The Wearable World in the Palm of our Hand: The Perceived Importance of Augmented Reality in Marketing Strategies

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ABSTRACT

The present article refers to an exploratory study of the perceived importance of augmented reality for marketing strategies, namely in what concern: costs, branding, communications and product versus immersion, body, wearable and blended augmented reality. It starts with the theoretical framework for augmented reality, followed by the design and research methodology; it then proceeds with the analyses and comment of data gathered, and at the end, it refers to the research limitations and perspectives. Results point out that augmented reality is not perceived as an outstanding tool for marketing nor as an investment with high benefits, nevertheless it is seen as pertinent for blended marketing and immersive augmented reality gathering some sympathy from respondents.

Key words: Importance of Augmented Reality, Marketing Strategies, Perceived opinion.

1. Augmented Reality, concept, definition and technology

A puzzling facet of augmented reality (from now on AR) is that in contrast with other promising technologies (e.g. multimedia, geographic information systems, artificial intelligence) that took massive marketing and communication efforts and ages to reach the mass market, it has been around us for a long time, although we do not notice or acknowledge it.

In fact when a youngster plays with Nintendo Wii, he imposes the date on a digital photography or sees a film like Alice in Wonderland, he is also having an AR experience.

In two decades AR has experienced a steady growth that can be traced in many different areas, from training to medicine, marketing to war devices and amusement industries. Nowadays, as it moves into the arena of mobile communications, it is expected that AR will be a killer app of the decade (Grifantini 2010).

In historical grounds, it is commonly accepted that Sensorama (1962), a motorcycle simulator with visuals, sound, vibration, and smell, created by the cinematographer Morton Heilig, was the first successful AR device, but the credits of the term are due to Tom Caudell and David Mizell, researchers at Boeing, who proposed to substitute the numerous, complex and expensive airplane drawings by a head-mounted apparatus with eyewear reusable boards managed by computers (Caudell and Mizell 1992).

Among the computer jargon, AR seems to be one of the oddest terms, as unlike other designations (e.g. database, electronic edition, computer assisted design....) it is not connotative; on the contrary, its denominative flavor led us to an imaginary and pictorial dimension, which in fact can be one of its teasers. Conversely it is recurrent to say that the chosen words are an oxymoron, as if it is reality it cannot be augmented.

Besides that subjectivity, the concept has been defined and framed by various authors. The main ideas will be taken into account in the next paragraphs.

One summarized definition, very popular on the Web but also presents in books, states that "… augmented reality is a system that enhances the real world by superimposing computer generated information on the top of it (Furth 2006:30)"; Although that definition gives a general idea of what it can be, it is very limited and biased, as there are AR applications that use other processing systems such as mobile phones or head-up displays.

In fact with the evolving technologies and deployments, AR concept, becomes very elusive and difficult to achieve, nevertheless, one approach that is accepted without controversy is given by Ronald Azuma, the Research Leader of Mixed Reality Experiences team of Nokia Research Center Hollywood, in a paper from 1997 entitled "A Survey of Augmented Reality", where the author acknowledging these constraints states:
"... To avoid limiting AR to specific technologies, this survey defines AR as systems that have the following three characteristics:
1) Combines real and virtual
2) Interactive in real time
3) Registered in 3-D (Azuma 1997:2)".

He also says that AR is a richer variation of virtual reality: "Augmented Reality (AR) is a variation of Virtual Environments (VE), or Virtual Reality as it is more commonly called. VE technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it. Ideally, it would appear to the user that the virtual and real objects coexisted in the same space, similar to the effects achieved in the film *Who Framed Roger Rabbit*? (Azuma 1997:2)".

Nevertheless many authors prefer to distinguish the two concepts; in that sense it is recursive in the literature the reference to the scheme of the academics Paul Milgram (Department of Mechanical and Industrial Engineering, University of Toronto) and Fumio Kishino (Department of Electronic, Information Systems and Energy Engineering, Osaka University). These researchers came up with the concept of "Reality-Virtuality Continuum" that in the words of the authors can be described as followed: "… relates to the mixture of classes of objects presented in any particular display situation... where real environments, are shown at one end of the continuum, and virtual environments, at the opposite extremum. The former case, at the left, defines environments consisting solely of real objects (defined below), and includes for example what is observed via a conventional video display of a real-world scene... The latter case, at the right, defines environments consisting solely of virtual objects, an example of which would be a conventional computer graphic simulation. As indicated in the figure, the most straightforward way to view a Mixed Reality environment, therefore, is one in which real world and virtual world objects are presented together within a single display, that is, anywhere between the extrema of the virtuality continuum (Milgram and Kishino 1994:2)".

