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PRIORITY OF DIGITAL MARKETING MEDIUMS IN INDIAN E-LEARNING INDUSTRY: A PRESCRIPTIVE ANALYSIS USING AHP

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Abstract: Decision making in business has evolved as a highly complex process. Robust analytical techniques backed up by ultramodern computational abilities are now being relied upon for unbiased decisions. The aim of this paper is to find out the priority of the digital marketing mediums that are extensively used in E-learning space. Analytic Hierarchy Process, AHP, is used in this study and its algorithm prescribes the relative rank of the digital marketing channel alternatives. Primary data forms the basis of this study. Advertisement per click is found to be the most preferred medium followed by social media, banner advertising and email marketing in decreasing order of preference. The paper concludes that the top two ranked mediums contribute to more than 70% of the industry preference.

Keywords **- AHP, Digital Marketing, E-Learning, MCDM, Prescriptive analytics.**

I. INTRODUCTION

Business decisions form an integral part of any managerial function. Since every decision involves an element of risk, choosing the right or the optimum option has emerged to be extremely critical in today's complex business environment. Decision making becomes even more complex when encountered with subjectivity, as it involves variability and induces inconsistency with respect to space, time and origin. To overcome such intrinsic behaviour of decision problems, researchers and practitioners, across the globe are making relentless efforts to develop methodologies that not only aid in accurate decision making but also finds spatial and temporal reliability in their applications. Most decision problems have common characteristics of identifying one or making a priority among a finite number of alternatives or options whose performance is understood to be influenced by a set of multiple yet conflicting criteria, each of which may have different units of measurement. This forms the ambit of multi criteria decision making (MCDM) which belongs to the broader area of prescriptive analytics. A wide range of mathematical methods have been developed within the domain of prescriptive analytics, and MCDM to be precise (Boer, Labro, & Morlacchi, 2001). It includes technique for order preference by similarity to ideal solution (TOPSIS), analytic hierarchy process (AHP), analytic network process (ANP), data envelopment analysis (DEA), genetic algorithm (GA), goal programming (GP), simple multi-attribute rating technique (SMART), along with other methods (Dahel, 2003).

The world of advertising has witnessed a radical shift from its traditional forms to online and digital channels. Consumer media habits, like purchasing behaviours, also have changed since the last half of the twentieth century. The combination of an abundance of consumer choice and consumers' increasing access to information has created a wealth of opportunities as well as challenges to organization when it comes to media choice. The world of digital media is changing at a phenomenal pace. Constantly evolving technologies are transforming not just how we access our information but how we interact and communicate with one another on a global scale. This study considers digital marketing tools like Banner Ad, Adv. Per click, social media and email marketing and their priority to organizations in the e-learning domain. A banner ad is a form of advertising on the World Wide Web delivered by an ad server. This form of online advertising entails embedding an advertisement into a web page. Adv. Per click is a model of internet advertising which is used to channelize the traffic to websites. In this entire process, publishers are paid by the advertisers whenever the user clicks on the ads. Relevant to the target market, advertisers bid on the keywords using search engines. Social media is a computer-based technology that facilitates the sharing of ideas and information and the building of virtual networks and communities. By design, social media is internet based and offers users easy electronic communication of personal information and other content, such as videos and photos. Email marketing is the act of sending a commercial message, typically to a group of people, using email. In its broadest sense, every email sent to a potential or current customer could be considered email marketing.

The priorities of all of these digital marketing mediums has been compared using Analytical Hierarchy Process, a highly popular method of prescriptive analytics based on multi criteria decision making. Five criteria, namely cost of advertising, brand awareness, target group served, ease of response tracking and traffic at site have been found to relevant from a preliminary field study involving organizations from E- learning sector which is a part of education industry. The rest of the research paper is organized as follows. The next section elaborates on the literatures followed and discussed on the gap area. It is then followed by the section on Research Framework that captures the research design adapted, sampling technique and data collection method and research methodology which provides an elaborate treatment of AHP. The outcome of AHP implementation on the data collected is subsequently discussed in the results & discussion section. Finally, in the conclusion section, outcome, implications, limitations and scope for further research has been discussed.

