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Raising the Pulse:

The effect of image interactive technology on customer pleasure and arousal in
physical retail stores

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Raising the pulse: the effect of Image Interactive Technology on customer pleasure and arousal in physical retail stores

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Abstract:

The importance of our research is based in the perspective that the hedonic components of the shopping experience are vital to the continued competitive success of brick-and-mortar stores. With the increasing availability of new forms of technology and increasingly technologically savvy customers, the application of technology to retail settings can offer a means for innovative advancement. One form of technology that has been shown to have a positive correlation with hedonic values in retail settings is Interactive Image Technology. In this research the effect of IIT on customers' emotional response to physical store environments was measured via a combination of self-reporting and psychophysiological measures in a 'true' experimental design method.

Key words: Hedonic Experience; Hedonic Consumption; Image Interactive Technology (IIT); RFID; QR codes; Psychophysiological Measures; Pleasure; Arousal

1.0 Introduction

Significant changes in the retail industry have come about in connection with the development of new technologies. The Internet, in particular, has opened up borders and access to markets in ways that have encouraged proliferation among retailers. Internet based-shopping has allowed for a highly saturated market place that offers advantages over traditional brick-and-mortar stores: such as price, convenience and comparability (Arnold & Reynolds, 2003; Burke, 1997). Additionally this proliferation of choice has led to an increasingly demanding consumer segment that no longer views product and service quality as sufficient markers of value (Diep & Sweeney, 2008). "In this environment it is no longer enough for a retailer to operate in a conventional manner by enticing customers with broad assortments, low pricing, and extended store hours" (Arnold & Reynolds, 2003 p.77).

Increasingly, retail theory has explored the total consumption experience in order to find ways to sustain a competitive advantage and enhance values inherent to in-store shopping experience (Diep & Sweeney, 2008; Kim, 2001; Babin et. al., 1994). This perspective sees the shopping experience as being dualistic in nature, and emphasizes the importance of enhancing the emotional, entertaining and sensory elements of

the experience (Hirschman & Holbrook, 1982; Arnold & Reynolds, 2003). Potential benefits of enhancing these elements includes a higher level of value creation (Hirschman & Holbrook, 1982), increased mood (Dick & Basu, 1994), increased levels of customer engagement (Pantano & Naccarato, 2010), and loyalty intentions (Kim & Niehm, 2009; Jones, Reynolds & Arnold, 2006). Furthermore it can encourage consumers to stay longer and spend more money in the store (Kenyon, 1997 cited in Kim, 2001).

An additional aspect affected by technological advancement is an increased importance placed on innovation. In multiple retailing journals the importance of innovation as a means to enhance competition and maintain profitability is discussed (Pantano & Viassone, 2014; Shankar et. al., 2011). The importance of innovation has been argued to correspond with its ability to develop new technological tools able to affect experiential components, adapt to changing trends, increase market share and to further utilize existing resources (Hauser et. al., 2006; Pantano & Viassone, 2012 cited in Pantano & Viassone, 2014). With the increasing availability of new forms of technology and increasingly technologically savvy customers, the application of technology to retail settings can offer a means for innovative advancement. In this way, while technology has contributed to

increased consumer demand, it similarly offers methods through which such demands can be addressed. One such method includes the application of Interactive Image Technology (IIT). Within this paper, IIT will be defined as a form of technology, or a combination of technologies, that allow users to modify the content by means of a visual screen platform.

While the use of technology in retail situations is not a new phenomenon, key types of technology and specific attributes are starting to be increasingly associated with the hedonic side of the overall experience. The focus of this research is on technology that is seen to be interactive, allowing direct manipulation of content, and providing useful information, functions and entertainment (Pantano & Naccarato, 2010; Pantano & Viassone, 2014). Some work has been done on the use of IIT and its connection to hedonic benefits but only in relation to online retail settings (Kim, Fiore & Lee, 2007; Yoo, Lee & Park, 2010).

The amount of research focusing on interactive technology, and its effects on hedonic experience in a physical retail setting, is extremely limited and does not directly test its effects on the consumer experience. This represents a significant gap in research connected to the effects of IIT on the emotional element of the customer experience. From this background we developed our research question: *Will the application of IIT in in-store fashion retail settings directly enhance hedonic aspects of the shopping experience, such as pleasure and arousal?*

In order to examine customers' hedonic response to IIT, in a physical retail setting, this study will apply a combination of RFID tags and QR codes with video screens, mobile phones and computers, into an interactive platform. The choice of RFID tags and QR codes was made based on their potential for interactive application, and their already being present in many retail markets.

Research conducted in online retail spheres, have shown results indicating that IIT positively affects the hedonic customer experience (Kim, Fiore & Lee, 2007). Further research, though limited, has continued to argue that similar effects can be expected when such technology is applied to a physical retail setting but provide

no method for measuring such responses (Pantano & Naccarato, 2010). In this study we plan to address the lack of research engaging in direct measurement of IIT's effect on the hedonic experience for consumers in a physical retail setting. **The aim** of this research is to see if the addition of IIT to *physical* fashion retail stores affects the hedonic shopping experience by enhancing customers' pleasure and arousal.

2.0 Literature Review and Theoretical Framework

The importance of our research is based in the perspective that the hedonic components of the shopping experience are vital to the continued competitive success of brick-and-mortar stores. Therefore the basis of our theoretical perspective is in hedonic elements of the shopping experience. Particularly in the production of two specific emotional responses: pleasure and arousal. Arousal and pleasure are both seen as foundational elements of emotional response and can be used to increase understanding and predict behavior connected to retail environments. While multiple methods have been devised to measure emotional responses to environmental stimuli within retail contexts, our perspective is based on the research conducted by Mehrabian and Russell. However, due to some theoretical arguments surrounding the stability of the arousal variable in their research, additional perspectives connected to the viability of heart rate measurements has been adopted.

