SMART PHONE SELECTION BY CONSUMERS' IN PAKISTAN: FMCGDM FUZZY MULTIPLE CRITERIA GROUP DECISION MAKING APPROACH

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ABSTRACT

Mobile phone is used in different ways and different pattern. Cell phone selection is challenging problem in current generation. Brutal market competition by inventions of diverse models with innovative designs and characteristics has made the buying decision making more complex. To solve this complexity, a few methods regarding the usage of fuzzy ideas had been proposed. For the few kinds of uncertainty within the selection method fuzzy linguistic method is used. The objective of the study is to investigate the uncertainty in selection criteria of cell phone. This paper, is an attempt to replicate the study in the Pakistani context in order to arrive at the current trends, especially in metros like Lahore where mobile telephony seems to have made an immense impact.

INTRODUCTION

The mobile phones are widely used for making call, SMS, MMS, email and to access the internet. The first portable cell phone was manifest by in (Martin, 1973), using a handset weighing 4.4 lbs. (Richard, 2008). In the advance world, smart phones have currently overtaken the usage of the earlier telecommunication systems. The consumer had a lot of variety on the mobile phones. There were variety of designed features included material, shape, size and color. The improvement of the cell records systems is made relatively a complex activity by using the short-ever-growing wide variety of newly added mobile technology (Ondrus, Bui & Pigneur, 2005). There may be an outstanding complications and doubt concerning reputation of cellular technologies by decision makers, providers, traders and clients alike, to help this selection process amongst diverse available options for the technology evaluation, multi-standards decision-making approach appears to be suitable. It's miles the choices of various concerned actors inside the market on which the fulfillment of introducing a cutting-edge technology in a cellular data gadget (Ling, Hwang & Salvendy, 2007).

LITERATURE REVIEW

Due to brutal market competition by inventions of different models with the innovative designs and characteristics have made buying decision making more complex. Mobile phone is used in different ways and different pattern. Sometimes, it is showing upgraded study and sometimes it is showing bad impacts in parts. The telephones manufacturing is enduring affected changes drove by rapid technical expansion and governing changes (Oh, Suh, Hong & Hwang, 2009). It is important in choosing the cell phones by the customers. So, decision making has turn out to be an important component in our daily lives and will be used for complex issues such as multiple conflicting standards. MCDM gives a little by little system for which a consensus decision may be made by using a set of decision makers. they contact the lives of thousands and thousands everywhere on the earth for his or her exercises. Lin, Chen and Tzeng (2010) combined AHP and FIM with MCDM techniques to paradigm the value-created evaluation model for planning the new e-era mobile phones.

Işıklar and Büyüközkan (2007) proposed a MCDM method to estimate the mobile phone options in respect to the users' preferences order. MCDM approach with group decision making is used to evaluate the smart phones as alternative according to the consumer preferences (Büyüközkan & Güleryüz, 2016). MCDM technique TOPSIS, is also used for true ranking to forecast the sports (Riaz, Saeed, Saqlain & Jafar, 2018). Criterion for choosing the cell phone has been identified and then these factors are evaluated on the basis of peoples' choice. On the bases of criterion rank, some cell phone has been ranked according to their criterion. The cell phone selection is a challenging problem in current generation (Büyüközkan & Güleryüz, 2016). To solve this complexity, a few methods regarding the usage of fuzzy ideas had been proposed (Klir & Yuan, 1995). For the few kinds of uncertainty within the selection method fuzzy linguistic method is used. The objective of the study is to investigate the uncertainty in selection criteria of cell phone.

