by fuzzy structures in different areas has provoked us to find their applications in the nexus of Mass Media. In this paper, we will present two problems which harnesses fuzzy soft set techniques and algorithm to come in to play for solving mass media decision making problem.

Keywords : Fuzzy soft set; FS-aggregate algorithm; Selection..

1 Introduction

The tool of Fuzzy sets for dealing uncertainties was founded by Zadeh [1] in 1965. A Fuzzy soft set is a bijection from choice function to the interval $[0,1]$. Rough sets was developed by Pawlak in 1982 [3], which was then applied in the nexus of medical science, computer systems and in modeling other fields. At present the Soft Set [2] theory is on its voyage of progress creating advancements in all the fields of science and social sciences coming on its way. The applications of Soft Set theory in decision making can be found in [4]. Whereas a new definition of parameterizations reduction can be seen in [6] to reduction and compare the under consideration concept of attributes reduction in rough set structure. The algebra of soft set was introduced by Rosenfeld [7]. Biswas et al. [8] discussed the algebraic nature of Rough sets and proposed the topic of rough groups. Saeed et al. [21] came up with the new notion of soft element and soft members under the soft set environment.

The concept of fuzzy soft set (fs-set) was given by Maji et al. in [5] by the amalgamation of ideas of fuzzy sets [1]. A number of researchers have harnessed fs-sets to propose the solutions of problems having decision making which can be seen in [11, 12]. Moreover, Bhardwaj et al. [14] used Reduct soft set for real life decision making problems. Lin [9, 10] presented novel theory of soft set for computing a unified view of fuzzy sets via neighborhood; and applied it in the selection decision-making problem. Zulqarnain et al. [17, 20] presented the generalized TOPSIS technique for the multi-criteria decision-making in neutrosophic structure and intuitionistic fuzzy soft structure to diagnose a medical disease. Saeed et al. [19, 22] has presented the major applications of fuzzy logic controller in smart parking system and impact of pH on detergent in automatic washing machine. Rehman et al. [16] introduced the m-convex and m-concave sets in the structure of soft set with their properties. Saeed et al. [18, 23] presented the wide application of neutrosophic soft set in the player selection for the soccer team and prediction of the champion of FIFA 2018 World Cup using similarity measure and TOPSIS.

In this paper, we have devised the techniques discussed by Pal in [15] and Gogai et al. in [13] to solve decision making problems encountered by media houses in a rather different way. The paper is having the following formation. Section 1 of this note comprises of introduction, section 2 presents some fuzzy soft set theoretic definitions, section 3 presents algorithms which will help us in solving the problems discussed in this paper, section 4 presents the problems discussed in this paper and at last in section 5, conclusions and future directions in this concern will be presented.

2 Preliminaries

In this section, we give some basic notions related to proposed article.

2.1 Fuzzy Set

[1] Fuzzy set A in universe Y is as follows

$$A = \{(y, \mu_A(y)) : y \in Y\},$$

where the function $\mu_A : Y \to [0, 1]$ defines the degree value of membership of the element $y \in Y$.
Let A and B be two Fuzzy Set and μ_A, μ_B are their membership functions. The complement $A^{'}$ is defined by its membership bijection as

$$\mu_{A'}(y) = 1 - \mu_A(y); \text{ for } y \in Y.$$

The union operation $A \cup B$ of union can be expressed as

$$\mu_{A\cup B}(y) = max\{\mu_A(y), \mu_B(y)\}$$

The intersection operation $A \cap B$ of union can be expressed as

$$\mu_{A\cap B}(y) = min\{\mu_A(y), \mu_B(y)\}$$

2.2 Soft Set

[2] Molodtsov rectified this difficulty by using an appropriate parameterization. Let Λ be any nexus and Ω be a set of parameters. The pair (F, Ω) is called a Soft Set (over Λ) if and only if F is a mapping of Ω into the set of all subsets of Λ. Hence the Soft Set is a parameterized family of subsets of the set Λ.
In this paper, Λ is any nexus, Ω is a set of parameters, $P(\Lambda)$ is the power set of Λ, and $B \subseteq \Omega$.
A soft set (F, B) over Λ is a set defined by a bijection F_B representing a mapping $F_B : B \rightarrow P(\Lambda)$; for all $\omega \in B$. The soft set (F, B) can be depicted by the collection of ordered order pairs.