2.1 Hedonic consumption

Hirschman and Holbrook (1982) define hedonic consumption as "those facets of consumer behavior that relate to the multisensory, fantasy and emotive aspects of one's experience with products" (p. 92). Under this perspective, hedonic consumption involves the development of an experience through elements understood via the five senses and the corresponding emotional response they elicit. "Individuals not only respond to multisensory impressions from external stimuli (a perfume) by encoding these sensory inputs but also react by generating multisensory images within themselves" (Hirschman & Holbrook, 1982 p. 92).

This perspective of an experiential and emotionally based value of shopping is reflected in the development of new fields of retail research e.g. Experiential retailing (Kim, 2001) and Entertailing (Arnold & Reynolds, 2003), and in the application of behavioral and environmental psychology to retailing (Huang, 2003; Foxall & Greenley, 1998). Within these fields of research it has become generally accepted that a focus on the experiential and emotional elements of the consumption practice is not only important but essential in order to maintain a competitive advantage within retail. Yoo, Park and MacInnis work on the effect of emotional responses to store attitude, showed “in-store emotions...serve as critical mediators in the store characteristics-store attitudes relationship” (1998, p. 253). Baker et al. (2002), through the use of a comprehensive model designed to analyze what influences consumers store choice, found “Creating a superior in-store shopping experience is critical and could provide an effective competitive weapon for bricks-and-mortar retailers that face growing competition from Internet-based e-tailers offering similar merchandise at the same (or lower) prices.” (p.138).

While both utilitarian and hedonic aspects contribute to the overall in-store experience, it is argued that emotional benefits are more instrumental in shaping customer experiences (Babin et al., 1994; Jones, Reynolds & Arnold, 2006; Bagdare & Jain, 2013). As Langrehr (1991) puts it “people buy so they can shop, not shop so they can buy,” (cited in Babin et al., 1994 p. 646) “Hedonic value represents the emotional worth of the shopping experience” and is shown to be strongly related to satisfaction, word of mouth, loyalty and re-patronage anticipation (Jones, Reynolds & Arnold, 2006 p. 979). It is important to note, when discussing the emotional attributes of shopping, men and women have been shown to differ in their response to shopping experiences, particularly in relation to conventional (brick-and-mortar) shops. Dittmar and Drury (2000) investigated the psychological and emotional role for men and women in shopping experiences, finding them to play a significantly larger role for women than men. Reasoning behind this difference is well summarized by Dittmar, Long and Meek in that “as a general tendency, men are comparatively

more motivated by functional factors, whereas women are more motivated by emotional and social factors” (2004 p. 424).

Very little work has been done researching the use of IIT to enhance hedonic values in a retail situation and even that is limited in scope. For an overview of the research conducted in this area please see Table 1. Pantano & Naccarato (2010) in their work, consider the use of what they term ‘advanced technologies’ and analyze how their introduction to a retail situation modifies the retail context and affects consumers shopping experience. According to Pantano and Naccarato (2010) the main characteristic of advanced technologies that is relevant, in relation to enhancing consumer shopping experience in retail settings, is that of interactivity. In their analysis they consider three forms of technology that are considered interactive and are already being exploited in retail situations. The technologies discussed are RFID tags, Shopping assistant systems, and smart mirrors. The primary focus of Pantano and Naccarato’s (2010) research is on the application of technology to enhance efficiency in-store which is more closely connected to utilitarian values of the shopping experience. However, they do mention how the use of advanced interactive technology in-store leads to an enhanced level of innovation which “attracts consumers’ attention and allows them to live new exciting in-store experiences” (Pantano & Naccarato, 2010 p. 202). They argue, from a purely theoretical standpoint, that the introduction of these technologies will provide enjoyable tools, stimulating consumer interest, enhancing the hedonic nature of the experience and allowing consumers to “play with products as in a videogame,” (Pantano & Naccarato, 2010 p. 203). They further suggest that this new “funny” experience has the potential to attract the male population; a population they argue is not typically attracted to conventional retail stores.

Further research that considers the use of technology-based innovations in in-store retail settings is Pantano and Viassone (2014), who argue that these technologies can be used to support and enrich consumers’ in-store experience by providing “customized information, useful functions, and entertaining

Table 1: Previous research into the use of Image Interactive Technology to enhance hedonic benefits in retail settings

Author (year)	Context	Type of Technology	Dependant Variable	Result
Pantano & Naccarato (2010)	<i>In-store/Online</i> In-store	RFID tags, Shopping assistant systems, and Smart mirrors	Analyze current applications of advanced technologies	New technologies in stores (1) modifies the appearance of the point of sales, (2) Improves shopping activity (3) influences subsequent buying behavior, (4) provides new tools which can satisfy a wider segment of the population.
Pantano & Viassone (2014)	In-store	Non-specific “advanced technologies”	Investigate retailers' expectations	A high level of retailer interest exists but there is a low-level of adoption rates.
Kim, Fiore & Lee (2007)	Online	Image Interactive Technology (IIT)	How the level of IIT affects consumer online retail experience	Positive correlation between level of IIT and perception of the retail experience
Yoo, Lee & Park (2010)	Online	Various web-based e-commerce platforms	What dimensions of interactive technology affect consumer value	Consumers are looking for bi-directional interactive shopping environments

tools” (p.44). However, the primary focus of their research is based from the retailers and employees perspective. Their aim is to advance knowledge on the demand for technology-based innovations and to analyze retailers’ expectations for the introduction of such innovations in point of sale (Pantano & Viassone, 2014). While these articles represent the extent of this type of research, in physical retail settings, additional work does exist within an online retail context.