Fig. 1. Mixed Reality (source: Milgram and Kishino 1994:2)

Concerning the technology behind AR, regarding the hardware, the main devices are: computers, game consoles, joysticks, gloves, image projection devices, glasses and helmets with graphics displays, headphones, smart

phones, GPS devices, wearable pieces and paper or the body itself (in this case generally the hands)[1]. In the software/programming side, there is a variety of open source libraries developed for Java, C++, Adobe Flash/Shockwave, and Mobile Communications[2].

In regard to user interaction, there are many ways to characterize the AR. Some of the most important and distinctive ones are as follows:

a) Immersive AR: in broad terms immersion is the capability of creating a sensory, emotive or cerebral environment for the user that clones the real world or creates an artificial one. The main AR deployments are focused in sight, hear and touch, for which many developments are expected in the years to come, so far smell and taste seems to be left out;

b) Body: looking at computers history, they started by allowing people to produce, communicate and manage information, they then provided a tool for social interaction, and finally the next step was done towards the communication between machines. AR opened the doors for the body to gain access to information from devices; trends are that in the near future input devices will interact directly with users: speech and handwriting recognition, biometrics, object manipulation, telepresence, digital holograms and so forth;

c) Ubiquitous/Wearable: the term ubiquitous computing was coined by Mark Weiser, chief scientist at the Xerox Palo Alto Laboratories, in a scientific article entitled "The computer for the 21st century" (1991). His visionary idea anticipated a computing era where computers were integrated in everyday objects (general purpose electronics, domestic appliances, car embedded devices, etc.), invisible, servant and intuitive and at the same time networked. Wearable computing is a more recent concept and can be seen as a subset of ubiquitous computing, as it comprises a diversity of gadgets that can be easily transported, assures the user's mobility and dedication to other tasks and have any kind of information processing, (e.g. wrist watch running Unix [IBM], glasses able to display information [Vuzix], shoes that emit radio frequencies [MIT], textiles that help to monitor vital signs [Philips], hand hold reality markers [Ydreams];

d) Blended marketing: is a marketing strategy that explores the synergetic added value obtained by the combined use of different media (Rodrigues *et al.* 2009). It is commonly accepted that this device is based in digital and non-digital media and has its historical roots in the Internet (World Wide Web).

However with the technological development, emergence of new applications and web culture paradigms (social media, blogs, feeds, and so forth), blended marketing has evolved in many directions, combining and taking advantage of the different media characteristics to put in place innovative marketing approaches, such as: viral marketing, social media, folksonomies, mobile interactive information, immersive worlds...

In that sense AR applications are already used to support or amplify marketing strategies; One excellent example can be found in the innovative packing for Chocapic cereals, where Nestlé in association with Dassault Systèmes designed and developed a web AR application that turns the cereal box into 3D videogame consoles[3].

2. Research Design

Research questions: the idea behind the case is to question how AR is seen as a marketing tool, namely in which regards: cost, branding, relational and product marketing.

In order to collect information, 150 individuals with marketing background (MBA students, web developers, marketers, small company managers with commercial presence in the web, university teachers and investigators in communication studies, web and graphic designers, merchandising managers) were asked to answer a simple questionnaire concerning the variables above mentioned.

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[1] One of today's hype AR applications, consist in the manipulation of 3D hologram images that are synchronized with a printed marker, a remarkable example can be found at General Electric Smart Grid Augmented Reality (http://ge.ecomagination.com/smartgrid/#/augmented_reality)

[2] There are various Web pages dedicated to the subject, for a quick reference the blog Augmented Reality Resources for Software and Hardware (sproke.blogspot.com/2009/11/augmented-reality-resources-for.html) maybe a good starting point.

[3] A small introduction to the application and a demo video can be seen at the Dassault site (www.3ds.com/company/3d-experiences/3dvia-nestle/#vid1)

Before going any further, it shall be mentioned that the research is an initial effort to a more ambitious investigation (a kind of field test) in order to acknowledge trends and the importance of the research object. In that context it uses an opportunistic sample due time and budget limitations, therefore its representativity and results should take into account that circumstance.

Concerning the areas in analysis and the respective variables, they convey some of the most relevant marketing topics:
a) Costs (initial hardware/software, training, development, maintenance);
b) Branding (trust, image, differentiation, consistency);
c) Relational (communication channels, building relationships, building great experiences, user generated content);
d) Product (awareness, features, support to users, feedback).
Obviously the choice is arguable and others could also be elected (customer relationship management, advertising, for instance). Yet, considering the limitations inherent to an article of this kind, it appears adequate to center our attention in these.

The questionnaire walk the talk, first every interviewee received general information about immersive, body, wearable and blended dimensions of AR, with links to YouTube videos that illustrate these concepts.

