

Intelligent Embedded Marketing Service System Based on TV Apps: Design and Implementation

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ABSTRACT

Due to the increment of advertising requirements based on various multi-media services, two studies were conducted to propose an Intelligent Embedded Marketing Service System (IEMSS) and then to use IEMSS to implement product placement strategies for idol dramas in interactive television. In the study 1, IEMSS combines the TV apps, multiple agents, multi-document summarization technologies to retrieve and store the information and comments about merchandises from search engines, blogs, and forums. IEMSS uses multi-document summarization technique which considers TF-IDF (term frequency-inverse document frequency), position and artificial neural network (ANN) to automatically generate and transmit the key positive comments to user via TV apps. In experiments, the results show that the accuracy of IEMSS is 100% to indicate IEMSS is enough to help users to understand the merchandise and improve purchase intention.

In the study 2, a 2 (product description messages: shown versus not shown) x 2 (online reviews: shown versus not shown) between-subjects design was conducted to examine the effectiveness of IEMSS for actual application. The result of this empirical research revealed that displaying reviews of embedded products obtained from the Internet using IEMSS functionality can provide audiences with the views of others who have used the embedded product while they are watching idol dramas, improving their attitudes toward the brand and product placement, and stimulating their purchase intentions.

In sum, based on the results of the study 1 and study 2, IEMSS can be successfully applied to automatic summarization for advertising. Furthermore, this approach can be considered an extension of eWOM marketing and an application of Media Richness Theory, which thereby increases the effectiveness of product placement.

Keywords: TV apps, multi-document summarization, multiple agents, advertising service, product placement, Media Richness Theory

1. INTRODUCTION

In an advertising marketing environment characterized by an era of focus communications and fragmentation, the promotional effects of traditional advertising have gradually waned. The improvement of information technology leads to create multi-media services and increase advertising requirements based on various multi-media services. The embedded marketing services based on TV apps are the trend of the future. In recent years, advertisers have favored product placement because audiences do not easily perceive that the embedded products are actually advertisements. Therefore, audiences are unaware that they are receiving advertising messages that affect their perception of the product. For example, embedding a particular brand in a television program can be considered product placement regardless of whether the brand is mentioned, the brand logo is shown, or branded products are filmed. These strategies of embedding can be effectively integrated with the situations and timing of plotlines, enabling audiences to encounter brand messages in natural situations and reducing the potential for rejection by audiences. Audiences' positive view of the protagonists may even be transferred to the embedded products, effectively increasing positive perceptions of the brand and even stimulating purchase intentions. Thus, product placement is considered a more efficient strategy of marketing compared to other types of advertising (Smit, van Reijmersdal, & Neijens, 2009).

However, although longer product exposure on a television channel may facilitate brand recognition, it can also lead to negative perceptions of the brand as the audience gradually recognizes the marketing intention behind embedded products (van Reijmersdal et al., 2010). Additionally, overfamiliarity with this marketing strategy may limit the advertising effectiveness. To reduce audiences' negative perceptions of product placement, we examined whether increasing the completeness and diversity of messages, as well as the richness of media, facilitates the development of positive benefits based on Media Richness Theory. Two studies which are IEMSS design and the application of IEMSS to product placement in an idol drama were conducted in

this research.

Specifically, in study 1, this study proposes an Intelligent Embedded Marketing Service System (IEMSS) which combines the TV apps (e.g., Yahoo TV Widgets or Android apps), multiple agents, semantic analysis and multi-document summarization technologies. IEMSS which is designed with three-tier architecture includes (1) TV App User (TVAU), (2) Merchandise Recommender System (MRS), and (3) Active Database Server (ADS) to provide the introduction and comments of merchandise. ADS provides the web content retrieval agent (WCRA) to retrieve and store the information and comments about merchandises from search engines, blogs, and forums. Finally, MRS combines the semantic analysis and multi-document summarization technique which considers TF-IDF (term frequency-inverse document frequency), position and artificial neural network (ANN) to automatically generate and transmit the key positive comments to TVAU via TV apps.

In study 2, IEMSS was used to implement product placement strategies for idol dramas in interactive television. Empirical research was performed to examine the effectiveness of this system for actual application. Specifically, we assessed whether providing descriptions and online reviews of products embedded in idol dramas using the IEMSS functions designed by the study 1 can improve consumers' perceptions of products, attitude toward product placement and purchase intention. The study 1 and study 2 are demonstrated as follows.