$$(F, B) = \{(\omega, F_B(\omega)) : \omega \in B, F_B(\omega) \in P(\Lambda)\}$$

2.2.1 Example

Suppose $\Lambda = \{\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5\}$ be a universal set and $\Omega = \{\omega_1, \omega_2, \omega_3, \omega_4\}$ be a set of parameters. If $B = \{\omega_1, \omega_2, \omega_4\} \subseteq \Omega$, $F_B(\omega_1) = \{\lambda_2, \lambda_4\}, F_B(\omega_2) = \Lambda$ and $F_B(\omega_4) = \{\lambda_1, \lambda_3, \lambda_5\}$ then the soft set F_B is written by $F_B = \{(\omega_1, \{\lambda_2, \lambda_4\}), (\omega_2, \Lambda), (\omega_4, \{\lambda_1, \lambda_3, \lambda_5\})\}$.

2.3 Fuzzy Soft Set

[5] A fuzzy soft set (F, B) over Λ is a set given by a bijection F_B representing a mapping $F_B : B \rightarrow P^F(\Lambda)$. Here, F_B is called fuzzy approximate function of the fuzzy soft set (F, B). Thus, a fuzzy soft set (F, B) over Λ can be represented by the set of ordered pairs

$$(F, B) = \{(\omega, F_B(\omega)) : \omega \in \Omega; F_B(\omega) \in P^F(\Lambda)\} :$$

Note that the set of all fuzzy subsets over Λ will be denoted by $P^F(\Lambda)$.
Let $(F, B) \in FS(\Lambda)$. If $F_B(\omega) = \phi$; for all $\omega \in B$, then (F, B) is known as an empty fuzzy soft set, depicted by F_ϕ.
Let $(F, B) \in FS(\Lambda)$. If $F_B(\omega) = \Lambda$; for all $\omega \in B$, then (F, B) is known as an universal fuzzy soft set, depicted by F_Λ.

2.3.1 Example

Let $\Lambda = \{\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5\}$ be a universal set and $\Omega = \{\omega_1, \omega_2, \omega_3, \omega_4\}$ be a set of parameters. If $B = \{\omega_1, \omega_2, \omega_4\} \subseteq \Omega, F_B(\omega_1) = \{0.9/\lambda_2, 0.5/\lambda_4\}, F_B(\omega_2) = \Lambda$, and
$F_B(\omega_4) = \{0.2/\lambda_1, 0.4/\lambda_3, 0.8/\lambda_5\}$ then the soft set F_B is written by

$$(F, B) = \{(\omega_1, \{0.9/\lambda_2, 0.5/\lambda_4\}), (\omega_2, \Lambda), (\omega_4, \{0.2/\lambda_1, 0.4/\lambda_3, 0.8/\lambda_5\})\}.$$

2.4 Reduct Soft Set

[6] Let $C \subseteq \Omega$ and $(F, C) \subseteq (F, \Omega)$ Suppose R is a reduct of C. Then soft set (F, R) is called reduct softest (F, C)
The choice value of an object $C_i\Lambda$ is p_i where $p_i = \sum c_{ij}$, where c_{ij} are the entries in the table of reduct-softset.

2.5 Weighted Soft Set

[6] The weighted soft set called "W-soft set" is the weights given to attributes of each choice of the objects under consideration i.e for $c_i \in \lambda$ this value is W_{pi} where $W_{pi} = \sum d_{ij}$ such that $d_{ij} = w_j \times y_{ij}$.

3 Fuzzy Soft Aggregation Operator

An fuzzy soft (fs) aggregation operator is a tool for generating an aggregate out of fs-set and its cardinal set of a fuzzy set. The approximate functions of an fs-set are fuzzy in nature. An fs-aggregation operator is an operation with which a number of approximate functions of an fs-set are joined together forming a single aggregate of fs-set such that the resulting set is fuzzy in nature. After we find an aggregate fuzzy set, it becomes necessary to identify best single option out of resulting ones. Therefore, we can do decision making via algorithm given below.
Step 1: Compute (F, B) over Λ.
Step 2. Calculate cardinal set (c-set) $c(F, B)$ of (F, B).
Step 3: Evaluate aggregate fuzzy set $(F, B)^*$ of (F, B).
Step 4: Identify the best option from the resulting set by finding max $(F, B)^*(\lambda)$.

