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The Impact of Augmented Reality on E-commerce

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ABSTRACT

Augmented reality is a great ally for electronic commerce. Advances made in this technology can be applied to businesses to increase sales or for brand building, by enhancing human perception of reality in this application, through contextualization of individual objects that are encountered in the real world with virtual complements so as to make the real objects more meaningful and appealing. The most common application of AR is as a virtual changing room – e-businesses displaying their products (clothing, accessories) via mobile/web cameras as a 3D projection on a real person. This paper focuses on the growth and impact of e-commerce, the attitudes of Chennai consumers towards Augmented Reality technology in relation to e-commerce products and services, and analysis of the potential for Augmented Reality as a marketing tool in Chennai for both online and offline sales. This paper concludes with the results of the study pointing towards a highly positive attitude towards the acceptance of this technology. Both online as well as offline product marketers could gain now by studying their target audience and investing in AR marketing campaigns in Chennai.

Key words: E- commerce, Technology, Augmented reality, Promotion oriented.

INTRODUCTION

Ecommerce has had its significance in business for over a decade now after the electronic revolution engulfed the world. The ability to connect, communicate, buy and sell over the net has changed business structures everywhere by providing lower costs and higher returns and an unbridled reach to potential consumers. Carrying out transactions electronically provides vast competitive advantages over traditional methods. Electronic commerce has expanded rapidly over the past few years and is predicted to continue at this rate, or even accelerate. The rise in the number of people using smartphones, tablets and the latest gadgets to connect to the information space is proof of the reach of the internet as the most effective medium of trade in this era. Soon the boundaries between "conventional" and "electronic" commerce will become increasingly blurred as more and more businesses move sections of their operations onto the Internet.

In today's concept of keeping up with the latest, new marketing approaches are being explored by entrepreneurs, one of which is Augmented Reality (AR). It is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data. As a result, the technology functions by enhancing one's current perception of reality. Augmentation is conventionally in real-time and in semantic context, with environmental elements around the user. With the help of advanced AR technology (e.g. adding computer vision and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulable. Artificial information about the environment and its objects can be overlaid on the real world. Research explores the application of computer-generated imagery in live-video streams as a way to enhance the perception of the real world.

AR technology includes head-mounted displays and virtual retinal displays for visualization purposes, and construction of controlled environments containing sensors and actuators. Augmented Reality may be considered as an extension of Virtual Reality. AR involves video capture tracking of the real world to combine with the interaction of virtual objects and provided a 3D graphics that could be overlaid on any OS platform, be it on a desktop, tab or a Smartphone. All that is required is a device with a camera and an internet connection to bring AR to the masses. There are countless apps for any purpose one can think of. The application of AR is limited only by imagination.

Augmented Reality works on something called the QR Code (Quick Response Code). It is the trademark for a type of matrix barcode (or two-dimensional code) first designed for the automotive industry. More recently, the system has become popular outside of the industry due to its fast readability and large storage capacity compared to standard UPC barcodes. The code consists of black modules arranged in a square pattern on a white background. The information encoded in the QR code can be virtually any kind of data and it can store say, the product's website link. When the code is scanned using a QR code reader, available online, consumers can directly go to the product's website wherever they are and gather further information about the product while shopping.

Nowadays Object Recognition has replaced the cumbersome scanning of QR codes by code reading apps. A marketer can choose a planar object in an advertisement that would be recognized by the consumers, upload it to an AR technology provider's servers to act as a fingerprint, and then the app does all the rest. The object can be anything from a poster to a magazine to a small item, and the action can be anything from overlaying a 3-D graphic to playing a video file to sending one to a brand's web page. The object itself is now the real world "tag," and object recognition lets the data associated with the tag be much richer and more dynamic than a QR code could manage.

OBJECTIVES OF THE STUDY

The following are the key aspects on which this research aims to focus:-

- To study the growth and impact of e-commerce in Indian metros with reference to Chennai
- To study the attitudes of Chennai consumers towards Augmented Reality technology in relation to e-commerce products and services
- To analyse the potential for Augmented Reality as a marketing tool in Chennai city for both online and offline sales

REVIEW OF LITERATURE

There have been many business models and ways to capture consumer segments. Out of all those ecommerce has a distinct success rate and there are plenty of reasons why an ecommerce site makes business sense for companies, customers and also prospects. 'Why e-commerce works, and why now more than ever…' (Aliya Khan, 9 Sept, 2010, business.wikinut.com) shows the upside of trading online. Firstly, being able to offer products online instantly multiplies the market reach for a company beyond a neighborhood or city to take in the whole of the country, or even perhaps the whole of the world. Also significant amount of capital is not needed in this case and even payments in online businesses are received quickly. So the cost burden on an e-tailer is significantly lower. Ecommerce offers a level playing field to big businesses and a one man operation alike. Consumers only look at the efforts of the etailer – products/services offered.

