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# AR 기술을 이용한 오프라인 상점의 지속적인 성장에 관한 연구

## A study on the sustainable growth of off-line stores using AR technology

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**요약** IT기술의 발달은 단순제품의 다기능화와 소비자의 생활패턴인 라이프 스타일까지 변화시키고 있다. 실제 온라인에서 오프라인으로 변화 패러다임은 오프라인의 생태계를 위협하는 수준이다. 본 연구에서는 오프라인의 다양한 발전 방법이 단순 구매 목적으로 소비자를 매장방문 뿐 만 아니라, 엔터테인먼트 체험요소인 3차원 공간감, 현실감 등 증강현실을 적용하여 매출과 수익증대라는 함수관계에 있음을 예측하였다. 함수결과를 기반으로 가상현실 및 증강기술을 실제 현장에 적용하고 매출과 수익을 비교 분석한 결과 오프라인 백화점에 매출이 증대됨을 연구하였다. 따라서 향후 오프라인 매장의 매출 성장을 위한 모델링 및 기획에 활용될 수 있을 것이다.

**Abstract** In this paper, the advancement in IT technology is not only inducing the multi-functionality of simple products but also changing even the lifestyle, that is, the pattern of consumers' daily life. The actual paradigm for the conversion from off-line to on-line is at the level of threatening the ecology of off-line. In this study, the diversified advancement method of off-line is in functional relationship with the increase in sales revenue and profits not only through the visit of consumers to the sales outlets for the simple purpose of making purchase but also through the application of augmented realities such as 3-dimensional sense in space and sense in reality, which are entertainment experience factors. Therefore, the improvement in the enhancement of sales revenues by applying augmented reality to off-line department store was researched in this study.

**Key Words** : Virtual Reality, Augmented Reality, Sustained growth, 3-dimension.

### I. Introduction

Under such trend, grafting of IT technology to off-line is changing the basic sales function of shopping centers into diversified composite function

due to the changes in the consciousness and structures of consumption. The perspectives of marketing in off-line need to establish a spatial plan for consumer-oriented composite IT shopping that provides a diverse range of consumption desires

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through a functional and visual differentiation. This study aims to graft AR(Augmented Reality) technology that draws out potential customers by means of shopping experiences and information sharing function. AR is a digital experience technology that realistically provides study information provided in the form of 3-dimensional images. The core aspect of digital experience is the interface in a diverse range of formats that uses the sensory organs of the consumers and the interactivity enhanced through this. The figure of the composite cultural space is distinguished from form and is compared with the model in terms of types, abstraction and conceptualization. Accordingly, while the figuration is a concept for the form which is natural or concept of shape without any meaning, the figure ultimately has its foundation in nature. This is the concept of shape with cultural significance and this type signifies that the format and spatial method comes some existence rather than reviewing all the elements through the rediscovery of architectural language.<sup>[1]</sup> Development of composite shopping culture shopping space that pursues the improvement of income level, changes in lifestyle, diversification of the individuality of consumers, attitude of shopping and composite functions rather than simple purchasing of goods.<sup>[2]</sup> Such information technology system is applied to the internet and the mobile revolution in the era of IoT, with telecommunication means and GPS location-based services throughout the entire industries, while information composition technique such as augmented reality (AR), etc. is applied to the distribution industry. These new technologies are introduced to medical service, architecture, game, broadcasting, education and distribution, and practical daily life such as consumer shopping, etc.<sup>[3]</sup>

## II. Characteristic changes in shopping space

The full opening of the distribution market in 1996

brought about the characteristic change of multi-store strategy of department stores in Korea due to the competition from discount stores that expanded into the Korean market by overseas corporations. The emergence of huge scale composite shopping malls since the latter part of the 1990's created new One-Stop mall and shopping culture of shopping malls that include a diverse range of entertainment, resting places and office-tels. LG Economic Research Institute reported that the mall of advanced countries has established itself as generalized shopping format and new terminology of mall walker as the mall-goer movement of enjoying mall was created.<sup>[4]</sup> Therefore, the 1st type of the consumer awareness on mall is the recognition as a "3rd space" that is similar to one's own house. The 2nd type is the recognition as a cultural venue for experiencing of cultures along with enjoying shopping. The 3rd type is the advantage of conducting various tasks through the furnishing of diversity as a convenient space. Lastly, the 4th type is as a surfing space that is recognized by the mall-goers as a mysterious space that offers curiosity and the opportunity for discoveries.<sup>[5]</sup>