Step 1:
Let $(F, B) \in FS(\Lambda)$. Assume that $\Lambda = \{\lambda_1, \lambda_2, \ldots, \lambda_m\}$, $\Omega = \{\omega_1, \omega_2, \ldots, \omega_n\}$ and $B \subseteq \Omega$, then the (F, B) can be presented by the following table.

Table 1:

(F, B)	ω_1	ω_2	$\vdots$	ω_n
λ_1	$\mu_{F_B}(\omega_1)(\lambda_1)$	$\mu_{F_B}(\omega_2)(\lambda_1)$	$\vdots$	$\mu_{F_B}(\omega_n)(\lambda_1)$
λ_1	$\mu_{F_B}(\omega_1)(\lambda_2)$	$\mu_{F_B}(\omega_2)(\lambda_2)$	$\vdots$	$\mu_{F_B}(\omega_n)(\lambda_2)$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
λ_m	$\mu_{F_B}(\omega_1)(\lambda_m)$	$\mu_{F_B}(\omega_2)(\lambda_m)$	$\vdots$	$\mu_{F_B}(\omega_n)(\lambda_m)$

Where $\mu_{F_B}(\omega)$ is the membership function of (F, B). If $b_{ij} = \mu_{F_B}(\omega_j)\ (\lambda_i)$ for $i = 1, 2, \ldots, m$ and $j = 1, 2, \ldots, n$; then (F, B) is distinctly expressed by the matrix

$$[a_{ij}] = \begin{bmatrix} b_{11} & b_{12} & \ldots & b_{1n} \\ b_{21} & b_{22} & \ldots & b_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ b_{m1} & b_{m2} & \ldots & b_{mn} \end{bmatrix}$$

This matrix is called an $m \times n$ fs-matrix of (F, B) over Λ.

Step 2:
Let $(F, B) \in FS(\Lambda)$ then the cardinal set (c-set) of (F, B) denoted by $c(F, B)$ and defined by $c(F, B) = \{\mu_{c(F_B)}(\omega)/\omega : \omega \in B\}$ is a fuzzy set over Ω. The membership function $\mu_{c(F_B)}$ of $c(F, B)$ is defined by $\mu_{c(F_B)} : \Omega \to [0, 1]$,

$$\mu_{c(F_B)}(\omega) = \frac{|F_B(\omega)|}{|\Lambda|}$$

where $|\Lambda|$ and $|F_B(\omega)|$ are the cardinalities of nexus Λ and fuzzy set $F_B(y)$ respectively. The collection of all c-sets of the fs-sets over U will be depicted by $cFS(\Lambda) \subseteq F(\Lambda)$. Now let $(F, B) \in FS(\Lambda)$ and $c(F, B) \in cFS(\Lambda)$.
Assume that $\Omega = \{\omega_1, \omega_2, \ldots, \omega_n\}$ and $B \subseteq \Omega$, then $c(F, B)$ can be presented by the table below.

Table 2: LMOF_2

E	ω_1	ω_2	$\vdots$	ω_n
$\mu_{c(F_B)}$	$\mu_{c(F_B)}(\omega_1)$	$\mu_{c(F_B)}(\omega_2)$	$\vdots$	$\mu_{c(F_B)}(\omega_n)$

If $a_{1j} = \mu_{c(F_B)}(\omega_j)$ for $j = 1, 2, \ldots, n$, then the c-set $c(F, B)$ is distinctly express by a matrix,

$$[a_{1j}] = [a_{11}, a_{12}, \ldots, a_{1n}]$$

Which is called the cardinal matrix (c-matrix) of the c-set $c(F, B)$ over Λ.

Step 3:
Let $(F, B) \in FS(\Lambda)$ and $c(F, B) \in cFS(\Lambda)$, then fs-aggregation operator, denoted by FS-agg, is defined by $FS - agg : cFS(\Lambda)xFS(\Lambda) \to F(\Lambda)$ as

$$FSagg(c(F, B), (F, B)) = F * B$$

where $F * B = \{\mu_{F*B}(\lambda)/\lambda : \lambda \in \Lambda\}$ is a fuzzy set over U. $F * B$ is called the aggregate fuzzy set of the fs-set (F, B). The membership function μ_{F*B} of $F * B$ is denoted as follows:

$$\mu_{F*B} : \Lambda \to [0, 1],$$
$$\mu_{F*B}(u) = \frac{1}{|\Lambda|} \sum_{\omega \in \Omega} \mu_{c(F_B)}(\lambda)(\omega) * \mu_{F_B}(\lambda)(\omega)$$

where $|\Lambda|$ is the cardinality of Λ, now let $(F, B) \in FS(\Lambda)$ and $c(F, B) \in cFS(\Lambda)$. Assume that $E = \{\omega_1, \omega_2, \ldots, \omega_n\}$ and $B \subseteq \Omega$, then $c(F, B)$ can be presented by the following table:

(F, B)	μ_{F*B}
λ_1	$\mu_{F*B}(\lambda_1)$
λ_2	$\mu_{F*B}(\lambda_2)$
λ_3	$\mu_{F*B}(\lambda_2)$
.	.
.	.
.	.
λ_m	$\mu_{F*B}(\lambda_m)$

If $c_{i1} = \mu_{F*B}(\lambda_i) fori = 1, 2, \ldots, m$ then $F * B$ can be represented by the matrix $[c_{i1}]$ as follows:

$$[c_{i1}] = \begin{bmatrix} c_{11} \\ c_{21} \\ \vdots \\ c_{m1} \end{bmatrix}$$

and known as the aggregate matrix of $F * B$ over Λ. Suppose $M \circ (F, B)$, $M \circ c(F, B)$, $M \circ F * B$ denotes matrices of (F, B), $c(F, B)$ and $F * B$, respectively then

$$|\Lambda| \times M \circ F * B = M \circ (F, B) \times M^t \circ c(F, B)$$

and

$$M \circ F * B = \frac{1}{|\Lambda|} M \circ (F, B) \times M^t \circ c(F, B)$$

where $M^t \circ c(F, B)$ is the transpose of $M \circ c(F, B)$ and $|\Lambda|$ is the cardinality of Ω.

Step 4:
At last we will find the best possible choice by finding maximum value of the aggregate matrix $F * B$.

4 Main Result

Following are the two sets of problems encountered by the media houses for the show to be telecasted and selection of an anchor person for a particular time slot. The former will be found using fs-agg algorithm.

4.1 Case Study 1

Seven shows are available to be aired at peak hour on Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. Now the burning question is depending on commercials rates, channel rating and demand, the management of TV channel is in a fix to decide on which day and which program to be aired? According to the data given by the marketing department of TV channel depending on commercials rates and rating at prime time is higher on Sunday, whereas on the rest of the five days in descending order as follows: Saturday, Friday, Thursday, Monday and Wednesday. On which day which particular show is aired at prime time?
The management of TV channel have the following set of programs

$$\Lambda = \{\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6, \lambda_7\}$$

with the following sets of attributes

$$\Omega = \{\omega_1 = \textbf{Star Cast}, \omega_2 = \textbf{writer}, \omega_3 = \textbf{International Value}, \\ \omega_4 = \textbf{Target Audience}, \omega_5 = \textbf{Adaptation}\}$$

4.1.1 Parameters

Here we explain all the attributes turn by turn as follows:
Star Cast
Star cast means which actors whether they are famous, debutante or average stars are playing roles in it? For Example: The star cast of that show comprises of Tom Cruise, Van Dam and Brook Shield.
Play Writer
Whether the play writer is a man of letters, digest writer or a professional play writer? For Example: The play writer is Ian Flaming, Shakespear or Aldose Huxlay?
International Value
It refers to the fact that how it is acclaimed in other countries and by the overseas nationals of the country from which that channel belongs to?
For Example: Mind Your Language is famous in Pakistan for Ali Nadim and Ranjeet Singh's Indo-Pak Tussle.
Target Audience
It Refers to the group or community about which show is concerned with. For Example: In Mind Your Language the target audience was overseas nationals of all countries residing in the UK having difficulty in English.

Adaptation
Adaptation means whether the show concept is partially or completely taken from some novel, short story, a true story, some incidence, theory or some previously telecasted show or a remake. For Example: OO7 movies are adaptations from Ian Flaming OO7 series, Titanic from real incidence of Titanic sinking and PTV's show Jinnah se Quaid (1997)(telecasted as From Jinnah to Quaid from PTV World during 2013) was an adaptation from Mohtarma Fatima Jinnah's Book Mera Bhai.