2. Study 1: IEMSS Design

2.1. Related Work

IEMSS is designed to provide the real-time positive merchandise comments from web forums or blogs. Necessary research background and relevant technology include: (1) requirement classification techniques and (2) MDS.

2.1.1. Requirement classification techniques

In recent years, several requirement classification systems have been proposed and implemented. Those systems consist of the following steps: (1) Preprocessing and (2) Learning classifier (Ko et al., 2007; Lo et al., 2011b; Tsai et al., 2011).

The main roles of preprocessing are (i) segmenting requirements into sentences and (ii) extracting content term (Ko et al., 2007). However, several studies only focus on the analysis of English sentences (Ko et al., 2007; Lo et al., 2011b). For Chinese, the CKIP group develops the Chinese segmentation system which includes the methods for resolving unknown terms (Ma and Chen, 2003) is very useful. Although, these approaches are serviceable, they have lower power for special domain such as topic term in this case. For example, the topic term “微舒打” which there are two segments “微舒(Nb)” and “打(VC)” of is a specific technicality.

For classifier, there are many kinds of classification techniques such as clustering, association rule, k-Nearest Neighbor (kNN) and artificial neural network (ANN)(Ishii et al., 2006; Lo et al., 2011a; Lo et al., 2011b; Tsai et al., 2011). Ishii et al. proposed a new combining method which consists of latent semantic analysis (LSA) and kNN (Ishii et al., 2006). Lo et al. designed the system which combines TF-IDF (term frequency-inverse document frequency), LSA, and self-organizing map (SOM)(Lo et al., 2011b). Although, this result of combining method is the higher accuracy, the method cannot retrieve the positive-comment sentences from corpus. Therefore, this study will consider the positive influence factors to improve the classification algorithm.

2.1. 2. Multiple-document summarization

Due to a huge amount of information which is retrieved from web forums or blogs, this study uses MDS to simplify and get rid of the repeated information. TVAU can save the searching time and get the important information. The designed MDS is based on MEAD (Radev, Hatzivassiloglou, and McKeown, 1999; Radev, Jing, and Budzikowska, 2000; Radev, Winkel, and Topper, 2002) which is a public domain portable multi-document summarization system. The main procedures of MEAD are the following steps: (1) preprocess, (2) feature selection, (3) classifier, (4) reranker, (5) summarization, and (6) evaluation (see Figure 1).

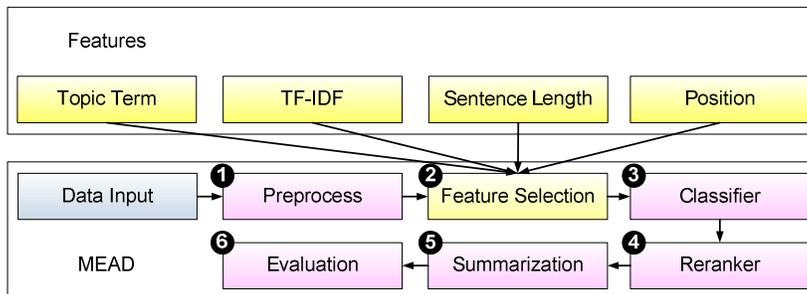


Figure 1. The procedure of MEAD

(1). Preprocess

For preprocess, the intelligent agent retrieves the contents of blog and forum articles using HTML format to segment the sentences in original document in order to facilitate follow-up to the weight computing (Huang and Wu, 1999; Huang, Yang, and Chu, 2001; Kung et al., 2011; Lo et al., 2010).

(2). Feature Selection

MDS is designed to consider several features to compute the weight of each sentence by words and phrases. The main four features are topic term, TF-IDF (term frequency-inverse document frequency), sentence length, and position (Chen et al., 2011; Liu et al., 2005; Radev, Jing, and Budzikowska, 2000; Radev, Winkel, and Topper, 2002; Yeh, 2002; Yeh, Ke, and Yang, 2002; Yeh et al., 2005).

(3). Classifier

For classifier, there are several weighting values which are defined. The scores of every sentence are mainly computed through the weighting value with each feature (Kaikhah, 2004; Lo et al., 2010). However, the weighting values are usually calculated as simple average (SA) to perform the lower accuracy in experiments. Therefore, this study combines the MDS and ANN to improve the performance.

(4). Reranker

Erkan and Radev indicated that classifier is only carried out in accordance with score of sentence similarity calculation and sorting. It makes the problem that may exist the high similarity between sentences, especially in multi-document summarization (Erkan and Radev, 2004). Reranker mechanism is designed to recalculate the sentence with the syntactic similarity and set the threshold to filter out important sentences to reduce the redundancy ratio. Finally, the

summary is made by extracting the sentences from original document by the compression ratio.