Forrester Research has found the following (a few years ago):

- 64% of small businesses that were selling their products online suggested that doing so had increased their sales and profitability.
- Nearly 50% felt that having an e-commerce site had actively expanded their market reach and customer base.
- Three out of every four businesses that were selling products online had seen a significant fall in operating costs because of lower essential administration levels.

Web 2.0 is quickly giving way to web 3.0 now. There has never been a better time for entrepreneurs to invest in ecommerce as more and more people are depending on the internet in their day to day activities.

Sheth and Parvatiyar (1995) studied that there are different kinds of business models used in online shopping are based primarily on the type of consumer a brand wants to target. Different types of consumer segments react in different ways to different efforts by e-marketers. The relationship marketing literature suggests that consumer characteristic, e.g., sociological orientation, plays an important role in a consumers' propensity to engage in the Internet transactions. The retailing literature also suggests that consumer characteristics are important indicators of the probability of making purchase decisions on the Internet.

Stone (1954) suggested that shopping behavior has social-psychological origin and classified shoppers into four types: economic shopper, the personalizing shopper, the ethical shopper and the apathetic shopper. Another typology was identified by Stephenson and Willett (1969) who grouped consumers into recreational, convenience and price oriented shoppers. Two additional categories, i.e., psycho-socializing and name-conscious shoppers were added by Moschis (1976).

James Gurd (2010) has listed out possible areas of application of augmented reality in retail, not just for online consumers. From store finder mobile apps to dynamic contextual advertising and dynamically generating cross and up-sell recommendations, e-businesses must be encouraged to enrich the consumption of content to increase brand engagement in today's competitive market. Augmented reality has significant commercial implications. It goes beyond being just an attractive new app and delivers content and solutions that people didn't even know they wanted but subconsciously always desired. This could potentially help tap segments that were previously not completely reachable through other forms of marketing.

'Augmented reality marketing strategies: the how to guide for marketers', a report by Hidden in Mar 2011, gives a complete understanding of the uses, opportunities and even creative ideas on using augmented reality in marketing products and services. Stats published by Hidden show that for digital marketing campaigns augmented reality delivers on average 55,000 unique users per month with onsite dwell times averaging seven minutes 45 seconds. AR can link augmented content to practically anything by providing robust interactivity, portability and mobile 'on-the-go' experiences, while collating business intelligence through point of sale interactions and giving measurable ROI manifesting in conversion to direct sales, dwell time, brand awareness and PR for the brand.

Enterprise apps with AR elements are expected to account for the third-largest proportion of revenues by 2015 according to Juniper Research, Mobile augmented reality. It also says mobile augmented reality is to generate 1.4 billion downloads by 2015 as major brands embrace the concept. Marketers are driving growth in AR and data from ABI Research has proven that the market for augmented reality will reach $350m (£218m) during 2014 - and that is just in the US alone. Augmented reality is a fast growing technology and a 'must have' marketing tool which is helping transform the way information is being engaged. AR is already being used as part of marketing communication to help bring brand experiences to life and also to effectively drive traffic to digital campaigns.

A recent study conducted by Yuzhu Lu and Shana Smith on 'Augmented Reality E-Commerce: How the Technology Benefits People's Lives' a couple of years ago examines the user reactions to traditional ecommerce systems, virtual reality systems and augmented reality systems. Experiments conducted on a group of people revealed that people gained most information through augmented reality systems online and also better user confidence and user interaction, as opposed to a traditional ecommerce system or even a virtual reality system. 95.8% of participants mentioned, in their feedback, that the AR e-commerce system

provides the capability to see how products fit in the physical space, so that users can gain more visualization information. It presents products in a real scale relative to the environment, and is able to show views from several perspectives. Site visitors can efficiently evaluate product information, such as color and size, and determine whether it is worthy of a purchase. AR provides people an interesting experience and helps them gain more information and a much more correct judgment while shopping online.