4.1.2 Example

Let B be the subset of the set of attributes Ω. So (F, B) that will decide which show to be broadcasted on Sunday, Saturday, Friday, Thursday, Monday, Tuesday and Wednesday is given by:

$$(F, B) = \{(\lambda_1, \{\omega_1, \omega_5\}), (\lambda_2, \{\omega_2, \omega_3, \omega_4\}), (\lambda_3, \{\omega_2, \omega_3, \omega_4\}),$$
$$(\lambda_4, \{\omega_1, \omega_4\}), (\lambda_5, \{\omega_1, \omega_2, \omega_4, \omega_5\}), (\lambda_6, \{\omega_2, \omega_4\}), (\lambda_7, \{\omega_3, \omega_4, \omega_5\})\}.$$

The given soft set is tabulated using the characteristic function as follows:
Consider the soft set (F, B) where B is the choice parameter for channel management. Suppose

$$h = \begin{cases} 1, & \text{if } h \in F(\omega), \\ 0, & \text{if } h \notin F(\omega), \end{cases}$$

	ω_1	ω_2	ω_3	ω_4	ω_5
λ_1	1	0	0	0	1
λ_2	0	1	1	1	0
λ_3	0	1	1	1	0
λ_4	1	0	0	1	0
λ_5	1	1	0	1	1
λ_6	0	1	0	1	0
λ_7	0	0	1	1	1

Where $\omega_i \in B$.

4.1.3 Algorithm for the Broadcast of Shows in Particular Days

To select the sequence in which shows $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6$ and λ_7 to be telecasted owing to their weighted choice values in descending order on the Sunday, Saturday, Friday, Thursday, Monday, Tuesday and Wednesday, the following algorithm may be followed
1. Calculate the soft set (F, B).
2. Evaluate set B of choice parameter for channel management.
3. Identify all reduct-soft set of (F, C).

4. Select one reduct-soft set (F, R).
5. Evaluate the weighted table of the soft set (F, R) according to the weights decided by channel management.
6. Compute k for which $W_{qi} = maxW_{qi}$.
If k has more than one value, then the values in descending order will be placed for telecast.

Weights Consider the channel management sets the parameter as follows:
Star Cast $=\omega_1$=0.8, Writter $=\omega_2$=0.6, International Value $=\omega_3$=0.5,
Target Audiance $=\omega_4$=0.3, Adaptations $=\omega_5$=0.7
Applying these weights the reduct-softset is evaluated as

	ω_1	ω_2	ω_3	ω_4	ω_5	Choice Value W_{qi}
λ_1	0.8	0	0	0	0.7	1.5
λ_2	0	0.6	0.5	0.3	0	1.4
λ_3	0	0.6	0.5	0.3	0.7	2.1
λ_4	0.8	0	0	0.3	0	1.1
λ_5	0.8	0.6	0	0.3	0.7	2.4
λ_6	0	0.6	0	0.3	0	0.9
λ_7	0	0	0.5	0.3	0	0.8

4.1.4 Decision

So according to the table show λ_5 will be telecasted on Sunday, λ_3 on Saturday, λ_1 on Friday, λ_2 on Thursday, λ_4 on Monday, λ_6 on Tuesday and λ_7 on Wednesday.

4.2 Case Study 2

The news section of the same channel wants to know which Anchor person is will be best suited for the specific time slot for a one program and 4 days a week. The selection is out of 5 anchors $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5$. Now the management asks the opinion from its marketing department, social media cell, along with two agencies i.e advertisement agency, rating agency and from one of its infotainment producers. They have to give their opinion out of the following criteria parameters i.e ω_1= **Research Work**, ω_2= **Influential Personality**, ω_3= **Command on Language**, ω_4= **Good Personal Relations with all fraternities** and ω_5= **Strong Credibility**.
This constitutes a set of parameters

$$\Omega = \{\omega_1, \omega_2, \omega_3, \omega_4, \omega_5\}.$$

The opinion given by each of the agencies, departments and officials in the fuzzy soft sets form (F_1, Ω), (F_2, Ω), (F_3, Ω), (F_4, Ω) and (F_5, Ω) over Λ, where F_1, F_2, F_3, F_4 and F_5 are mappings from Ω onto $P(\Lambda)$ is given as follows:

$F_1(\omega_1) = \{\frac{\lambda_1}{0.80}, \frac{\lambda_2}{0.70}, \frac{\lambda_3}{0.65}, \frac{\lambda_4}{0.85}, \frac{\lambda_5}{0.65}\}$, $F_1(\omega_2) = \{\frac{\lambda_1}{0.95}, \frac{\lambda_2}{0.80}, \frac{\lambda_3}{0.70}, \frac{\lambda_4}{0.65}, \frac{\lambda_5}{0.55}\}$

$F_1(\omega_3) = \{\frac{\lambda_1}{0.70}, \frac{\lambda_2}{0.65}, \frac{\lambda_3}{0.55}, \frac{\lambda_4}{0.70}, \frac{\lambda_5}{0.75}\}$, $F_1(\omega_4) = \{\frac{\lambda_1}{0.70}, \frac{\lambda_2}{0.90}, \frac{\lambda_3}{0.85}, \frac{\lambda_4}{0.65}, \frac{\lambda_5}{0.45}\}$

$F_1(\omega_5) = \{\frac{\lambda_1}{0.85}, \frac{\lambda_2}{0.80}, \frac{\lambda_3}{0.82}, \frac{\lambda_4}{0.80}, \frac{\lambda_5}{0.87}\}$,

$F_2(\omega_1) = \{\frac{\lambda_1}{0.82}, \frac{\lambda_2}{0.75}, \frac{\lambda_3}{0.66}, \frac{\lambda_4}{0.86}, \frac{\lambda_5}{0.55}\}$ $F_2(\omega_2) = \{\frac{\lambda_1}{0.94}, \frac{\lambda_2}{0.81}, \frac{\lambda_3}{0.72}, \frac{\lambda_4}{0.61}, \frac{\lambda_5}{0.62}\}$,

$F_2(\omega_3) = \{\frac{\lambda_1}{0.69}, \frac{\lambda_2}{0.64}, \frac{\lambda_3}{0.54}, \frac{\lambda_4}{0.71}, \frac{\lambda_5}{0.70}\}$ $F_2(\omega_4) = \{\frac{\lambda_1}{0.71}, \frac{\lambda_2}{0.92}, \frac{\lambda_3}{0.86}, \frac{\lambda_4}{0.67}, \frac{\lambda_5}{0.57}\}$,

$F_2(\omega_5) = \{\frac{\lambda_1}{0.84}, \frac{\lambda_2}{0.79}, \frac{\lambda_3}{0.81}, \frac{\lambda_4}{0.79}, \frac{\lambda_5}{0.64}\}$

$F_3(\omega_1) = \{\frac{\lambda_1}{0.80}, \frac{\lambda_2}{0.79}, \frac{\lambda_3}{0.64}, \frac{\lambda_4}{0.78}, \frac{\lambda_5}{0.75}\}$, $F_3(\omega_2) = \{\frac{\lambda_1}{0.95}, \frac{\lambda_2}{0.82}, \frac{\lambda_3}{0.73}, \frac{\lambda_4}{0.62}, \frac{\lambda_5}{0.68}\}$

$F_3(\omega_3) = \{\frac{\lambda_1}{0.68}, \frac{\lambda_2}{0.63}, \frac{\lambda_3}{0.53}, \frac{\lambda_4}{0.70}, \frac{\lambda_5}{0.69}\}$, $F_3(\omega_4) = \{\frac{\lambda_1}{0.72}, \frac{\lambda_2}{0.93}, \frac{\lambda_3}{0.87}, \frac{\lambda_4}{0.69}, \frac{\lambda_5}{0.55}\}$

$F_3(\omega_5) = \{\frac{\lambda_1}{0.86}, \frac{\lambda_2}{0.81}, \frac{\lambda_3}{0.83}, \frac{\lambda_4}{0.81}, \frac{\lambda_5}{0.81}\}$,

$F_4(\omega_1) = \{\frac{\lambda_1}{0.81}, \frac{\lambda_2}{0.80}, \frac{\lambda_3}{0.65}, \frac{\lambda_4}{0.79}, \frac{\lambda_5}{0.75}\}$, $F_4(\omega_2) = \{\frac{\lambda_1}{0.96}, \frac{\lambda_2}{0.83}, \frac{\lambda_3}{0.74}, \frac{\lambda_4}{0.63}, \frac{\lambda_5}{0.76}\}$,