Many studies that consider the use of new interactive technology-based tools to enhance the hedonic shopping experience primarily discuss the use of these tools in the enhancement of online shopping formats (Kim, Fiore & Lee, 2007; Yoo, Lee & Park, 2010). One realm that is already applying technology-based innovations for the purpose of enhancing the consumer shopping experience is Internet apparel retailing (Kim, Fiore & Lee, 2007). In Kim, Fiore and Lee’s (2007) work the focus is on image interactive technology (IIT) such as close-up pictures or zoom-in functions, mix-and-match functions, and 3D virtual models, which have already been adopted by various online retailers. Kim, Fiore and Lee (2007) argue that the benefits from such applications, i.e. shopping enjoyment, shopping involvement, desire to stay, and patronage intention, are not only enhanced by this technology but are positively correlated to the level of interaction the technological application applies. Their results showed that participants exposed to higher levels of image interactivity expressed higher levels of enjoyment, involvement and positive store perception (Kim, Fiore & Lee, 2007).

Interactive image technology has already been shown to be connected to the level of enjoyment customers experience, in online settings (Kim, Fiore & Lee, 2007). These results help support the arguments put forward by Pantano and Naccarato (2010), that interactive technologies in physical retail stores have the potential to enhance the excitement of the in-store experience. These suggested benefits, enjoyment and excitement, are considered hedonic aspects of the shopping experience and are often researched under the terms pleasure and arousal. Therefore, we propose:

Hypothesis 1 (H1): The presence of Interactive Image Technology (IIT) will increase the customers’ perceived level of pleasure experienced in an in-store fashion retail setting.

Hypothesis 2 (H2): The presence of Interactive Image Technology (IIT) will increase the customers’ perceived level of arousal experienced in an in-store fashion retail setting.

2.2 Importance of Pleasure

The importance of pleasure as a tool to understand and predict responses both emotional and behavioral has been a continuous theme in psychology and human motivational studies (Russell, Weiss & Mendelsohn, 1989). “The concept of pleasure has emerged in too many contexts for it to be ignored in any description of affect” (Russell, Weiss & Mendelsohn, 1989 p. 493). The relevance of pleasure to behavior is not only considered to be established but has further been argued and tested to have specific predictive capacity within retail settings. Tai and Fung (2011) found ratings of pleasure and arousal to be predictive of product trial, desire to explore, time spent, money spent and future patronage, with the first three categories showing the highest levels of significance. These findings are in agreement with previous work, including Donovan et al. (1994) and Groeppel-Klein (2005), who found pleasure to be influential on in-store behaviors i.e. spending levels, time spent in-store and re-patronage intentions. Additional findings have found pleasure and arousal to be connected to liking of store and enjoyment of shopping in the store (Donovan & Rossiter, 1982). These findings further contribute to the previously discussed benefits, i.e. satisfaction, word of mouth, loyalty and re-patronage anticipation, connected to enhancing the hedonic values of the shopping experience (Jones, Reynolds & Arnold, 2006).

2.3 Importance of Arousal

The connection arousal has to the fundamental nature of emotion has been thoroughly established in theoretical models of emotion (Bagozzi, Gopinath & Nyer, 1999). According to psychophysiological, neuroscientific, and psychobiological research, arousal is argued to be the basis of emotions, motivations, information processing, and behavioral

reactions (Groeppe-Klein, 2005). Furthermore, it is argued that this element is important to include when conducting studies involving consumer responses to external/environmental stimuli; “Arousal is definitely considered as being fundamental to behavior that is related to emotions and ...plays a major role for customers’ interaction with the store environment” (Groeppe-Klein & Baum, 2001 p. 414). Tai and Fung (2011) found that “an aroused shopper will spend more time and effort in the transaction with the store environment” (p. 325). Arousal has also been shown to be relevant to purchasing behavior as “buyers are more aroused than non-buyers” (Groeppe-Klein, 2005 p. 436). Emotional arousal, and the seeking out of emotional arousal, is argued to be a major motivational factor leading to consumption (Hirschman & Holbrook, 1982). Additionally, increased arousal is one, of a list of variables that may indicate a hedonically valuable shopping experience (Babin et al., 1994).

2.4 Measuring the emotional consumption experience

Research has worked to outline which emotions are connected to the overall shopping experience (Bagdare & Jain, 2013; Machleit & Eroglu, 2000; Richins, 1997; Yoo, Park & MacInnis, 1998). A variety of consumption related emotions have been identified and measurements designed based on emotional theory (Richins, 1997). Of the three most frequently used models for measuring shopping-related emotions, the ones designed by Izard in 1977 and Plutchik in 1980, are argued to be the most accurate for viewing the entire range of emotions, or the overall consumption experience (Machleit & Eroglu, 2000). The third model, the PAD (Pleasure, Arousal and Dominance) scale, “was designed not to capture the entire domain of emotional experience but rather to measure emotional responses to environmental stimuli” (Richins, 1997 p. 128). Since our interest is not in the full range of emotions experienced but rather a focused interest in the pleasure and arousal evoked by a specific external stimuli (IIT), the PAD model proves to be more appropriate for our research (Machleit & Eroglu, 2000). An additional reason why this model was chosen over Izard’s and Plutchik’s models was its inclusion of arousal as a significant indicator of

approach-avoidance behavior. As was already indicated by empirical research in both hedonic consumption and environmental psychology, arousal plays a significant role in consumer behavior in-store. The inclusion of this variable is further supported from a psychophysiological perspective. According to Groeppe-Klein (2005), arousal is a “fundamental feature of behavior” and argues that a “store atmosphere must evoke phasic arousal reactions to attract consumers” (p. 428). As neither the Izard or Plutchik model include this variable, we argue that the PAD model will be more relevant to the study of IIT in a physical retail setting.