In light of the above studies, white papers, articles and blog posts it is evident that augmented reality cannot be ignored by marketers in the years to come. There have been sufficient studies to show the increasing propensity of information and the need for customisation of content for consumers in this decade, which AR can provide in the process of brand exposure through ads and campaigns. The benefits derived from this technology, if rightly implemented, can affect more than one dimension of a business. It makes one naturally curious to see if the same benefits can be derived in the Indian context as well. For the purpose of this study the consumers in Chennai have been taken as the subject of research on the effects of augmented reality in providing a richer, more targetted marketing content. Also the study aims to determine the ecommerce activities currently existing in the city, the propensity for information, personalisation, experiential shopping preferred by consumers and to explore the potential of augmented reality to provide perceptional benefits to ecommerce in Chennai by functioning as a persuasion tool in ecommerce sites.

RESEARCH METHODOLOGY

The research design used for this study is explorative since the potentiality and impact of augmented reality and ecommerce is determined through various qualitative statements given by the respondents. Data collection is through both primary and secondary sources. A questionnaire is used for primary data collection in Chennai and various statistical figures from previous researches are used as secondary data to highlight facts about ecommerce. An online survey containing 18 direct questions, 30 rating statements (4 point scale) and 7 demographic questions conducted on 222 respondents in Chennai yielded data that would shed light on ecommerce and augmented reality preferences. Sampling methods used are judgement sampling – since only those comfortable using computers are asked for their opinions, and referral sampling – the associates of respondents have also provided responses to the questionnaire. The statistical analyses used on the primary data collected include factor analysis, cluster analysis, discriminant analysis, to study the various relationships between data collected and to effectively interpret them to suit a marketer's practical needs.

FACTOR ANALYSIS

The means for all 30 analysis statements rated from 1 to 4 are around the 2.5 range. So the opinions of respondents have mostly been between agree and somewhat agree for all questions asked. In the Total Variance Explained table we see that 10 factors have been extracted that have Eigen value greater than 1. Eigen values explain the variances of the factors and values greater than one represent considerable variance, forming significant factors.

Table 1 : Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.221	14.069	14.069	4.221	14.069	14.069
2	2.55	8.501	22.571	2.55	8.501	22.571
3	1.825	6.083	28.654	1.825	6.083	28.654
4	1.641	5.471	34.125	1.641	5.471	34.125
5	1.378	4.595	38.72	1.378	4.595	38.72
6	1.31	4.366	43.086	1.31	4.366	43.086
7	1.23	4.1	47.186	1.23	4.1	47.186
8	1.142	3.808	50.994	1.142	3.808	50.994
9	1.077	3.59	54.584	1.077	3.59	54.584
10	1.029	3.429	58.013	1.029	3.429	58.013
11	1	3.332	61.345			
12	0.965	3.217	64.563			

13	0.905	3.017	67.579			
14	0.857	2.858	70.437			
15	0.834	2.781	73.218			
16	0.766	2.553	75.771			
17	0.752	2.507	78.278			
18	0.724	2.415	80.693			
19	0.638	2.126	82.819			
20	0.619	2.064	84.883			
21	0.594	1.979	86.861			
22	0.582	1.94	88.801			
23	0.523	1.745	90.546			
24	0.509	1.697	92.243			
25	0.469	1.564	93.807			
26	0.427	1.424	95.231			
27	0.417	1.392	96.622			
28	0.369	1.229	97.851			
29	0.354	1.179	99.03			
30	0.291	0.97	100			

The 10 factors extracted explain 58.035% variance of the entire data collected.

The Component Matrix gives the loadings of each variable on the 10 extracted factors. Rotated Component Matrix (Varimax rotation) gives better understanding of the actual variance present in the data. It can be seen that the first variable with 0.603 value is loaded most on factor 1, the second variable with value 0.575 is loaded most on factor 2 and so on for other variables as well.

ROTATED COMPONENT MATRIX

Based on these loadings we can reduce the 30 variables into 10 significant factors that affect the study. The positive values show positive loadings on the factors extracted and the negative values show inverse relationships. The factors can be explained by arranging consumer variables from the questionnaire, into 10 groups based on highest Component Matrix loadings per statement, as below:-

Factor 1 – INFORMATION ORIENTED

This factor revolves around the need of consumers to have instant information about products and services whenever and wherever. With electronic devices becoming commonplace, the desire to stay connected, to know about new apps that are available online and to involve in the topics that are trending become important for people. This familiarity with the internet also reduces qualms about ecommerce thus increasing favour towards seeking information as well as making purchases online. Wanting instant information is the most significant statement in this factor with a value of 0.630