Preliminaries

- ✓ Linguistic Set: In crisp set, an element ***У*** in the universe א is either a member of some crisp set **À** or not. It can be represented mathematically with indicator function: **µ À (У)= {**1, if *У* belongs to **À** and **0**, if *У* doesn't belongs to **À**} (Riaz et al., 2018).
- ✓ Fuzzy Set: Fuzzy set µ in a universe א is a mapping µ: א → [0,1] which assigns degree of membership to each element with symbol µ À (y) such that µ À (y) ϵ [0, 1] (Klir& Yuan,1995).
- ✓ Triangular Fuzzy Number TFN: A fuzzy numberωover theuniverse of discourse אmight be described by a three-sided distribution function parameterized by a triplet (p, q, r). The FN 's and MF is described as;

$$\omega(\varkappa) = \begin{cases} 0 & if\ \varkappa < p \\ \dfrac{a-p}{q-p} & if\ p \le \varkappa \le q, \\ \dfrac{q-a}{r-d} & if\ q \le \varkappa \le r, \\ 0 & if\ \varkappa > r \end{cases}$$

The ω is regarded as a TFN, if the membership function $\omega(\varkappa)$ is piecewise linear (Anand, Clement & Bharatraj, 2017).

MATERIAL AND METHOD

Zadeh's study on fuzzy sets (Zadeh, 1965) was the beginning of a new approach in the science and engineering of systems and computers. Thus, in applications triangular fuzzy numbers (TFNs) are normally used due to their computation simplicity, Since, TFNs are useful in indorsing representation and information processing in fuzzy environment. In this study TFNs are adopted in the FMCGDM with Generalized Fuzzy TOPSIS method.

Table 1 Fuzzy Number and Corresponding Linguistic Variable

S. No	Linguistic variable	Code	Fuzzy Number
1	Extremely short	ES	(0.0,0.0,0.1)
2	Short	S	(0.0,0.1,0.3)
3	Moderately short	MS	(0.3,0.3,0.5)
4	Moderately	M	(0.3,0.5,0.7)
5	Moderately Tall	MT	(0.5,0.7,0.9)
6	Tall	T	(0.7,0.9,1.0)
7	Extremely Tall	VT	(0.9,1.0,1.0)
8	Large	L	(0.2,0.4,0.5)

Numerical Calculations

Suppose a set of six mobiles as alternatives,$\mathcal{M} = \{M_1, M_2, M_3, M_4, M_5, M_6\}$ are evaluated by four experts $\mathcal{D} = \{X_1, X_2, X_3, X_4\}$ under fuzzy environment for Operation performance against five criteria's $\mathcal{K} = \{K_1, K_2, K_3, K_4, K_5\}$. Weights are given to each criterion$\mathcal{G} = \{0.2, 0.15, 0.35, 0.15, 0.15\}$.

K_1 = RAM
K_2 = ROM
K_3 = Processor
K_4 = Camera
K_5 = Display Size
M_1 = Samsung
M_2 = Nokia
M_3 = HTC
M_4 = Huawei
M_5 = Q-Mobile
M_6 = Rivo

Table 2 Linguistic Values Assigned by Each Decision Makers to Each Alternative's Criterion

	Strategies	X_1	X_2	X_3	X_4
K_1= RAM	M_1	S	MT	M	T
	M_2	S	MT	T	T
	M_3	S	M	M	MT
	M_4	S	MT	M	T
	M_5	S	VT	ES	VT
	M_6	MS	S	MT	MS
K_2= ROM	M_1	S	MT	M	T
	M_2	S	MT	T	T
	M_3	S	M	M	MT
	M_4	S	MT	M	T
	M_5	S	VT	ES	VT
	M_6	S	M	MT	MS
K_3= Processor	M_1	M	S	T	T
	M_2	MS	L	VT	HL
	M_3	M	M	S	S
	M_4	T	MS	ES	M
	M_5	VT	S	M	MT
	M_6	MT	M	MT	ES
K_4= Camera	M_1	VT	T	VT	ES
	M_2	M	S	M	T
	M_3	MT	M	MT	MT
	M_4	T	MT	T	M
	M_5	T	MT	T	M
	M_6	T	MT	T	M
K_5= Display Size	M_1	MT	MS	M	MT
	M_2	VT	S	ES	MT
	M_3	T	ES	M	MT
	M_4	M	M	MT	MT
	M_5	MS	MT	T	MT
	M_6	M	M	MT	MT