2.4.1 Mehrabian and Russell’s PAD (Pleasure, Arousal and Dominance) Measurement Scale

The PAD (pleasure, arousal and dominance) model developed by Mehrabian and Russell is considered to be one of the leading approaches to understanding behavior-environmental relationships (Donovan & Rossiter, 1982). In this model three emotional responses are put forward as mediators of approach and avoidance behaviors in an environmental setting, i.e. Pleasure-Displeasure, Arousal-Nonarousal, and Dominance-Submissiveness (Foxall & Greenley, 1998). Mehrabian and Russell (cited in Donovan & Rossiter, 1982) argue “any environment, including that of a retail store, will produce an emotional state in an individual that can be characterized in terms of the three PAD dimensions” (p. 38). Furthermore, they argue that this emotional state is directly connected to approach-avoidance behaviors (Donovan & Rossiter, 1982). “Approach behaviors relate to a willingness or desire to move towards, stay in, explore, interact supportively in, perform well in, and return to the environment”, with avoidance behaviors representing the opposite responses (Donovan & Rossiter, 1982 p.41). Several authors have found that ratings of pleasure and arousal on the Mehrabian and Russell emotional instrument, measure respondents emotional state in a manner that is found to be predictive of approach-avoidance behaviors (for examples see Tai & Fung, 2011; Donovan et al., 1994; Donovan & Rossiter, 1982).

The increasing importance placed on obtaining a greater understanding and predictability of

approach-avoidance responses to retail environments has led to the repeated usage of the PAD model within a retail context (Tai & Fung, 2011; Richins, 1997; Machleit & Eroglu, 2000; Huang, 2003; Groeppel-Klein & Baum, 2001; Donovan et al., 1994; Donovan & Rossiter, 1982; Foxall & Greenley, 1998). “However, subsequent research has found that pleasure and arousal explain most of the variance in affect and behavior, and thus research has focused on these two variables” (Afonso Vieira & Vaz Torres, 2014 p. 159). While the importance of pleasurable and arousing responses to environmental stimuli is considered to be established, the third emotional response, that of dominance, is more contested (for examples see Donovan & Rossiter, 1982; Foxall & Greenley, 1998; Russell & Pratt, 1980; Donovan et al., 1994).

2.4.2 Measurement of psychophysiological responses

Further research based on insight of environmental psychology, while maintaining the importance of pleasure and arousal as predictive and contributing dimensions, contest the validity of the arousal measurement as proposed by Mehrabian and Russell. “From a psychophysiological perspective on the construct ‘arousal’ and the association with emotional constructs such as ‘pleasure’ leads to the conclusion that verbal (or self-reporting) scales might not be an appropriate way to measure arousal” (Groeppel-Klein & Baum, 2001 p. 414). An argument supporting this assumption is that verbal measurements of arousal are less valid due to the necessity of remembering the experience (Groeppel-Klein, 2005). Likewise this ‘reflection of arousal’ will only give a general overall perspective of respondents’ experiences, rather than specific instances connected to interaction with particular stimuli.

Groeppel-Klein and Baum (2001) explored how to increase the validity of measuring the arousal dimension. Based on neurophysiological theory and insights, Groeppel-Klein and Baum (2001) argue that arousal can be divided into three reactionary systems i.e. general activation, affect-arousal and preparatory activation. These separate systems have varying physical and emotional reactions that are seen as affecting behavioral responses. “For marketing purpose,

and especially when testing the impact of in-store stimuli on customers’ arousal and behavior tendency, the ‘preparatory activation’ - system and in part the ‘affect-arousal’ - system...are of major relevance (Groeppel-Klein & Baum, 2001 p. 414).

According to this perspective the preparatory activation system and the affect-arousal system encompass motivational and emotional components, respectively. In order to measure the corresponding physical and emotional reactions to these arousal states, psychophysiological measures such as cardiovascular and electrodermal variations are considered the most valid measurements (Groeppel-Klein & Baum, 2001). These measurements increase validity by allowing arousal reactions to be measured during all phases of the shopping experience and further remove the ability for researchers to influence test results.

The majority of research utilizing psychophysiological responses, in order to measure arousal within a retail context, focuses on electrodermal variations. For this reason a large quantity of criteria exists for analyzing arousal via electrodermal responses. As has been previously mentioned, both electrodermal and cardiovascular responses are found to be superior methods for viewing arousal variation. While electrodermal methods are considered to be the most sensitive method for analyzing arousal, it has been shown that reactions in heart rate are closely connected, and follow similar patterns, to skin conductance and similarly reflect the stimulus properties of test variables (Malmstrom, Opton & Lazarus, 1965). Since heart rate has been shown to follow the same patterns as electrodermal variation, as is explored and supported in the Malmstrom, Opton and Lazarus study, it can be argued that the insights attributed to electrodermal patterns can be applied to heart rate in a similar manner (1965).

According to Groeppel-Klein (2005), based on previous research by Steiger (1988 cited in Groeppel-Klein, 2005), the level of arousal evoked can be measured by summing the total amplitudes of the test persons produced during the controlled experiment. “The amplitude describes the strength of each phasic arousal reaction” (Groeppel-Klein, 2005 p. 431). This

method of summing the amplitudes rather than taking sample measurements based on time intervals is further supported and argued for based on the fact of homeostatic control of physiological variables (Malmstrom, Opton & Lazarus, 1965). Basically, this is referring to the biological process of stabilizing physical responses, like heart rate, which is a natural protection response. By measuring the total amplitude, non-related drops in heart-rate are able to be removed from calculations of experienced arousal. This allows for a more accurate representation, of the overall level of arousal, as compared between participants. Frequency of the number of amplitudes is also considered to be of relevance in analysis of environmental stimuli for retail situations. The number of times the participant's attention and arousal spike, reflects the level of attention individuals pay towards their environment (Groepel-Klein, 2005).