Factor 2 – PROMOTION ORIENTED

The varied qualities of a good promotional campaign, from curiosity to entertainment generation, are all included in this factor. Different promotions mean different things to different people. The influence a promotion manages to exert on a consumer is the effect studied under this factor. The consumers' positive response towards promotions, also inducing purchase, leading to increase in satisfaction in usage of a product/service establishes promotion orientedness as a major factor. Impact of curiosity generating promotions is loaded the heaviest on this factor with a value of 0.635

Factor 3 – ECOMMERCE CONCERNS

The concern for shopping online is a major factor in discriminating between segments of consumers. Knowing the preferences of respondents in not wanting to engage in ecommerce activities due to regrets or trust issues, will aid in understanding to what extent people are reserved about shopping online and removing obstacles for them in the future.

Factor 4 – ECOMMERCE BENEFITS

This factor helps discriminate between respondents and determine how many are enthusiastic about shopping online. It represents the preferences of consumers in wanting to actively seek out information required for individual needs and considerable engagement in ecommerce activities. It includes responses for availing the benefits arising out of ecommerce like a variety of options being available online, the convenience of shopping from home and being able to get attractive offers on various products

and services. The consumer need to control the type and amount of information gotten about products and services is a significant variable under this factor with a value of 0.586

Factor 5 – INTERACTIVITY

Favouring an interchange of information comprises this factor. Consumers would like being a part of something that responds to them. So preferences to the use of an interactive web app or participatory promotional campaigns would be positive indicators of making a purchase. This factor includes the need for consumers to be able to stay up to date on their peers' activities online. The highest loading on this factor is 0.741 and it is for comfort in shopping online with the aid of virtuality.

Factor 6 – PERSONAL FEEL

The need for a personal touch while making purchases is the essence of this factor. Consumers like to be able to personalise the promotions for products, the shopping experiences as well as the purchase activity. This means they would not prefer buying online since it gives convenience and speed at the price of personal feel in shopping. The value 0.760 is the highest loading under this factor for the need to have a complete shopping experience before a purchase.

Factor 7 – SOCIAL INFLUENCES

This factor revolves around the social needs of a consumer. The influence of peers and other groups around a consumer while making an ultimate purchase reflects how much significance is given to being a part of a social group. This would mean the consumers follow what seems to be most socially acceptable and like being part of online communities to engage in brand activities taking place on social media networks. Wanting to engage in social media activities on Facebook and Twitter is the major variable in this factor with a loading of 0.642.

Factor 8 – BRAND CONNECTIONS

Connections made with brands before making purchases reflect the need to relate oneself to the brand. There is also the need to exchange positive brand information with peers and strengthen the connections made with the brand. With a loading of 0.741, the need to connect to a brand is a strong influencer.

Factor 9 – SHOPPING NEEDS

The respondents' predilections while making an actual purchase determines what are the shopping needs for a consumer and also if shopping online or offline is preferred. This helps segregate potential consumer groups that would react well to ecommerce. The need to have a salesperson physically present indicating a preference to offline shopping, is the variable loaded heaviest on this factor with a value of 0.712

Factor 10 – SENTIMENT

This factor is to ascertain if the consumers base their product criteria and purchase decision on a variable other than price, quality, information, promotions, social influence, etc. The consumers might be majorly influenced by personal sentiment alone while shopping, despite the existence of other factors and their interrelationships. This has to be determined in order to segregate such segment of people.

So the above 10 factors can be used to judge the preferences of respondents in ecommerce and in marketing promotions. This factor analysis also provides regression factor scores under every factor, for all 222 respondents which will determine individually the coefficients for the regression equation for all factors combined. These regression scores can be used in further analysis.

Rate the following based on your personal preferences.	**Table – 2 : Rotated Component Matrix**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
I like knowing about new apps available online	0.604	0.074	-0.003	0.113	0.182	0.162	-0.014	0.074	-0.198	-0.011
I am more likely to buy products that are promoted in a unique way	0.386	0.597	-0.01	-0.112	-0.181	-0.022	0.1	0.08	-0.143	0.171
Having a salesperson physically present will make me more comfortable while I shop	-0.07	0.074	0.159	0.032	-0.06	0.196	0.065	-0.103	0.712	-0.029
I will definitely buy a product if I am convinced by its promotions	-0.143	0.603	0.137	0.225	0.126	0.017	-0.272	-0.001	0.276	0
I like having instant information about products/services	0.63	0.073	-0.029	0.343	0.071	0.052	-0.262	0.054	0.124	-0.176
If I come across an interactive app I explore it	0.164	0.034	0.062	0.571	0.325	-0.043	-0.174	0.26	-0.168	-0.019
I am more likely to buy a product with promotions that touch my sentiments	-0.046	0.194	0.139	0.01	0.084	0.071	-0.038	0.143	0.024	0.754