### 1. Changes in the consumption market structure and consumption trend

The value and gentrification of the consumption market is determined to become the growth factors for off-line outlets. It is said that the stage of the consumption trend for the consumers in Korea is in High Consumption Stage until the year of 2000 with the final stage of consumer or the final stage of economic growth being the highly advanced public and large scale consumption stage. That is, the focus must be placed on pursuing of highly advanced national culture along with the material wealth simultaneously.<sup>[6]</sup> The introduction of cultural space within commercial space for the fulfillment with a wide range of psychological desires of consumers is a natural phenomenon. The 21st century is the era of putting priority and importance on sensibility and experiences. The

consumer environment is pursuing value of goods rather than oriented towards gentrification through value marketing. The consumer is changing the consumption format of the value of goods and designs in terms of their brand loyalty. Therefore, the measures for conversion of cognition in sustained growth and the role of department store in the creation of consumption culture are important. Figure 1 below illustrates the example for the diverse manifestation of desires in consumption culture for each generation.<sup>[7]</sup>

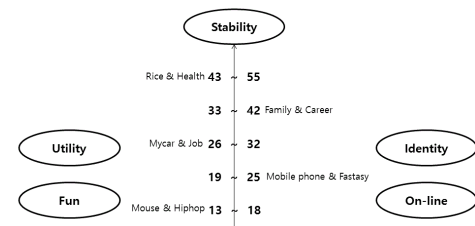


그림 1. 세대별 소비자 문화의 융합  
 Fig. 1. The Fusions of Consumer Culture by Generation

The fusion of consumer culture for each generation can be divided into 3 categories. The first is the experiential desire that refers to experience and psychological, fulfillment and flow. The second is the social desire that refers to social-needs, friends and family. Finally, the third is the practical desire that refers to convenience, utility, stability and safety. In addition, the marketing strategy for the changes in the consumption format reviews the market size from the perspective of the quantity of purchase by consumers. However, it also understands the method, actions and environmental relationship of consumptive life through multi-disciplinary approach. Moreover, systematic research on the consumer behavior in social and cultural activities leads to the response and purchase behavior of consumers. Now, further segmented consumer-oriented management by the charge of the daily life formats and cultures is required.<sup>[8]</sup>

## 2. Sustainable growth strategy

The off-line industry is presenting newly

progressed model through the repositioning of the off-line business format at the stage of advancement from the new exit plan into business diversification strategy due to the slowdown in growth because of economic downturn and the emergence of heterogeneous business formats. The industry is making approaches with IT smart app through the big data analysis of the behavioral research on female consumers in order to achieve sustained growth. In particular, ‘Virtual Fitting’ technology in which the appearance of wearing the garment the consumer selected is shown virtually was developed by Microsoft, etc. by applying the augmented reality (AR) technology to off-line outlet. Figure 2 illustrates the most advanced technique for increasing the purchases by consumers by using ‘digital mirror’ that enables the consumers to virtually change the color and design of the garment they are currently wearing. This technique has already been employed at some of the off-line outlets including Neiman Marcus of the USA, etc.