II. LITERATURE REVIEW

Literature review was done with the objective to have an understanding of the research works already done in similar and related field and to find out the gap where further research is needed. The review process also helped in developing the required knowledge base on the subject of enquiry. Traditional marketing is the most recognizable form of marketing which is the non-digital way to promote products and services of any business entity. On the other hand, digital marketing is the marketing of products or services using digital channels to reach consumers (Yasmin et al., 2015). Digital marketing has turned out to be crucial part of approach of many companies. Digital marketing has the potential to achieve something more if it considers consumer desires as a priority (Sathya, 2015). Search engine has become a necessity for people to surf the web. It is a simple user interface is designed. Any user simply fills in several fields and the system makes the decision about what to find, where to search and how to look at. With the advent of SEM, an internet marketing model, promoting and ranking of websites has become easy and this has led to increased website traffic (iProspect, 2008). Literature on web theory is still evolving as it is a relatively a new area and the technologists at the forefront of Web design in many cases are not academically inclined to formulate the relevant theories (Day, 1997). Web advertising continues to be a major area of advertising research. A number of studies have been done on advertisements on the Web and their effects. (Pitt et al, 1996) have discussed the role of World Wide Web as an advertising medium in the marketing communication mix and proved that World Wide Web is a new medium for advertising characterized by ease-of-entry, relatively low set-up costs, time independence and interactivity. (Khan and Mahapatra, 2009) studied that the quality of internet banking (i-banking) services in India from customer's perspective. (Malhotra and Singh, 2007) carried out a research to find out i-banking adoption by the banks in India. Ducoffe (1995) introduced the concept of advertisement value. According to him advertising value is defined as the utility or worth of the advertisement. Ducoffe (1996), in another study on World Wide Web, proved the significant impact (either +ve or –ve) of entertainment, information and irritation on advertisement value. Teo (2005) introduced that the growth of Internet technology has enormous potential as it reduces the costs of product and service delivery and cuts across geographical boundaries in bringing buyers and sellers together. That e-commerce can also reduce cost in managing orders and interacting with a wide range of suppliers and trading partners have also been highlighted (Rastogi, 2015). Past research confirms that consumers have developed negative attitudes toward digital marketing (Li, Edwards and Lee, 2002; McCoy, Everard, Polak and Galletta, 2007; Ranchhod, 2007). The Internet can be referred to as a pull medium because consumers choose the content they view. In effect, the consumer is pulling from a plethora and free flow of information (Pitta and Fowler, 2005). Advertisers spend hundreds of millions of dollars to place their ads on high-traffic websites. Literature suggests that when people read an online advertisement, they are more likely to buy online. An advertising banner on the Internet can level the playing field between large and small companies (Smith and Montgomery, 2009). Concern is escalating over consumers developing negative perceptions of digital advertising, mainly due to intrusive messages being delivered to their computers, mobile phones, and other devices (Chatterjee, 2008). Again, exposure to banner advertising was found to increase the probability (Manchanda et al., 2006). Researches on the impact of the various digital advertising medium, especially in the e-learning segment, have not been found. Similar researches in Indian context is scarce and this acts as a strong motivation to delve into this subject. The understanding, experience and priority of the digital marketing mediums or vehicles to organizations operating in the e-learning domain still remains an area of investigation. The same has thus been taken up as the area where research may be conducted.

III. RESEARCH FRAMEWORK

A. Research Design

Cross sectional study design has been used in this research as it provides insights of particular population or group of people at a particular period of time. This helps in generalization of population characteristics that makes it more favoured in a study like this.

B. Sampling Technique & Data Collection

Judgmental sampling Method is used in this study. This is a non-probability sampling technique where the researcher selects units to be sampled based on their knowledge and professional judgement. 10 companies from E-learning industry, who had shown interest in participating this academic research, were approach online and data is collected through the questionnaire. The feedback was collected from Sales, digital marketing and training departments which led to the generating of 30 samples. The samples were collected from Kolkata market. Organization having pan India presence and having offices in Kolkata were considered.