I need to touch & feel products before purchasing them	0.111	-0.127	0.512	0.223	-0.118	0.549	0	0.121	-0.051	0.098
I don't shop online because I am primarily concerned about security	-0.053	0.098	0.744	-0.018	-0.189	-0.05	-0.008	0.001	0.078	-0.003
A good promotional campaign increases my satisfaction in using that brand	0.297	0.342	0.14	-0.204	-0.098	0.13	0.049	0.33	0.257	0.129
Shopping online makes it easier to locate any product I want	0.616	0.039	-0.3	0.051	0.027	-0.112	-0.043	0.08	0.005	0.107
If I like an ad/promotion I tell my friends about it	0.189	0.166	-0.038	-0.042	0.133	0.043	-0.252	0.619	0.024	-0.068
I need to connect to a brand before purchasing it	0.092	-0.005	0.039	0.198	0.015	0.067	0.144	0.741	-0.076	0.192
I am more likely to buy products with promotions that make me curious	0.165	0.635	0.012	0.06	0.213	0.035	0	0.08	0.033	0.036
I am comfortable shopping online if I can virtually experience the use of products	0.058	0.093	-0.167	0.023	0.741	0.074	0.107	0.098	0.011	0.058
When promotions include my participation I am more likely to buy the brand featured	0.202	0.407	0.081	0.048	0.477	-0.196	-0.048	-0.028	-0.198	0.216
I check out apps that my friends are using	0.163	0.005	0.132	0.122	0.508	0.21	-0.417	0.029	0.156	-0.051
While shopping if I don't get immediate clarification of queries I lose interest in buying	0.235	0.169	-0.06	0.033	0.117	0.041	-0.58	0.105	-0.082	0.007
Shopping online gives better value for my money through deals and offers	0.213	0.025	-0.355	0.48	-0.051	0.024	0	-0.176	-0.056	0.431
Entertaining promotions make me more likely to purchase the brand featured	-0.118	0.477	-0.368	0.35	-0.053	0.203	0.189	0.047	-0.007	0.196
I want to control the type and amount of information I get about products/services	0.128	0.123	-0.02	0.586	-0.08	0.185	0.134	0.026	-0.009	-0.097
If the same product is available online as well as in physical stores, I will buy online	0.081	0.012	-0.063	0.567	0.16	-0.24	0.012	0.017	0.344	0.276
Apart from price & quality, my purchase decisions are influenced by promotions	-0.17	0.339	0.234	0.316	0.109	-0.057	0.219	0.175	0.236	0.252
I don't shop online since I might regret the purchase decision later	-0.159	0.004	0.614	-0.12	0.195	0.012	0.149	0.015	0.144	0.17
If I like an ad/marketing campaign I follow that brand on Facebook, Twitter, etc.	0.173	0.255	0.095	0.188	0.218	0.071	0.642	0.132	0.073	-0.097
Informative promotional campaigns make me more likely to buy the brand featured	0.538	0.111	0.102	0.025	0.084	-0.014	0.111	0.233	0.452	-0.008
While making purchases, I'm influenced by what others are buying	0.127	0.056	0.318	0.078	0.296	0.309	0.386	-0.283	-0.049	0.277
I need to instantly compare alternatives when I am shopping	0.14	-0.259	-0.354	-0.117	0.185	0.272	-0.151	0.129	0.378	0.245
I need to have a complete shopping experience before making a purchase	0.059	-0.004	-0.093	-0.082	0.053	0.76	-0.076	-0.023	0.184	0.094
Experiencing personalised promotions increases my likelihood of buying that product/service	-0.112	0.291	-0.017	0.195	0.203	0.538	0.147	0.259	0.076	-0.15

CLUSTER ANALYSIS:

The ratings given for the statements in the questionnaire provide for some homogeneity between certain respondents and heterogeneity among others. This is represented in the factor scores derived for each sample. Using cluster analysis on the factor scores, the respondents can be clustered into various groups mimicking the consumer segments in the Chennai market that could be targeted by Augmented Reality and eCommerce marketers.