그림 2. 증강 현실을 활용한 가상 피팅  
 Fig. 2. Virtual Fitting by using augmented reality

Composite shopping space from the perspective of spatial marketing has important significance for the intangible consumption space.<sup>[9]</sup>

## III. Augmented reality technology

The computer-based technology that had undergone rapid advancement at the end of the 20th century

presented new academic domain that has been converged with virtual engineering. Overall lifecycle ranging from designing of products to system composition as well as the discarding of the products is being managed under virtual environment. This is because the majority of the manufacturers introduced Virtual Reality (VR) technology-based digital manufacturing technology throughout the entire stages of the system composition. In general, since the design drawings of the system and the actual realization environment do not coincide exactly, new modeling works are necessary for the application of VR technology. Majority of 3D modeling works require long period of time and high cost. As such, AR technology emerged by supplementing such problems. It is deemed that Augmented Reality (AR) can be realized at any realistic spaces through the use of the mobile devices such as smartphone. The definition of augmented reality used by Azuma (1997) is being quoted extensively.<sup>[10]</sup> AR technology has been accelerated by the advancement of mobile devices and inducing marked changes in the distribution industry that uses augmented reality. Location-based services and virtual experiences of goods of AR are not in the stage of commercialization in the area of new distribution. Since AR system uses the actual environment of the work sites, the modeling works executed to establish virtual environment are substantially reduced. AR technology realistically visualizes the manufacturing processes through the combination of the reality with virtual environment and enables the use of the existing knowledge or information appropriate for the circumstances of manufacturing sites in real time. [“Technological principles and framework of augmented reality”, CAD & Graphics, 2008.5, Park, Hong Seok and 1 other] In order to realize augmented reality, display technology, marker recognition and image synthesis technology are necessary. Display technology for small display device is necessary in the medical area in which resultant images with high resolution and is used under special

environment under which heavy HMD cannot be worn. Large display device is composed in the method of viewing by the user wearing shutter glasses for 3-dimensional object that appears in the large screen compose of more than 1 projector or monitor such as CRT. Such display device is used in the application areas such as flight simulator and multi-participation offices rather than 1:1 participation. Marker recognition technology, after the screen filmed by camera has been handed over, creates black and white screen by using only a consistent color of marker, that is, black, through only the brightness information of the screen and segregates the black areas in order to separately find the areas of black-colored forms among. Augmented reality (AR) system, which is an image synthesis technology, achieves interaction with the user in real time through combining with virtual reality. As such, it is a technology that enables the user to further experience reality through interaction between the user and a virtual object in real time through synthesis by means of camera correction technology, and to accurately determine the parameters of the actual camera that synthesizes the virtual object in the comparison image inputted in real time. Figure 3 below is a schematization of the principles of augmented reality technology.

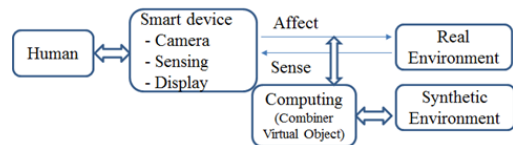


그림 3. 증강 현실 기술의 원리

Fig. 3. Principles of augmented reality technology

#### IV. Application and analysis of model for augmented reality for sustained growth

In the 21st century, IT competition strategy brought adjustment effects on the uncertainty of the corporate performances. Meanwhile, there is marked difference in

the management performances between the types of the IT competition strategies due to the uncertainty in environment. Such an empirical research illustrates that as the uncertainty of environment increases, corporations need distribution environment modification strategy to cope with such uncertainty through the mixed strategy aimed at pursuing both the superiority in differentiation and in cost, which appears to be contradictory to each other, simultaneously.<sup>[11]</sup>

### 1. Model analysis

Although the surrounding environment of corporation broadly encompasses the economic and social factors, the environment that imparts direct influence on the corporate management is referred to the industry or industrial group. Professor Michael E. Porter of the Harvard Business School is the one who introduced industrial structure analysis to management strategy and presented the Five Forces Analysis, which is a modification of for easier application of competitive strategy to corporation in 1980.<sup>[12]</sup> Professor Porter analyzed that it is determined by particular industry in long-term, along with the analysis of the threat by the new comer to the industry, ability of the supplier and purchaser for negotiator, threat by substituting goods and competitive intensity of the existing competitors within the industry. Therefore, analysis of the competition structure of department store will be associated to the industrial structure model of Professor Porter.<sup>[13]</sup>