C. Research Methodology

The present study uses Analytic Hierarchy Process, AHP (Saaty, 2012), which is designed to solve complex multi criteria decision problems. AHP requires the decision maker to provide judgments about the relative importance of each criterion and then specify a preference for each decision alternative using each criterion. The output of AHP is a prioritized ranking of the decision alternatives The steps needed to use AHP entails (Kousalya, Reddy, Supraja, Prasad, 2012):

i. Establishing a Structural Hierarchy

Any complex decision is to be structured in the form of a hierarchy. The overall goal of the decision is represented at the top level of the hierarchy while the criteria and the sub criteria, which contribute to the decision, are represented at the intermediate levels (Kousalya et al., 2012). Finally, the decision alternatives are laid down at the last (bottom most) level of the hierarchy. Fig. 1 shows the hierarchy for the digital marketing channel selection problem.

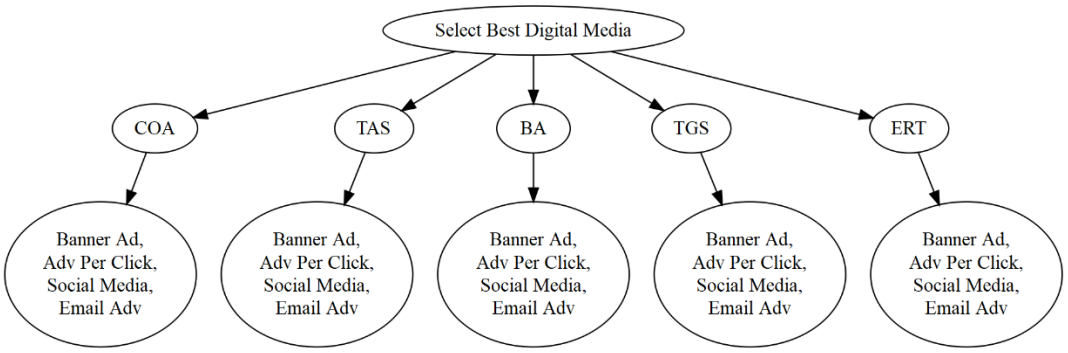

Fig. 1. Hierarchy of digital marketing channel selection problem.

It is to be noted that the first level of the hierarchy shows that the overall goal is to select the best Digital Marketing channel/ media. At the second level, the five criteria cost of advertising (COA), traffic at site (TAS), target group served (TGS), brand awareness (BA), and ease of response tracking (ERT) each contribute to the achievement of the overall goal. Finally, at the third level, each decision alternative, namely, Banner Ad. (BAD), Ad. Per click (APC), Social Media (SM) and Email marketing (EM) contributes to each criterion in a unique way.

ii. Establishment of comparative judgments

Once the hierarchy is established, the next step is to determine the priorities of elements at each level. Here, the decision maker specifies judgments about the relative importance of each of the criteria in terms of its contribution to the achievement of the overall goal. Pair wise comparisons are made for all elements in a level with to respect to an element of the immediate higher level in the hierarchy. The preferences are quantified using a nine point scale (Anderson, Sweeney, Williams, Camm, Cochran, 2016) (Table 1).

Table 1. Hierarchy of digital marketing channel selection problem.

Verbal Judgement	Numerical Rating
Extremely more important	9
Very Strongly more important	7
Strongly more important	5
Moderately more important	3
Equally important	1

Source: Author's Computation

iii. Synthesizing Priorities and Measuring Consistency

The mathematical process described below is used to synthesize the information on the relative importance of the criteria and the preferences for the decision alternatives to provide an overall priority ranking of the decision alternatives (Kousalya et al., 2012). In the ensuing research work, the AHP will use aggregate of 30 personal preferences (using geometric mean) to provide a priority ranking of the four digital marketing channels in terms of how well each channel meets the overall goal of being the best channel. The pair wise comparisons generate the matrix of rankings for each level of the hierarchy after all matrices are developed and all pair wise comparisons are obtained, Eigen vectors (relative weights) are obtained.