3.0 Method

3.1 Choice of Method

In order to support a causal relationship between the pleasure and arousal experienced by our participants a 'true' experimental design method was applied. Experimental methods "involve manipulation by the experimenter of one or more independent variables, together with some objective measurement of the effects of doing this" (Field & Hole, 2003 p. 64). This method was chosen since it enables a reasonably unambiguous cause and effect relationship to be identified (Field & Hole, 2003). This is achieved by making sure that the "only systematic effect on participants' behavior is the experimenter's manipulations of the independent variable" (Field & Hole, 2003 p. 71). In order to provide for this stipulation, our experiment was conducted in a closed lab with all extraneous factors maintained as constant as possible; the only independent variable in the experiment was the inclusion or exclusion of IIT. The lab used for the experiment is a retail lab situated at the Swedish Institute for Innovative Retailing within the University of Borås. The appearance of the lab is equal to a "real" retail store. During our experiment the lab consisted of clothing from a well-known equestrian brand in order to set up a fashion retail setting.

Participants in this experiment were randomly separated into two groups and were only tested once. This is in keeping with a between-group or static group comparison design (Field & Hole, 2003). The use of a static group comparison design was chosen in order to show a systematic variation in performance between the two groups that can directly be attributed to the addition of IIT within the physical retail setting. In order to isolate the effects of our manipulation of the independent variable, the application of IIT, it is essential that participants are randomly assigned to each group (Field & Hole, 2003). This helps to protect against all other potential influences by randomly distributing them between the two groups.

3.2 Measurements

Two techniques were used to measure the dependent variable, the application of IIT, i.e. survey and heart-rate monitoring. The survey used was a translated version of the PAD-model designed by Mehrabian and Russell, with the exclusion of the dominance dimension. The survey, translated from English to Swedish via a translation-retranslation process, included 12 variables on a semantic differential scale. Six of the variables were used to measure the participants' level of pleasure experienced during the experiment, with the other six measuring their level of arousal.

In order to increase validity of our arousal variable the arousal reactions were measured by an additional method, heart-rate monitoring. Heart-rates of participants were measured in terms of beats-per-minute (bpm), during all phases of the shopping experience via a pulse monitor. We decided to use a pulse monitoring system as it is less obtrusive than other psychophysiological methods. This choice is supported by Groepel-Klein and Baun's (2001) description of limitations connected to the use of electrodermal experiment techniques. An additional limitation of psychophysiological measurement techniques is their inability to account for the nature of the arousal experience i.e. positive or negative. This issue was controlled for, by the six variables used to measure arousal under the PAD model which indicate the positive or negative nature of the response. This use of a control element is deemed as a necessary accompaniment when administering psychophysiological

measurement methods (Groepel-Klein & Baum, 2001).

3.3 Procedure

The retail lab was outfitted to look like a traditional fashion retail store. The shopping experience was controlled by the same salesperson, in order to assure that all respondents were exposed to as similar of an experience as possible. The variation between the test and the control group came from their interaction, or lack of interaction, with the Image Interactive Technology.

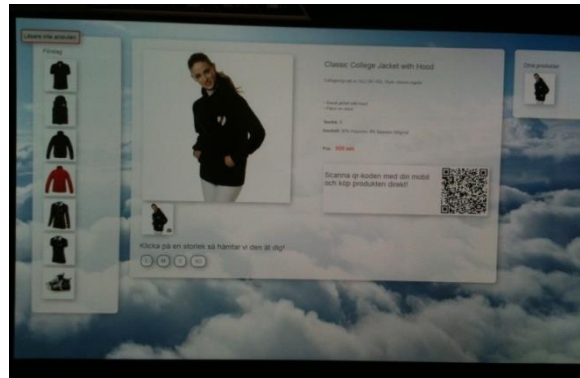


Retail Lab outfitted with Kingsland Apparel

In this experiment IIT refers specifically to the combination of RFID tags and QR codes with video screens, mobile phones and computers into an interactive platform. The video screen was placed inside the dressing room while the RFID tags were attached to the garments within the store. Radio Frequency Identification (RFID) tags are low cost, light weight sticker-like tags that are increasingly used to replace barcodes, especially within the clothing industry (Periaswamy, Thompson & Jia, 2011).



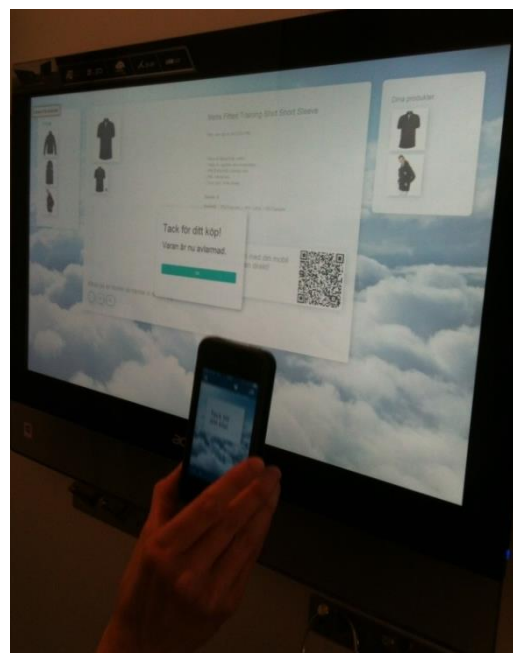
RFID tags attached to clothing tags



Interactive platform triggered by RFID tag

What is useful about this technology for our purposes is that this code can uniquely identify the articles to which they are attached and be used to trigger interactive information and visual profiles via video screens. In our experiment these tags were attached to articles of clothing, which allowed participants access to these interactive platforms simply by taking an article of clothing into the vicinity of the screens. For a more in-depth understanding of RFID tags we recommend Roberts (2006).

The QR codes appeared on the video screens when a garment was taken into the dressing room. Quick Response, or QR, codes are two-dimensional codes that can be scanned via mobile devices. They, like RFID tags, are seen as potential replacement for traditional bar codes (Crompton, LaFrance & van't Hooft 2012). These codes allowed consumer to purchase the items they have in the dressing room, immediately via a mobile phone.