(5). Summarization

Summarization can retrieve and recombine words and phrases in the original document according to the order of the sentences by reranker sorting.

(6). Evaluation

Evaluation process is used to measure the performance of text summarization system including the effect of output results as well as users' satisfaction (Myaeng and Jang, 1999). The k-fold cross-validation (Han, Kamber, and Jian, 2011) is usually used in evaluation process to provide conscientious measurements (Lo et al., 2011a).

2. 2. System Design

IEMSS which integrates TV app, web services (Chen et al., 2012), information retrieval and MRS techniques to recommend merchandise suitability to the user is designed with three-tier architecture is published to open platforms (e.g. Yahoo, Google, and other application stores). As shown in Figure 2, IEMSS includes (1) TVAU, (2) MRS, and (3) ADS.

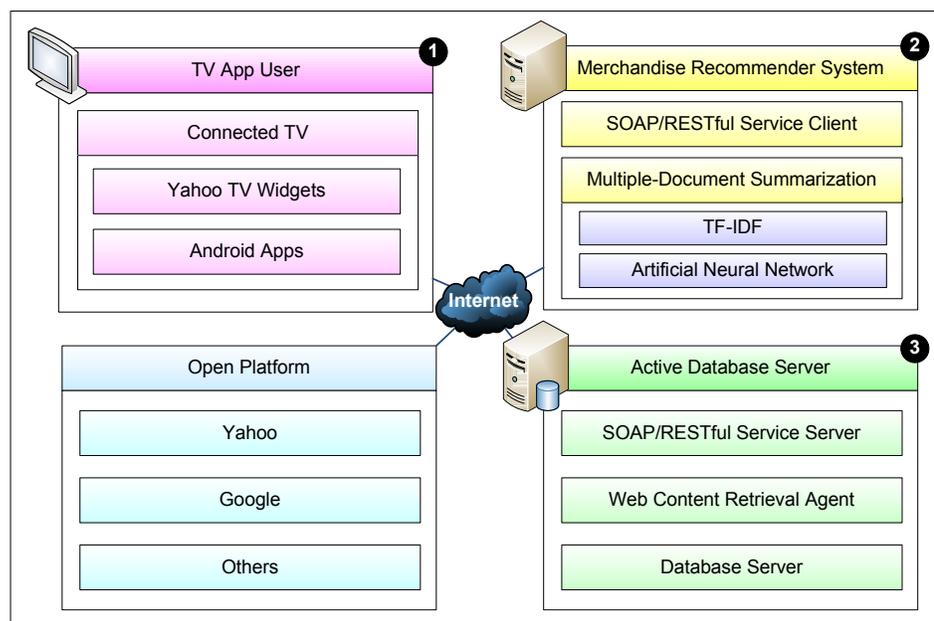


Figure 2. The architecture of IEMSS

2.2.1 TV App User

TVAU can use any kind of connected TV which can support Yahoo TV Widgets or Android Apps to access the embedded marketing service through application. The marketing information would be presented on the connected TV, and a TVAU can receive the embedded marketing service supported by software and hardware in a communication environment.

2.2.2. Merchandise Recommender System

MRS includes SOAP (Simple Object Access Protocol)/RESTful Service client (Chen et al., 2012) and MDS and analyzes the web forum and blog articles from ADS via SOAP/RESTful interface to summarize the relevant merchandise comments for embedded marketing services. The processing procedure is (1) predefine, (2) preprocess, (3) feature selection, (4) classifier, and (5) summary. The details are as follows.

(1). Predefine

In this section, this study predefines and establishes the merchandise comment term ontology (MCTO) which contains topic terms (e.g., brand name “微舒打”) and comment terms. Figure 3 shows the procedure for MCTO establishment.