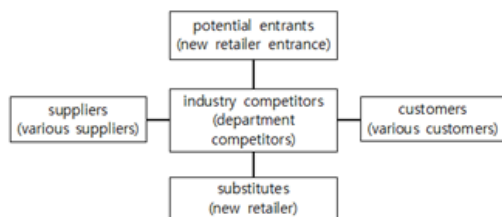


그림 4. 백화점 산업구조 분석 모델  
 Fig. 4. Five Forces of Department Store

The mix of the potential entrant and the substituting business circle in the department store industry in

Korea in accordance with the classification of the potential entrant and substituting goods of the structure analysis model of Figure 4 must not be overlooked. It is anticipated that large scale retail outlets such as department store or shopping center, etc. will enter with new substitutable distribution format with the department store anticipated to emerge with substituting characteristic rather than in the format as department store itself. There is a limit in the mixing of the substituting goods and potential entrants illustrated through the model in Figure 4. Therefore, it is possible to present directionality for the improvement in off-line sales revenue through the structural change from that focuses on simple product sales to composite shopping space that combines a diverse range of entertainment elements.

### 2. Cyber IT market and value creation

Recently, advanced IT corporations are aggressively making preparations for an era of virtual and augmented reality. In 2010, with the beginning of the acquisition of Imagination, an AR company in Austria, by Qualcomm, Facebook took over Oculus VR at the cost of US\$ 2 billion, Magic Leap of Google made US\$ 540 million investment and Microsoft announced HoloLens, thereby illustrating the leading corporations are actively executing the acquisitions and investments related to virtual and augmented reality. Digi-Capital, an investment bank of England, forecasted that the size of the augmented reality and virtual reality market will undergo rapid growth to US\$ 200 million in 2016, approximately US\$ 5 billion in 2018 and US\$ 150 billion in 2020 by reflecting the trends and interests of the relevant corporations over the recent years. Golf Zone in Korea can be viewed as the golden boy of the combination of VR technology and AR technology.<sup>[14][15]</sup> The business feasibility of such combination was proven as those who tried Golf Zone once becoming dedicated repeat users. The revenue of Golf Zone increased from 133.1 billion Won in 2009 to more than 300 billion Won in 2013. The golf population in Korea

increased from 1.4 million in 2007 to 6 million in 2016, thereby reaching the settlement stage of screen golf. The use rate of screen golf over the last year was found to be very high at 63.6%. This is the result of converging entertainment elements to IT in all areas. Therefore, the introduction of the AR by Golf Zone proves the existence of new ecology. As such, the consumption culture management must be led by executing a diverse range of cultural management in the rapidly changing cyber marketing era for the consumers rather than simply supplying products and services on off-line to the consumers.<sup>[16]</sup> It is believed that the grafting of IT technology to the off line outlets will increase consumption through synergic effects.

## V. Conclusion

Recently, the interests in Virtual Reality (VR) and Augmented Reality (AR) technologies that emerged as the core of the future knowledge service industry have been increasing. Such advancement of IT technology is changing even the lifestyle through the changes in the daily life patterns of individuals. In fact, the paradigm is changing from off-line to on-line in all areas. In this study, the methods of drawing out the consumers from their home to the site of purchase were researched in order to achieve balanced growth of the on/off-line market in particular among many areas in which there are marked changes in paradigm. In order to draw them out of their home to the sales outlets, augmented realities including 3-dimensional sense of space and reality to which entertainment experience elements were applied were introduced to off-line outlets. IT technology of augmented reality was applied by placing focus on individuality and unity through the harmony and balance with the space as biological organism, as well as on relativity and complementarity by viewing the spatial characteristics from different angle. By applying IT technology, it is anticipated that actual and balanced increase in the sales revenue of on/off-line

outlets in unified space between the metaphysically relative space and nature, unreal void and unitary space is anticipated. Therefore, if augmented reality (AR) technology is grafted onto composite shopping space, it would be highly useful in growth strategy by drawing out and securing customers from the on-line to off-line outlets. The limit of this study includes not having materialized these assertions with focus on the empirical cases

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