Eigen Vector Method: If 'n' alternatives, represented as A_1, A_2,….., A_n, and having weights w_1, w_2, ….., w_n, are compared in pairs then the pair wise comparisons may be represented by a matrix (Kousalya et al., 2012).

$$A = [a_{ij}] = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \dots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \dots & \frac{w_2}{w_n} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \dots & \frac{w_n}{w_n} \end{bmatrix} \; where\; w_i > 0; \sum_{i=1}^{n} w_i = 1 \text{ and}$$

This matrix satisfies the reciprocal property, i.e. $a_{ji} = 1/a_{ij}$ where each term is non-negative and when multiplied by the transpose of the weight vector i.e. $w^T = (w_1, w_2, \dots, w_n)$ a vector 'nw' is obtained (Kousalya et al., 2012). Finding the weight vector, 'w' (priority vector) remains the prime objective in AHP and multiplication of 'A' with 'w' results in *nw* (Nguyen, 2014).

$$Aw = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \dots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \dots & \frac{w_2}{w_n} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \dots & \frac{w_n}{w_n} \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ \vdots \\ w_{n-1} \\ w_n \end{bmatrix} = \begin{bmatrix} \frac{w_1}{w_1}w_1 & \frac{w_1}{w_2}w_2 & \dots & \frac{w_1}{w_n}w_n \\ \frac{w_2}{w_1}w_1 & \frac{w_2}{w_2}w_2 & \dots & \frac{w_2}{w_n}w_n \\ \vdots & \vdots & \vdots & \vdots \\ \frac{w_n}{w_1}w_1 & \frac{w_n}{w_2}w_2 & \dots & \frac{w_n}{w_n}w_n \end{bmatrix} = \begin{bmatrix} nw_1 \\ nw_2 \\ nw_3 \\ \vdots \\ nw_{n-1} \\ nw_n \end{bmatrix} = n \begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ \vdots \\ w_{n-1} \\ w_n \end{bmatrix} = nw$$

The initial assumption is that w is given/ known, and if only A is known and w is to be evaluated, one would have to solve the system (A- nI) w = 0 where the unknown is w (Nguyen, 2014). According to (Kousalya et al., 2012) this has a nonzero solution if n is an eigenvalue of A, i.e., it is a root of the characteristic equation of A. But A has unit rank since every row is a constant multiple of the first row. Thus all the eigenvalue λ_i , i=1,2, ….., n of A are zero except one. Also, it is known

$$\sum_{i=1}^{n} \lambda_i = tr(A) = n$$

and $\lambda_i = 0$, $\lambda_i \neq \lambda_{max}$

The solution (w) of this problem is any column of A and these solutions differ by a multiplicative constant; however, this solution is normalized so that its components sum to unity (Kousalya et al., 2012). The consistency ratio is calculated as per the following steps (Kousalya et al., 2012):

i) Computation of eigen vector/ relative weights and λ_{max} for each matrix of order n

ii) Computation of consistency index for each matrix of order n as: $CI = (\lambda_{max} - n) / (n - 1)$

iii) The consistency ratio is then calculated using the formulae CR = CI / RI, where RI is a known random consistency index obtained from a large number of simulation runs and varies depending upon the order of the matrix (Anderson et al., 2016) (Table 2). If CR is more than that acceptable value, inconsistency of the judgments within the matrix has occurred and the evaluation process needs to be reviewed.

The entire analysis was done using R programming language.

Table 2: Average random index (RI) based on matrix size

Size of Matrix (n)	Random Consistency Index (RI)
1	0
2	0
3	0.52
4	0.89
5	1.11
6	1.25
7	1.35
8	1.40
9	1.45
10	1.49

Source: Adapted from Anderson, Sweeney, Williams, Camm, and Cochran, 2016.

IV. RESULTS AND DISCSSION

The aggregate of the observations (opinions) have been evaluated. Since the opinions are individual ratings on a 9 point scale, geometric mean is used to accommodate the extreme values. The pairwise criteria rating is presented in Table 3. Except for the paired comparison between COA & BA, all other comparisons indicate the preferred choice being strong.

Table 3: Pairwise Criteria Ratings

Pairwise Criteria	More Important Criteria	Rating
COA – TAS	COA	4
COA – TGS	TGS	7
COA – BA	BA	2
COA – ERT	ERT	5
TAS – TGS	TGS	6
TAS – BA	BA	4
TAS – ERT	ERT	6
TGS – BA	TGS	4
TGS – ERT	ERT	5
BA – ERT	BA	4

Source: Author's Computation

Tables 4, 5, 7 and 8 captures the pairwise comparison of the 4 alternatives with respect to COA, TAS, BA and ERT respectively. The pairwise alternative ratings with respect to COA indicate very strong preference of one with respect to the other. Similar observations are noted in case of comparison with respect to TAS and ERT; however with the exceptions of BA-SM for TAS and BAD-SM for ERT. The nature of paired alternative comparisons with respect to BA and TGS are pretty similar with one case in each having slightly stronger preference than equal likely.