Purchasing Phase: QR Code and Mobile 9

The collection of data during the experiment was divided into two phases. The first phase involved the continuous collection of heart-rate data while the participant interacted with the retail lab. Phase two of the data collection, involving the survey, occurred immediately following the retail lab experience. During the first phase, each participant was asked to perform three activities. The first activity consisted of searching for an item to try on. The second activity required participants to mix and match items in the store to create an outfit to their liking. The last activity was to purchase at least one item. After completing the first phase participants were escorted to a back room in order to fill out the survey in isolation.

Group 1, the control group (no-IIT), carried out the first phase without the use of IIT. However, the salesperson was available to assist with all tasks and provided similar information and suggestions to what was available via the IIT. Group 2, the test group (IIT), carried out each activity with the assistance of IIT. The salesperson was available to instruct participants on how to use the IIT.

The level of attentiveness of the salesperson was held constant. This was controlled for by having the same individual performing the role of salesperson in each group. This individual was experienced in retail sales and instructed on the level of service to provide. She was further instructed to maintain an equal level of service quality between both groups.

3.4 Sampling

The participants for the experiment were sampled via a random sampling technique, convenience sampling. Participants were collected on a volunteer bases from the area surrounding the lab. The application of a 'true' experimental design method requires a minimum sample size of 20 participants per group (Field & Hole, 2003). However, since our theory indicated that a variation in responses might occur between male and female respondents, the sample size was increased to allow for comparisons within subsamples (Dittmar & Drury, 2000). The total figures of participants included 84 respondents, 44 in the test group and 40 in the control group.

3.5 Data analysis

3.5.1 Self-reported measures

Six indicators of two dimensions of hedonic experience: pleasure and arousal were used in order to measure the effect of IIT in physical retail settings as indicated by responses to the PAD model. The higher the score indicated on the survey for pleasure and arousal, according to the PAD model, represents a positive correlation with approach behaviors.

In order to support the validity of the PAD model as a reliable measure of pleasure and arousal a Cronbach's Alpha test was administered. Cronbach's alpha is often used in measuring unidimensionality and can be applied to our model to explain the extent to which each scale measures the underlying factor or construct indicated by Mehrabian and Russell (Field & Miles, 2010). The results showed that the variables have a high level of internal consistency (Pleasure: $\alpha = 0.836$, Arousal $\alpha = 0.762$) and support the inclusion of all the variables outlined within the PAD model.

Once the validity of the PAD as a measurement instrument was supported, Mann-Whitney U-tests were used to compare sample groups. The Mann-Whitney U-test was chosen, over independent samples T-tests, since our sample size was limited and not all of the variables satisfied the normal distribution assumption. Furthermore, since we have directional hypotheses, i.e. the hypothesis: the test group (IIT) will have a higher mean rank than the control group (no-IIT) in both perceived level of pleasure and arousal, significance will be judged via a 1-tailed test (Field & Miles, 2010).

3.5.2 Psychophysiological measures

In analyzing the arousal experienced by participants, two key characteristics of the heart measurement were analyzed: total amplitude and frequency. The total amplitude will be calculated by summing all single amplitude reactions measured during the experiment. Frequency refers to the number of phasic arousal reactions experienced during the subject's exposure to the lab.

Prior to statistical evaluation of the psychophysiological responses, the first 50 seconds of the heart rate measurements were excluded. The reasoning for this was to increase the accuracy of our baseline (average bpm) measurement, by removing physiological responses that coincided with introduction to the measurement apparatus. Support for a delayed recording period, in order to let the subjects become use to the measurement apparatus, is provided by Groeppel-Klein and Baum (2001).

The difference in means for both total amplitude and frequency were then analyzed by means a Mann-Whitney U test, in order to compare the intensity of the arousal and moments of increased attention between the sample groups.

4. Results

Two sets of results are presented: survey responses to the PAD model variables and psychophysiological responses of heart-rate measured in beats per minute (bpm). Both sets of results are derived from two stages of Mann-Whitney U-tests. The first round of tests, for each set of results, utilizes the entire sample group, while the second round of tests restricts the samples to indicate differences between male and female respondents. The sample size for this experiment consisted of 84 respondents, 60 females and 24 males. The test group (IIT) contained a total of 44 respondents, 31 females and 13 males. The total number of respondents in the control group (no-IIT) was 40 respondents, with 29 females and 11 males. The majority of participants were in the age group 18-28, 78,6 %.

4.1 Self-reported measures

When testing the responses to the PAD model variables, a Mann-Whitney U test was conducted for each latent variable, i.e. pleasure and arousal, in order to show what differences existed between our sample groups. In order to test H1 and H2, the level of pleasure and arousal indicated by all respondents was compared between the test group (IIT) and the control group (no-IIT). When the mean rank of the summated pleasure variable was compared between the control and test groups, the control group (no-IIT=44.38) showed a higher, but not

significantly so, difference from the test group (IIT=40.80), $U= 805.00$, *ns*, $r= -0.07$. This indicates that no significant difference exists between the two groups, and therefore H1 cannot be supported. However, it is important to note that the overall mean (5.67) for both the test and control groups indicated a high level of pleasure. When analyzing arousal, the control group (no-IIT=40.10) showed a lower score than the test group (IIT=44.68), $U=784.00$, *ns*, $r=-0.09$. While this indicates results that are in line with H2, the high p-value ($p>0.05$) means that the hypothesis cannot be supported.

Further analysis of the data was conducted based on the understanding that men and women typically have varying emotional responses to conventional retail environments. The second round of tests involved an initial comparison between men and women, of the overall pleasure and arousal experienced, followed by a replication of the mean rank comparisons used in the first round of tests for pleasure and arousal applied separately for each gender.

When the Mann-Whitney U-test was applied comparing the overall pleasure experienced between men and women, the experiment was shown to evoke a significantly higher level of pleasure in women (46.76) than in men (31.85), $U = 464.50$, $p < 0.05$, $r = -0.28$. The level of arousal evoked during the experiment also showed to be significantly higher for women (45.35) than in men (35.38), $U = 549.00$, $p < 0.05$, $r = -0.18$.