The Agglomeration schedule and the Dendrogram give an idea about the optimum number of clusters to be used. 6 clusters have been selected to segment the samples based on Hierarchical Clustering using Ward's method and applying Squared Euclidean Distance. This generates the cluster membership for all 222 respondents amongst the 6 clusters. Based on the preferences of consumers in each cluster the general characteristics of a cluster can be determined.

The means of all factors for every cluster under the descriptive statistics helps understand the particular influence of the ten factors on consumer clusters.

Table – 3: Descriptive Statistics

Ward Method - Factors	No. of members in cluster	Minimum	Maximum	Mean	Std. Deviation
CLUSTER 1					
Information oriented	37	-.64492	1.51165	.5677071	.54639573
Promotion oriented	37	-2.80047	1.28725	-.4370858	.73135887
Ecommerce concerns	37	-1.76180	.08242	-1.0624977	.41995738
Ecommerce benefits	37	-1.28685	1.55864	.2988654	.71497282
Interactivity	37	-1.76516	.97556	-.0520843	.59668342
Personal feel	37	-2.01987	1.63811	-.3653041	.81475369
Social influences	37	-1.74721	.69007	-.6401347	.68559665
Brand connections	37	-2.47061	1.45853	-.3614873	.73205145
Shopping needs	37	-1.64405	1.99746	-.2152028	.76817668
Sentiment	37	-1.50161	1.23175	-.3140787	.68945036
CLUSTER 2					
Information oriented	68	-2.93912	1.77447	.1424900	.87059578
Promotion oriented	68	-1.22690	2.11436	.7299747	.70343816
Ecommerce concerns	68	-1.79495	2.47689	.1258327	.84457501
Ecommerce benefits	68	-2.56119	1.62560	-.1267132	.83481943
Interactivity	68	-1.76754	1.91353	.2972737	.83661447
Personal feel	68	-2.26034	2.12369	.0806394	1.04741608
Social influences	68	-2.06728	2.21690	.0635838	.84964601
Brand connections	68	-1.64578	2.43220	.4677239	.87198255
Shopping needs	68	-2.54286	1.20075	-.0610929	.81172835
Sentiment	68	-1.76156	2.22605	.2617098	.86879206
CLUSTER 3					
Information oriented	22	-3.94116	-.03532	-1.5641463	1.00703113
Promotion oriented	22	-1.63270	1.17909	.0352380	.82081353
Ecommerce concerns	22	-2.20360	1.12373	-.5955103	.92545327
Ecommerce benefits	22	-1.38725	1.99810	.3083284	1.15990308
Interactivity	22	-1.18848	2.18006	.5253743	.87856751
Personal feel	22	-2.00805	2.20233	.3465289	.96452896
Social influences	22	-1.53724	2.91923	.3408315	1.44811806
Brand connections	22	-2.04146	2.10531	-.0135725	1.11927791
Shopping needs	22	-1.73368	1.64968	-.1997813	.94938396
Sentiment	22	-1.06438	1.96429	.0788706	.87376529
CLUSTER 4					
Information oriented	19	-2.25585	1.03481	-.2577634	.90953255
Promotion oriented	19	-.54119	1.54163	.7819702	.64701422
Ecommerce concerns	19	-.28495	1.92061	.6813693	.64763610
Ecommerce benefits	19	-1.72608	1.50838	.1321160	.87119431
Interactivity	19	-2.57908	1.41250	-.1762780	1.05802231

Personal feel	19	-1.55308	2.20124	.5129814	1.07712690
Social influences	19	-1.19929	1.30687	-.0550617	.80406651
Brand connections	19	-2.09079	.16221	-1.1412165	.60108603
Shopping needs	19	-1.88443	3.26853	-.0390651	1.17810320
Sentiment	19	-2.77138	.15471	-1.1909569	.88310573
CLUSTER 5					
Information oriented	47	-1.80502	1.75409	.2375619	.78474130
Promotion oriented	47	-2.40686	.36425	-.9642879	.77403824
Ecommerce concerns	47	-.47935	2.19321	.7007290	.71713193
Ecommerce benefits	47	-2.14667	2.44007	.0656925	1.21095723
Interactivity	47	-1.57134	2.16869	.1237791	1.02908164
Personal feel	47	-1.75664	1.41858	.0365523	.81548637
Social influences	47	-1.61332	3.25859	.2564201	.99141270
Brand connections	47	-1.28951	2.26218	.2720628	.88904946
Shopping needs	47	-2.12785	2.09495	-.0928051	1.14462574
Sentiment	47	-2.05910	2.00944	-.3159139	.86908572
CLUSTER 6					
Information oriented	29	-1.15657	2.46092	-.0879713	.91976485
Promotion oriented	29	-1.56804	1.51079	-.1302498	.84943655
Ecommerce concerns	29	-2.27046	1.54767	-.0697678	1.11769632
Ecommerce benefits	29	-2.67080	1.75370	-.5111206	1.06795896
Interactivity	29	-3.35436	.96540	-1.1142781	.97678895
Personal feel	29	-2.15257	2.24357	-.3812230	1.12262562
Social influences	29	-2.08340	2.17043	.0295661	1.09637582
Brand connections	29	-2.17309	1.64099	-.3184634	1.04732740
Shopping needs	29	-.81545	3.01049	.7453824	1.06971697
Sentiment	29	-.63862	2.68564	1.0195044	.80788464