Then respondents were given the questionnaire (with the topics in analysis) in which they should value items in a scale from 0 to 5, according to their perceived importance of each AR variable for the marketing strategy.

Results are presented in tables in which frequencies are calculated as an average of the whole answers given by respondents, varying between 0 and 5 in accordance to evaluation scale.

3. Research Results

The first table analyzed concerns the costs, namely "what is, in your opinion, the cost benefit of investing in AR?" (table 1), the answers given are shown in the following table.

Considering 2,5 as the breakeven, only blended (2.9) is positively evaluated, this is using AR in parallel with other marketing approaches, all the other variables showed negative values, especially body (1,3) and wearable (1,2) AR.

Table 1. Evaluation of Cost/Benefit Investments in Augmented Reality

	Immersive	Body	Wearable	Blended	average
Initial (hardware/software)	2,2	0,8	1,2	3,0	1,8
Training	2,0	1,2	1,2	2,6	1,8
Development	1,8	1,2	0,8	2,8	1,7
Maintenance	2,6	2,0	1,6	3,0	2,3
Average	2,2	1,3	1,2	2,9	1,9

Looking at the information technology costs, only maintenance has an acceptable behavior (2,3) all the other perform insufficiently; That judgment can also be applied to the grand average (1,9).

As blended presents very atypical figures, if it is removed from calculations, all the information technology means will drop to values lower than 1,6 and the grand average will drop to 1,2.

From the cost point of view, evidenced opinions led us to conclude that AR is not considered a good cost/benefit investment for the marketing strategy.

Considering the importance of AR for branding (table 2), it can be identified two different perspectives, immersive (3,2) and blended (3,6) are considered good applications in these concerns, body (2,3) has a median performance and wearable is not seen as a good tool (1,9).

Table 2. Importance of Augmented Reality for Branding

	Immersive	Body	Wearable	Blended	Average
Trust	2,4	2,0	1,8	3,2	2,4
Image	4,0	2,6	2,0	3,4	3,0
Differentiation	3,8	2,6	2,0	4,0	3,1
Consistency	2,4	2,0	1,8	3,8	2,5
average	3,2	2,3	1,9	3,6	2,7

A closer look to branding variables evidences that, image and differentiation (3,0/3,1) show numbers to take into good account, while trust and consistency (2,4/2,5) perform values around the mean. The grand average is slightly above 2,5.

In general, it can be said that AR can be a useful instrument for branding; in any case, numbers seem to evidence that it is not a trend from the standpoint of the interviewee.

Going forward into the variables related to relational marketing (table 3), all of AR features perform as customary, even though body AR with more modest values than the others.

Table 3. Importance of Augmented Reality for Relational Marketing

	Immersive	Body	Wearable	Blended	average
Communication channels	1,8	2,8	2,6	3,8	2,8
Building relationships	4,0	2,0	2,0	3,0	2,8
Building great experiences	3,8	4,0	4,2	2,2	3,6
User generated content	1,0	1,0	3,0	2,4	1,9
average	2,7	2,5	3,0	2,9	2,7

From the standpoint of marketing variables, they present more auspicious figures though, in on hand, it is seen as a weak expedient to motivate users to generate content or to develop a community around the brand (user generated content 1,9), on the other side it is very well ranked for "building great user experiences" (3,6). The grand average (2,7) reflects the idea that AR is viewed as a strategy among many others without any special perceived added value.

At last, the importance of AR for product marketing (table 4). All the collected values are greater than 2.5, in regards to AR variables immersive (3,5) and blended (3.0) show interesting values, body (2,5) and wearable (2,7) have more modest ones, nevertheless positive.

Table 4. Importance of Augmented Reality for Product Marketing

	Immersive	Body	Wearable	Blended	Average
Awareness	4,0	2,4	2,6	3,2	3,1
Features	3,8	2,6	2,8	3,4	3,2
Support to users	3,8	2,4	2,8	2,6	2,9
Feedback	2,4	2,4	2,6	2,6	2,5
average	3,5	2,5	2,7	3,0	2,9

Concerning marketing variables, it can be said that AR is a good alternative to give visibility to: product awareness (3,1), features (3,2) and support to users (2,9).

The value 2,9 for the grand average is the greatest of all values for that category, which indicates that the product is considered the area with biggest potential for the AR in marketing.

Another perspective on the collected data can be drawn from reading the values all together.

Table 5. Importance of Augmented Reality for Marketing (aggregated values)

	Immersive	Body	Wearable	Blended	average
Branding	3,2	2,3	1,9	3,6	2,7
Relational	2,7	2,5	3,0	2,9	2,7
Product	3,5	2,5	2,7	3,0	2,9
average	3,1	2,4	2,5	3,1	2,8

Considering aggregated data in column only for the marketing questions (branding, relational, product), immersive and blended AR obtained the highest average preferences (3,1), body (2,4) and wearable (2,5) the lowest.