At this point, male and female respondents were isolated, and a Mann-Whitney U-test, comparing the mean ranks for the test and control group, was applied. In reference to the level of pleasure experienced by the women sampled, the level of differentiation between the test group (IIT = 30.77) and control group (no-IIT = 30.21) reduced further, $U = 441.00$, *ns*, $r = -0.016$. This indicates that no differentiation between the two groups exists in reference to the level of pleasure experienced by women. However, the opposite result was found with arousal. Women in the test group scored higher (IIT = 34.39), showing a statistically significant difference ($p = 0.037$), than the control group (no-IIT = 26.34), $U= 329.00$, $r= -0.23$.

When only male participants were sampled the level of pleasure experienced showed to be

significantly higher ($p = 0.034$), for the control group (no-IIT = 15.36) than the test group (IIT = 10.08), $U = 40.00$, $r = -0.37$. Scores for arousal showed no significant results ($p = 0.105$), with the control group again scoring higher (no-IIT = 14.50) than the test group (IIT = 10.81), $U = 49.50$, $r = -0.26$.

4.2 Psychophysiological measures

When testing psychophysiological responses, a Mann-Whitney U test was conducted for two variables, i.e. total amplitude and frequency, in order to test if the level of arousal and attention can be shown to differ between our sample groups. While it was the intention to include all cases in this sample, due to issues with the recording apparatus pulse measurements for 29 of respondents did not record properly: 6 control group and 23 test (IIT) group. These respondents were missing either part or all of the bpm measurements while undergoing the retail experience. For this reason these cases were removed from the sample before statistical analysis was conducted, resulting in a total of 55 responses: 34 from the control group (no-IIT) and 21 from the test (IIT) group.

For the first round of test the total amplitude and frequency was compared between the test group (IIT) and the control group (no-IIT). The frequency experienced by the control group was lower (no-IIT = 25.06) than the test group (IIT = 31.33), $U=266.00$, ns , $r = -0.20$. Similarly the control group's total amplitude was lower (no-IIT = 18.57) than the test group (IIT= 19.56), $U=159.00$, ns , $r = -0.05$. While both of these results indicate increased arousal among the test group, neither shows statistical significance. Therefore H2 cannot be supported.

The second round of tests involved replicating the mean rank comparisons for total amplitude and frequency separately for each gender. In reference to the frequency of phasic arousal reactions experienced by the women sampled, the control group's mean rank was significantly lower (no-IIT = 17.23) than the test group (IIT= 23.39), $U=113.50$, $p<0.05$, $r = -0.28$. While the total amplitude for the control group (no-IIT= 10.46) was also lower than the test group (IIT=14.00) it was not to a statistically significant degree, $U=45.00$, ns , $r = -0.26$.

When only male participants were sampled the mean rank of frequency was indicated to be higher for the control group (no-IIT=8.89) than the test group (IIT=8.00), $U=28.00$, ns , $r=-0.09$. Likewise, the total amplitude for the control group was higher (no-IIT=8.75) than that of the test group (IIT=5.83), $U=14.00$, ns , $r = -0.35$.

4.3 Summary of results

Overall, results showed that while the level of pleasure experienced in both scenarios was above average, no significant difference was shown between the test (IIT) and control (no-IIT) groups when the entire sample was tested. This held true for both self-reporting methods and psychophysiological methods. For this reason we are unable to support our hypothesis for both H1 and H2. However, when analyzing the data further, taking gender into consideration, as suggested by Dittmar and Drury (2000) and Dittmar, Long and Meek (2004), some significant results were shown.

When the mean rankings of pleasure and arousal were compared between male and female participants, the experiment was shown to evoke a significantly higher level of both pleasure and arousal in women than in men. When female respondents were isolated, the level of arousal shown via the survey and psychophysiological measurement significantly differed between the two groups, with the test group (IIT) showing increased level of arousal. The male respondents, once isolated, also had significant results showing an increased level of pleasure associated with the control group (no-IIT).

5. Analysis

The aim of this research is to explore the degree to which the use of Interactive Image Technology enhances the hedonic shopping experience, in brick-and-mortar fashion retail stores. This focus on the emotional and experiential elements of the shopping experience continues to be increasingly important as markets become more saturated and technologically savvy. In this research, the primary focus has been on the emotional elements of pleasure and arousal. This is due to their established predictive capacity in relation to consumer behavior.

While extensive research has not previously been conducted in connection to IIT's ability to enhance hedonic in-stores experiences, theoretical speculation has started to be developed by Pantano and Naccarato (2010). Their predictions on the positive correlation between advanced technologies and hedonic benefits to the customer are supported by results seen in Kim, Fiore and Lee's work in online shopping research (2007). Therefore, the hypotheses put forward in this paper expect a positive correlation to exist between the presence of IIT and the level of pleasure and arousal experienced by consumers.

The first hypothesis argues that the presence of Interactive Image Technology (IIT) will increase the customers' perceived level of pleasure experienced in an in-store fashion retail setting. Our results show no significant difference in the level of perceived pleasure between the test (IIT) and control (no-IIT) groups. This means that we failed to support the hypothesis, and that we cannot argue that IIT provided any significant increase in pleasure among our participants. According to the previously established predictive capacity of pleasure by Donovan et. al. (1994), Tai and Fung (2011) and Groeppel-Klein (2005), we can argue that these results means that neither group is predicted to be more or less likely to engage in a higher level of product trial, have an increased desire to explore the retail setting, or will spend more money in the retail space. However, it is important to point out that while no significant differentiation existed between the two groups, the overall average of perceived pleasure was extremely high for both groups, ranking almost a 6 out of the potential 7. This means that while IIT did not show to pose a significant advantage to the retail experience, neither did it detract from the potential of the retail space to provide pleasure and that both groups found the experience to be highly pleasurable.