The various clusters derived from the data above and their characteristics, along with the relation to the respondents' age are given below.

The different clusters elucidate the classification of consumers in the Chennai market. The results show that *Connection seekers* (31%) are on the higher side amongst the respondents. These are reluctant shoppers and their trust has to be gained for the success of an Augmented Reality based business. The *Conservatives* (21%) are the second highest number of respondents. But a majority of this cluster is composed of below 25 year-olds so considering the changing trends in shopping and further growth of ecommerce in India, this cluster could be expected to change its perceptions in the coming years, by which time there would be sufficient development in Augmented Reality technology in Chennai. The *Opinionators* (17%) are the most suitable cluster of people to be targetted by Augmented Reality marketers. They are the third highest in Chennai and the percentage of members is expected to rise. The *Followers* are another important cluster that must be targetted by marketers. They come fifth highest (10%) amongst the respondents. Since they react positively to ecommerce and also like social influences this segment could be easily captured after other segments like the opinionators and connection seekers have adopted Augmented Reality. The other 2 clusters of consumers – Value and Thrill seekers together form 21% of the respondents and they need to be exposed to alternate marketing tactics to be won over to make purchases online as well as to appreciate promotions using Augmented Reality.

DISCRIMINANT ANALYSIS:

The clusters formed in the previous analysis can be verified using Discriminant Analysis to determine how much of the classification is correct and how well the cluster model represents the survey data. This analysis also helps predict outcomes by providing discriminant functions that act as regression equations. Using the factor scores as independents in the analysis and the cluster membership for each case the following findings are made:

The Eigenvalues table has good canonical correlations which mean that the variation in the grouping variable has been explained well by the discriminant functions.

Table – 4 : Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	1.413	32.0	32.0	.765
2	1.177	26.6	58.6	.735
3	.837	18.9	77.5	.675
4	.522	11.8	89.3	.586
5	.471	10.7	100.0	.566

Table -5 : Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 5	.046	654.535	50	.000
2 through 5	.112	466.946	36	.000
3 through 5	.243	301.238	24	.000
4 through 5	.447	171.701	14	.000
5	.680	82.247	6	.000

Wilks' Lambda value for functions '1 through 5' shows that the discriminant equations leave only 4.6% of the data unexplained. The Canonical Discriminant Function Coefficients below explain the factors that can be used in the different functions as predictors. 5 discriminant functions have been formed to predict the factors influencing the clusters.

Table – 6 : Standardized Canonical Discriminant Function Coefficients					
Factors	Function				
	1	2	3	4	5
Information oriented	-.483	-.224	.270	.112	.768
Promotion oriented	.603	.510	-.390	-.166	.482
Ecommerce concerns	.456	-.063	.796	-.322	.100
Ecommerce benefits	.075	-.412	-.236	.103	-.096
Interactivity	.567	-.350	-.130	.520	.035
Personal feel	.514	-.111	.001	-.121	-.085
Social influences	.361	.138	.350	.027	-.301
Brand connections	.221	.184	.362	.737	.094
Shopping needs	-.234	.414	.171	-.263	-.076
Sentiment	-.263	.834	.123	.297	-.131

Promotions, Interactivity, Personal feel, Social influences are strong predictors in discriminant function 1. Shopping needs, sentiment and the lack of enthusiasm for ecommerce benefits are major predictors of function 2. The presence of Ecommerce concerns predicts function 3 very well. Function 4 is primarily predicted by Ecommerce benefits. Function 5 has Information factor as a significant predictor. Future cases with values close to the Centroids are predicted as belonging to that group.

The Classification Results table gives the percentage of correct classification for every cluster.