Of course it should be taken in account that the difference (10%[4]) is in many ways despicable, however it is interesting to point out that wearable AR, has already a large field of application and market, mostly in mobile communications, and yet respondents deny to acknowledge being in favor of immersive AR, apparently in benefit of the spectacular side of AR.

Looking at the values in lines their variation is very small 2,7/2,9 and still they are positive; Moreover figures are near 2,5 which reinforces the idea that AR is not perceived as an outstanding marketing instrument.

Nonetheless the average 3,1 for immersive and blended AR and the averages for body (2,4) and wearable (2,5), may hide significant differences, for which it is mandatory to look at frequencies in detail.

In order to clarify that issue, table 6 shows the top and lower 25% frequencies.

[4] 0,5 in a scale of 5 makes 10%

Table 7. Top and Lower 25% results

	Immersive	Body	Wearable	Blended	average
Trust	2,4	↓2	↓1,8	3,2	2,4
Image	4↑	2,6	↓2	3,4	3,0
Differentiation	3,8↑	2,6	↓2	4↑	3,1
Consistency	2,4	↓2	↓1,8	3,8↑	2,5
Communication channels	↓1,8	2,8	2,6	3,8↑	2,8
Building relationships	4↑	↓2	↓2	3,0	2,8
Building great experiences	3,8↑	4↑	4,2↑	↓2,2	3,6
User generated content	↓1	↓1	3,0	2,4	1,9
Awareness	4↑	2,4	2,6	3,2	3,1
Features	3,8↑	2,6	2,8	3,4	3,2
Support to users	3,8↑	2,4	2,8	2,6	2,9
Feedback	2,4	2,4	2,6	2,6	2,5

In the first case immersive AR exhibits 7 of the top 25% frequencies and blended only 3, which strengthens its leading position against all the other variables.

In the second case there are no significant divergences between body and wearable AR, both have 2 values in the top 25% frequencies, as for the lowest 25% frequencies body counts with 4 values in the and wearable 5.

Another possible analysis angle is looking at average values in lines (table 7), but differences are not worth mentioning, as each marketing variable has 1 question at the top and in the lower 25% of the results[5].

Not surprisingly the highest values showed (3,6), occurred in building great experiences, however the lowest value (1,9) was for user generated content; This is very atypical but understandable since so far the great majority of AR implementations do not privilege the user commitment in sharing and producing information and knowledge, differently to many others widely used in Internet.

4. Some Comments on Results

One main conclusion is that AR is thought to be a marketing investment with small returns, which obviously is a major breakdown for its adoption in business. In any case, it should be taken in account that AR, like many technology applications, could be implemented in different scales and in a building block approach. It is also important to put in evidence that it is not the fixed technology costs that are the main concern for the respondents, but training and development; this may open an opportunity window for AR as competencies and knowledge become widely available.

Nevertheless, the importance of cost in technology should not be overestimated, as economics of information technologies says it decreases exponentially along time (Moore 1965) and once the market reaches critical mass, price of services supply shall decrease considerably, as it happened in many areas before: Thus that barrier will probably fade in the time to come.

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[5] Brand: differentiation (3,1) – trust (2,4). Product: features(3,2) – feedback (2,5). Relational: building great experiences (3,6) – user generated content (1,9).

Restricting our analyses to the marketing variables, one main issue appears to be that AR has not, up till now, found his killer app, despite some outstanding breakthroughs in the mobile communications field, there are no equivalents for portals (WEB 1.0) or blogs or podcasts (WEB 2.0) and so far it lacks a good guidance or a steady reliable business model.

In general, immersive and blended AR is higher valorized by respondents. It should be no surprise that the use of AR in conjunction with other marketing media gathers relevance among the answers, as it is well known that media convergence is an utmost goal for marketing strategies in order to obtain synergy gains.

In regards to immersive, numbers show that the more spectacular AR uses are the ones that grab the majority of preferences. Paradoxically wearable AR is systematically overlooked by respondents though it is the segment that has greater potential for market growing (specifically gadgets and mobile communications) and, at the same time, it is the one for which expertise is widely available and development costs are more affordable.

To sum up, although AR is not regarded as a paramount marketing tool, contrarily to many authors and printed opinions, it is not disregarded as a potential tool among others.

5. Research Limitations and Perspectives

The present article, as it was stated, aims to be an exploratory study on the perceived opinion of the importance of AR for marketing, it is not factual in the sense that it does not collect the latest data or real cases for analysis. Therefore, conclusions are only worth for the study object and starting questions, even if achieved results are though pertinent and important for the defined goal: an exploratory research on the mentioned subject.

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