The second hypothesis argues that the presence of Interactive Image Technology (IIT) will increase the customers' perceived level of arousal experienced in an in-store fashion retail setting. Arousal was tested, in our research, via two measurement systems, i.e. survey and psychophysiological. The psychophysiological method is seen as being the most valid measure of arousal. However, it is dependent upon the

self-response of participants via the survey in order to indicate the positive or negative nature of the arousal experienced. While psychophysiological methods are argued to be more sensitive to arousal measurements, we found both tests showed consistently similar results; this may be due to the limitations of our sample size for the heart rate measurements.

The mood connected to the arousal element indicated that the response was more positive than negative, since it registered in the higher values on the PAD measurement scale. According to a similar qualification made by Groeppel-Klein and Baun (2001) this indicates that the arousal measurements can be viewed as positive responses to the retail environment. Our results show that, while there was a slight indication that the presence of IIT evoked a more arousing response, no significant difference could be supported between the test (IIT) and control (no-IIT) groups. This means that, though according to Tai and Fung (2011) and Groeppel-Klein (2005) potential exists that the presence of IIT in fashion retail space may encourage consumers to spend more time in the store, increase the level of interaction with the space and ultimately engage in more purchasing, it cannot be argued to support our hypothesis without further research.

Part of the reasoning behind our sampling of both male and female subjects for this experiment was based on the understanding that men and women's emotional responses to retail environments differ. Our results, when comparing the overall levels of pleasure and arousal among all participants, showed that women did experience significantly higher emotional reactions to the retail setting than men. This result can be seen as being in agreement with Dittmar and Drury's (2000) findings on the psychological and emotional role shopping experiences play for men and women.

In order to explore how this differentiation between men and women would affect our results, the same hypotheses were again tested but with samples restricted by gender. One of the significant results uncovered from this approach was that the level of pleasure indicated by men was lower in the test group (IIT) than in the control group (no-IIT). This means that not only did the male participants

experience significantly lower overall pleasure during the experiment, but the implementation of IIT further decreased the stimulation of a pleasure response. While this was the opposite reaction we expected to see, even in the male population, the reasoning behind these results could be based in motivation factors. As is discussed in Dittmar, Long and Meek's research (2004), men are typically motivated by more functional or utilitarian motives when shopping. It can be postulated therefore, that the presence of IIT in this retail experiment was seen as inhibiting the functional action of purchasing a fashion article. If the application of IIT is seen to increase the difficulty to accomplish the "task" of shopping it can be hypothesized that men would have a negative response to its presence. Furthermore, it is important to note that this result suggests the opposite of the argument proposed by Pantano & Naccarato (2010), that interactive technology could serve to attract the male population.

The second significant result was that women in the test group (IIT) showed a higher level of arousal than those in the control group (no-IIT). This means our results show that the presence of IIT increased women's perceived level of arousal experienced in our in-store fashion retail experiment, which was in line with our second hypothesis. From this result we argue that the application of IIT in a fashion retail store could enhance the emotional state of women in a way that would encourage approach behavior.

In keeping with previous research into behavior-environmental relationships and the benefits associated with approach behavior, high levels of pleasure and the significant increase in arousal that resulted from the application of IIT suggests that female consumers will be more likely to move towards, stay in, explore, interact supportively in, perform well in, and return to a fashion retail environment that includes similar IIT as those provided in this experiment (Donovan & Rossiter, 1982; Donovan et. al., 1994; Tai & Fung, 2011; Foxall & Greenly, 1998). While this study resulted in the rejection of our initial hypotheses, some significant results were offered that support continued research in this area. A primary result is the contribution of the insight into the potential for the application of

IIT in fashion retail stores, which specifically focus on female market segments.

The focus of this research was to argue for IIT to be a method through which the experiential and emotional elements of the shopping experience could be enhanced. If IIT were seen to enhance the emotional elements of the retail experience it could be argued to provide a means of maintaining a competitive advantage through enhancement of hedonic aspects of the shopping experience. The importance of such research is additionally supported in the mediating role of emotions in customer relationships with store characteristics-store attitudes (Yoo, Park & MacInnis, 1998). Furthermore, the use of IIT as the means through which hedonic aspects of retail are enhanced fulfills criteria argued to be important in order to enhance competition and maintain profitability of physical retail stores, specifically that of innovation and interactivity.

6. Conclusion and further research

This research has addressed a gap in existing literature surrounding the use of IIT to enhance hedonic aspects of the in-store retail shopping experience, by providing a measured experimental approach. The application of the PAD model combined with heart-rate measurements provides a base approach for measuring and comparing consumer emotional states when interacting with IIT in a lab experiment. The combination of the six arousal variable from the PAD model and the psychophysiological heart-rate measurements consistently showed a correlation in their results, indicating that both were measuring the same thing. This supports not only our choice to apply the heart-rate method but also our framework for interpreting the results. However, we would argue that the power of the heart-rate measurements would have been stronger had the sample size not been diminished due to malfunctioning equipment. We would recommend that further studies using this approach be vigilant in checking their equipment's readings before conducting each experiment and/or utilizing more sensitive apparatus.

The tools used for measurement were felt to give a strong representation of the researched variables. However, upon further reflection, we

would consider changing the experimental design. The choice of a static group comparison design limits the number of potential respondents as it is more time consuming and only allows for each participant to experience one of the two scenarios. Additionally, static group comparisons can be seen as less sensitive and run a higher risk of showing no results. We would recommend that further analysis apply a within-subjects design, as it will allow respondents to differentiate between the two scenarios.

Regardless of the rejection of our hypothesis, this research provided results indicating that further research into the use of IIT to enhance hedonic values is warranted. The indication of an increased arousal state within the test group, though not significant, could be enough to encourage the replication of the experiment. However, with the additional significant findings that surfaced, when analyzing men and women separately, this justification for further research is strengthened. We would recommend that further research looking into emotional elements of shopping experiences create a separate theoretical basis for hypothesis formation for male and female respondents.

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