$F_4(\omega_3) = \{\frac{\lambda_1}{0.69}, \frac{\lambda_2}{0.62}, \frac{\lambda_3}{0.52}, \frac{\lambda_4}{0.71}, \frac{\lambda_5}{0.71}\}$, $F_4(\omega_4) = \{\frac{\lambda_1}{0.66}, \frac{\lambda_2}{0.61}, \frac{\lambda_3}{0.51}, \frac{\lambda_4}{0.67}, \frac{\lambda_5}{0.86}\}$,

$F_4(\omega_5) = \{\frac{\lambda_1}{0.88}, \frac{\lambda_2}{0.83}, \frac{\lambda_3}{0.85}, \frac{\lambda_4}{0.83}, \frac{\lambda_5}{0.77}\}$

$F_5(\omega_1) = \{\frac{\lambda_1}{0.82}, \frac{\lambda_2}{0.78}, \frac{\lambda_3}{0.60}, \frac{\lambda_4}{0.75}, \frac{\lambda_5}{0.71}\}$, $F_5(\omega_2) = \{\frac{\lambda_1}{0.89}, \frac{\lambda_2}{0.79}, \frac{\lambda_3}{0.69}, \frac{\lambda_4}{0.58}, \frac{\lambda_5}{0.70}\}$,

$F_5(\omega_3) = \{\frac{\lambda_1}{0.79}, \frac{\lambda_2}{0.57}, \frac{\lambda_3}{0.51}, \frac{\lambda_4}{0.70}, \frac{\lambda_5}{0.69}\}$ $F_5(\omega_4) = \{\frac{\lambda_1}{0.67}, \frac{\lambda_2}{0.60}, \frac{\lambda_3}{0.52}, \frac{\lambda_4}{0.63}, \frac{\lambda_5}{0.79}\}$,

$F_5(\omega_5) = \{\frac{\lambda_1}{0.89}, \frac{\lambda_2}{0.87}, \frac{\lambda_3}{0.89}, \frac{\lambda_4}{0.79}, \frac{\lambda_5}{0.75}\}$

In the matrix form fuzzy soft sets are represented as:

$$(F_1, \Omega) = \begin{bmatrix} 0.80 & 0.70 & 0.65 & 0.85 & 0.65 \\ 0.95 & 0.80 & 0.70 & 0.65 & 0.55 \\ 0.70 & 0.65 & 0.55 & 0.70 & 0.75 \\ 0.70 & 0.90 & 0.85 & 0.65 & 0.45 \\ 0.85 & 0.80 & 0.82 & 0.80 & 0.87 \end{bmatrix}$$

$$(F_2, \Omega) = \begin{bmatrix} 0.82 & 0.75 & 0.66 & 0.86 & 0.55 \\ 0.94 & 0.81 & 0.79 & 0.61 & 0.62 \\ 0.69 & 0.64 & 0.54 & 0.71 & 0.70 \\ 0.71 & 0.92 & 0.86 & 0.67 & 0.57 \\ 0.84 & 0.79 & 0.81 & 0.79 & 0.64 \end{bmatrix}$$

$$(F_3, \Omega) = \begin{bmatrix} 0.80 & 0.79 & 0.64 & 0.78 & 0.75 \\ 0.95 & 0.82 & 0.73 & 0.62 & 0.76 \\ 0.68 & 0.63 & 0.53 & 0.70 & 0.71 \\ 0.72 & 0.93 & 0.87 & 0.69 & 0.86 \\ 0.86 & 0.81 & 0.83 & 0.81 & 0.77 \end{bmatrix}$$

$$(F_4, \Omega) = \begin{bmatrix} 0.81 & 0.80 & 0.65 & 0.79 & 0.75 \\ 0.96 & 0.83 & 0.74 & 0.63 & 0.76 \\ 0.69 & 0.62 & 0.52 & 0.71 & 0.71 \\ 0.66 & 0.61 & 0.51 & 0.67 & 0.86 \\ 0.88 & 0.83 & 0.85 & 0.83 & 0.77 \end{bmatrix}$$

$$(F_5, \Omega) = \begin{bmatrix} 0.82 & 0.78 & 0.60 & 0.75 & 0.71 \\ 0.89 & 0.79 & 0.69 & 0.58 & 0.70 \\ 0.79 & 0.57 & 0.51 & 0.70 & 0.69 \\ 0.67 & 0.60 & 0.52 & 0.63 & 0.79 \\ 0.89 & 0.87 & 0.89 & 0.79 & 0.75 \end{bmatrix}$$

Since we now have all the fuzzy soft matrices formed by all the agencies and officials giving opinion, we will apply the following algorithm to select the anchor person.