Table 3: TFN are Assigned by Each Decision Makers to Each Alternative's Criterion

Criteria	$\mathbf{M_1}$	$\mathbf{M_2}$	$\mathbf{M_3}$
$\mathbf{K_1}$	(0.2,0.4,0.6)	(0.2,0.325,0.475)	(0.20 ,0.40, 0.60)
$\mathbf{K_2}$	(0.375,0.55,0.725)	(0.475,0.625,0.8)	(0.275,0.45,0.65)
$\mathbf{K_3}$	(0.275,0.45,0.625)	(0.275,0.425,0.575)	(0.150,0.30,0.50)
$\mathbf{K_4}$	(0.625,0.725,0.775)	(0.325,0.50,0.675)	(0.450,0.65,0.85)
$\mathbf{K_5}$	(0.325,0.550,0.750)	(0.350,0.4,0.575)	(0.375,0.525,,0.675)
Criteria	$\mathbf{M_4}$	$\mathbf{M_5}$	$\mathbf{M_6}$
$\mathbf{K_1}$	(0.20,0.40,0.60)	(0.425,0.550,0.875)	(0.175, 0.3,0.55)
$\mathbf{K_2}$	(0.375,0.55,0.725)	(0.450, 0.525, 0.60)	(0.325, 0.50,0.70)
$\mathbf{K_3}$	(0.275,0.425,0.575)	(0.425, 0.575,0. 725)	(0.325,0.475,0.65)
$\mathbf{K_4}$	(0.550,0.375, 0.90)	(0.550,0.75, 0.90)	(0.50,0.7, 0.875)
$\mathbf{K_5}$	(0.40, 0.60, 0.80)	(0.45,0.65, 0.825)	(0.40,0.60, 0.80)

By simplifying each step of fuzzy TOPSIS and finally we calculate, closeness coefficient of each alternative by using $\boldsymbol{M_i^* = \frac{d_i^-}{d_i^- + d_i^+}}$

$\mathbf{M_1^*}$=0.355/0.355+0.422 = 0.457
$\mathbf{M_2^*}$=0.029/0.029+0.748 = 0.037
$\mathbf{M_3^*}$=0.025/0.025+0.757 = 0.032
$\mathbf{M_4^*}$= 0.424/0.424+0.352 = 0.547
$\mathbf{M_5^*}$ = 0.773/0.773+0 = 1
$\mathbf{M_6^*}$ = 0.343/0.343+0.431 = 0.443

Lastly, in table:4 ranking of each alternative is shown.

Table: 4 Alternative Rankings

Strategy	Final Score	Ranks
$\mathbf{M_1}$	0.457	3
$\mathbf{M_2}$	0.037	5
$\mathbf{M_3}$	0.032	6
$\mathbf{M_4}$	0.547	2
$\mathbf{M_5}$	0.001	1
$\mathbf{M_6}$	0.443	4

RESULTS AND DISCUSSION

In this study TFN's are used in FMCGDM for the selection of mobile phone in metro like Lahore. This study is completely based in Pakistani context and it was done first time. Criterion for choosing the cell phone has identified and then these factors are evaluated on the basis of peoples' choice. On the bases of criterion rank, some cell phone has been ranked according to their criterion. Results of above calculations shows that due to the brutal market competition mobile phone selection is a difficult task within the budget, using this algorithm mobile phone can be selected easily.

CONCLUSION

The findings are based totally upon the studies conducted in Lahore and hence might not be relevant immediately to different metropolitan regions on counts of socio-cultural diversity and contextual elements. With a bigger pattern size unfold throughout different metropolitan towns in Pakistan one would possibly arrive at effects with higher self-assurance levels and also at traits for city Pakistan mainly. One of these studies wishes to be undertaken periodically to gauge exact patron perceptions that they hold converting with time.

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