Ward Method	**Table 7 : Predicted Group Membership of clusters**						**Total**
	1	**2**	**3**	**4**	**5**	**6**	
Original Count							
1	34	1	0	0	0	2	37
2	1	54	5	3	2	3	68
3	0	1	14	3	2	2	22
4	0	0	0	18	0	1	19
5	0	2	1	1	42	1	47
6	0	1	0	0	0	28	29
Percentage %							
1	91.9	2.7	.0	.0	.0	5.4	100.0
2	1.5	79.4	7.4	4.4	2.9	4.4	100.0
3	.0	4.5	63.6	13.6	9.1	9.1	100.0
4	.0	.0	.0	94.7	.0	5.3	100.0
5	.0	4.3	2.1	2.1	89.4	2.1	100.0
6	.0	3.4	.0	.0	.0	96.6	100.0

All clusters have a good percentage with clusters 1, 4, 5, 6 being around 90% correctly classified. Clusters 2 and 3 have lower percentages indicating that cluster members require to be grouped better. 13.6% of members of cluster 3 are classified under cluster 4 in this analysis and few others in other clusters. Only 63.6% (14 members) of the original members grouped under cluster 2 seemed to have been classified correctly.

The respondents for whom precise categorisation has not been possible cause these classification results to be less than 100%. The overall classification statistic (average %) shows that 85.6% of the original data is correctly classified. This proves that the clusters used are significant and they represent the consumer segments in Chennai market well. Also, through this analysis, the discriminant scores for each case explaining function classification (from 1 to 5) for each respondent are given. They are classified based on the coefficients of their predictor variables. These scores can be used for further analysis as well. With the confidence of the classification statistics derived, it can be said that the cluster segments interpreted in the study would be sufficient evidence of the potential of augmented reality to be a successful venture, purely based on the opinions and preferences of consumers in Chennai for this technology and ecommerce in general.

OTHER FINDINGS:

- About 87% of Chennai consumers are shopping online every few days, although a majority of those transactions are travel services (94%) and banking services (81%); (multiple responses to the question allowed). Majority of the products bought online are books and electronics closely followed by services like music/video, software downloads and paid online subscriptions like magazine subscriptions, job/marriage portals, etc.
- Many consumers (45%) who shop online spend more than Rs.5000 on purchases made. This finding in a conservative metro like Chennai could indicate that people from higher income brackets prefer shopping online.
- 41% of all respondents, including the ones who do shop online, still have trust issues about the product but more than half (58%) stated that ecommerce is a major time saver. This bears a positive note to etailers as more people are warming up to the idea of saving time on shopping by just going online.
- 89% of respondents use a PC/laptop with webcam while 67% use a smartphone and most of them go online on these devices almost every day to few times a week. This shows the increased use of gadgets by consumers to stay connected and it bodes well for the implementators of augmented reality in Chennai.
- A majority of people (61%) had heard about augmented reality before this survey and many, even the ones who haven't heard of AR before, responded positively to taking the time to download an AR app and viewing the ad (67%) and in stating that shopping online will get easier with AR (70%).
- In the scenario type questions as well around 70% of the respondents have given positive reactions to all scenarios including giving support to their favourite brands in the event of release of an AR app by them. Such optimistic responses present a viable investment opportunity for marketers, especially ecommerce marketers in introducing personalised brand-consumer interactions in Chennai.

Segmenting Chennai's consumers into 6 clusters is the first step to introducing Augmented Reality to the market. The type of consumers to target is clearer, so now campaigns can focus on what those consumers are looking for in products and services available online. Further research into how to affect the attitudes of consumers into embracing this technology will be useful while getting down to the nitty-gritty of things; positive reactions in this study do not automatically guarantee the success of AR as soon as it is implemented. Even if there is positive impact on consumers, AR could be a few more years away from becoming mainstream in Chennai's marketing scene and commercially successful. An entrepreneur toeing the idea of using AR, especially for his online business would do well to do an analysis of the costs versus benefits of developing, implementing and delivering AR solutions to his end customers.

CONCLUSION

Ecommerce is poised to grow in leaps and bounds all over the world and in India people are just warming up to the idea of shopping online as a mainstream activity. A few years down the line when there is robust preference for Indians to shop online AR can take it to the next level. Augmented reality could potentially be the biggest thing in e-commerce since the search engine. It's a great concept from the desktop, but mobile takes it to a whole different level. This could both disrupt brick and mortar retail stores and complement them. With the results of the study pointing towards a high acceptance of this technology, online as well as offline product marketers could gain now by studying their target audience and investing in AR marketing campaigns in Chennai.

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