4.2.1 Algorithm for Selection of Anchor Person for a Particular Slot

Step 1. Find the average of all the matrices (F_1, Ω), (F_2, Ω), (F_3, Ω), (F_4, Ω) and (F_5, Ω) as B. This will act as FS-agg matrix (F, B) over Λ.
Step 2. Find the c-set $c(F, B)$ of (F, B).
Step 3. Compute $F * B$ of (F, B)
Step 4. Identify the best suited choice by finding the largest value of the set $F * B$.

Step 1:
The average of these matrices is given by:

$$(F, B) = \begin{bmatrix} 0.8100 & 0.7640 & 0.6400 & 0.8060 & 0.6820 \\ 0.9380 & 0.8100 & 0.7300 & 0.6180 & 0.6780 \\ 0.7100 & 0.6220 & 0.5300 & 0.7040 & 0.7120 \\ 0.6920 & 0.7920 & 0.7220 & 0.6620 & 0.7060 \\ 0.8640 & 0.8200 & 0.8400 & 0.8040 & 0.7600 \end{bmatrix}$$

Step 2:
Now we will calculate the c-set for $c(F, B)$ of the average matrix as follows:

1. $\mu_{c(F_B)}(\lambda_1) = \frac{0.8100+0.9380+0.7100+0.6920+0.8640}{5} = 0.8028$

2. $\mu_{c(F_B)}(\lambda_2) = \frac{0.7640+0.8100+0.6220+0.7920+0.8200}{5} = 0.7616$

3. $\mu_{c(F_B)}(\lambda_3) = \frac{0.6400+0.7300+0.5300+0.7220+0.8400}{5} = 0.6924$

4. $\mu_{c(F_B)}(\lambda_4) = \frac{0.8060+0.6180+0.7040+0.6220+0.8040}{5} = 0.7180$

5. $\mu_{c(F_B)}(\lambda_5) = \frac{0.6820+0.6780+0.7120+0.7060+0.7600}{5} = 0.7076$

Therefore, the c-matrix is given by:

$$c(F,B) = \begin{bmatrix} 0.8028 \\ 0.7616 \\ 0.6924 \\ 0.7180 \\ 0.7076 \end{bmatrix}$$

and on set form as $c(F,B) = \{0.8028/\omega_1, 0.7616/\omega_2, 0.6924/\omega_3, 0.7180/\omega_4, 0.7076/\omega_5, \}$.

Step 3:

Now the aggregate fuzzy set $M \circ F * B$ is computed as:

$$M \circ F * B = \frac{1}{5} \begin{bmatrix} 0.8100 & 0.7640 & 0.6400 & 0.8060 & 0.6820 \\ 0.9380 & 0.8100 & 0.7300 & 0.6180 & 0.6780 \\ 0.7100 & 0.6220 & 0.5300 & 0.7040 & 0.7120 \\ 0.6920 & 0.7920 & 0.7220 & 0.6620 & 0.7060 \\ 0.8640 & 0.8200 & 0.8400 & 0.8040 & 0.7600 \end{bmatrix} * \begin{bmatrix} 0.8028 \\ 0.7616 \\ 0.6924 \\ 0.7180 \\ 0.7076 \end{bmatrix} = \begin{bmatrix} 13.6828 \\ 13.9943 \\ 12.0998 \\ 13.1676 \\ 15.0740 \end{bmatrix}$$

In the set form it is given by

$$F * B = \{13.6828/\lambda_1, 13.9943/\lambda_2, 12.0998/\lambda_3, 13.1676/\lambda_4, 15.0740/\lambda_5\}$$

Step 4:

From the aggregate matrix it is found that anchor person λ_5 is the best suited choice for TV channel's management.

5 Conclusion

In this paper; We have solved a decision making problem for the channel management for broadcasting seven different shows on seven different days at prime time. We have solved another problem in which an anchor person is selected for a specific slot by the ranks/grades allotted by five different sources. The problems discussed in this article has opened new meadows where all the complex decision making encountered by channels will be solved. Saving time, money and delays for decision.

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