Table 4: Pairwise Alternative Ratings with respect to Cost of Advertising

Pairwise Alternative	More Important Criteria	Rating
BAD – APC	APC	6
BAD – SM	SM	7
BAD – EM	EM	5
APC – SM	SM	5
APC – EM	EM	6
SMA – EM	SM	7

Source: Author's Computation

Table 5: Pairwise Alternative Ratings with respect to Traffic at Site

Pairwise Alternative	More Important Criteria	Rating
BAD – APC	BAD	5
BA – SM	SM	3
BA – EM	BAD	5
APC – SM	SM	6
APC – EM	APC	4
SM – EM	SM	7

Source: Author's Computation

Table 6: Pairwise Alternative Ratings with respect to Brand Awareness

Pairwise Alternative	More Important Criteria	Rating
BAD – APC	BAD	4
BAD – SM	SM	5
BAD – EM	BAD	6
APC – SM	SM	5
APC – EM	APC	3
SM – EM	SM	2

Source: Author's Computation

Table 7: Pairwise Alternative Ratings with respect to Target Group Served

Pairwise Alternative	More Important Criteria	Rating
BAD – APC	APC	4
BAD – SM	SM	2
BAD – EM	EM	6
APC – SM	APC	7
APC – EM	APC	5
SM – EM	SM	4

Source: Author's Computation

Table 8: Pairwise Alternative Ratings with respect to Ease of Response Tracking

Pairwise Alternative	More Important Criteria	Rating
BAD – APC	APC	4
BAD – SM	SM	3
BAD – EM	EM	4
APC – SM	APC	6
APC – EM	APC	4
SM – EM	SM	7

Source: Author's Computation

In the next phase the criteria weights have been computed which shows COA as the most important criteria while choosing a digital marketing medium. Both TGS and awareness of the brand (medium) are almost equally important, though, TGS scores slightly more than BA. The summary of criteria is shown in Table 9.

Table 9: Criteria Weights

Criteria	Weights (%)
COA	34
TAS	10
BA	23
TGS	25
ERT	8

Source: Author's Computation

Finally, the AHP rank or the relative preference of the alternatives (digital marketing mediums/ channels) have been calculated. Advertisement per click is found to be the most preferred medium, as considered by E-Learning companies. APC is followed by social media, banner advertising and email marketing in decreasing order of preference. Also, APC and SM put together contribute to more than 70% of the industry preference in their choice for digital marketing mediums.

Table 10: AHP Rank of Digital Marketing Channels

Channels	Priorities (%)	AHP Rank
Banner Advertising	17	3
Ad. Per Click	41	1
Social Media	30	2
Email Marketing	12	4

Source: Author's Computation

V. CONCLUSION

Priority ranking gives the importance of a particular channel. From the findings it can be concluded that the most preferred digital marketing channel is Ad. Per click which is followed by social media within the E-Learning sector. Banner advertising has been seen to be the third most preferred channel while email marketing appears to be less popular. It is to be noted that prescriptive analytical tools involving multi criteria decision making relies on a fixed set of observations and rank reversal phenomenon is experienced in some cases when criteria is changed. However the methodology of AHP being robust with an extremely strong mathematical foundation, finds wide spread application across various domains on the global platform. As far the researcher's knowledge domain is concerned, investigations related to ranking of digital marketing channels in E-learning industry using AHP are difficult to come across. Studies involving AHP require lengthy questionnaires which also limits the sample size. This study was conducted for particular sector and for a given geographical boundary. The same may thus be conducted for other sectors and comparison between industries can be studied. This study can be further enriched and validated with the use of comparable MCDM tools capable of handling subjective opinions. Also test of sensitivity of ranks may also be conducted to assess the generalizability of the present outcome. The theoretical and empirical contributions are expected to add value to the existing information base.

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