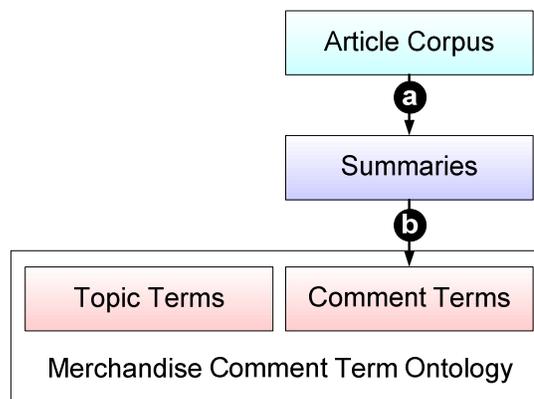


Figure 3. The procedure of MCTO establishment

For comment term establishment, SOAP/RESTful Service client queries ADS to build the article corpus. These articles are sent to several domain experts to generate the summaries as training data to establish comment terms (path (a) in Figure 3). Afterward MRS uses CKIP (Ma and Chen, 2003) to segment sentence into terms and calculates the score of each term by using TF-IDF function (Salton and McGill, 1986) which is defined as equation (1) (path (b) in Figure 3).

$$TFIDF(i, n) = TF(i, n) \times IDF(i) = \frac{F(i, n)}{\max_{t \in T} F(t, n)} \times \log\left(\frac{|N|}{DF(i)}\right), \text{ where } TFIDF(i, n) \quad (1)$$

is the weight of term i in the article n , $F(i, n)$ is the frequency of term i in the article n , T is the term set in the article n , and $DF(i)$ is the frequency of term i in the article set.

(2). Preprocess

The preprocess transfers the format of original HTML documents from forum and blog articles. Then it sets the document ID and Sentence ID sequentially in order to maintain the weight of sentences in each document and production. Afterward MRS uses CKIP to segment these sentences in articles to build vector space model (VSM)(Lo et al., 2011a).

(3). Feature Selection

For feature selection, the main four features which are discussed in previous work are topic term, TF-IDF (term frequency-inverse document frequency), sentence length, and position. However, the topic term which also exists in normal sentences and negative-comment sentences is no significance for retrieving positive-comment sentences. Moreover, the length of positive-comment sentences is also no significance in this study. Therefore, MRS uses two features which include (i) TF-IDF and (ii) Position to calculate the weight of each sentence.

(i). TF-IDF

We use the VSM to carry out the sentence score calculation. In this paper, the terms which are contained by MCTO only be considered. The equations (2) and (3) are used to calculate the value st_{jn} of the sentence j in article n .

$$ct_{jn} = TFIDF(c_{jn}, n), \text{ where the term } c_{jn} \text{ is in the sentence } j \text{ in article } n. \quad (2)$$

$$st_{jn} = \frac{\sum_{c_{jn} \in C_j} ct_{jn}}{|C_j|}, \text{ where } C_j \text{ is the term set in the sentence } j \text{ in article } n. \quad (3)$$

(ii). Position

Position is to assign weight by the position of the sentence in the document. Finding in this study shows that the positive comments are usually presented in the first or last sentences in the article. Therefore, this study designs

equation (4) to build the position feature for the value sp_{jn} of sentence j in article n .

$$sp_{jn} = \begin{cases} 1, & \text{the sentence } j \text{ is the first or last sentences in article } n \\ 0, & \text{otherwise} \end{cases} \quad (4)$$

(4). Classifier

For classifier, this study collects the values of ct_{jn} , st_{jn} , and sp_{jn} as characteristics of neurons in ANN (see Figure 4). Afterward ANN classifies the sentences as two output groups which include positive-comment sentences and non-positive-comment sentences.

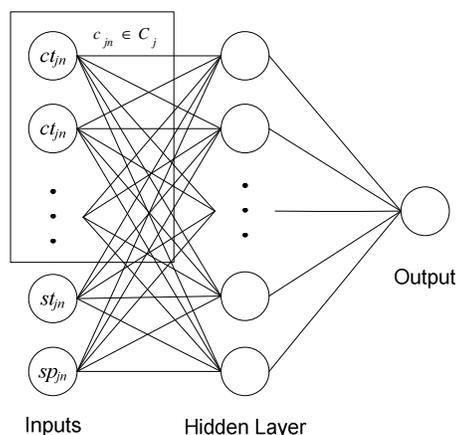


Figure 4. The architecture of ANN in this study

(5). Summery

After that, we get the sentences of positive-comment sentence group to generate a summary of comments to TVAU.

2.2.3. Active Database Server

ADS includes WCRA, SOAP/RESTful service server, and database server. WCRA provides functions which support fuzzy search, HTML crawler, and HTML parser (Lo et al., 2011b) to retrieve the key information from web forum and blog articles and store the information to database server. Moreover, ADS performs SOAP/RESTful service to serve client's request and provide the data from database server. ADS is a powerful application tool to provide information to MRS for embedded marketing service inference.

2.3. System Implementation and Evaluation

In this section, this study implements IEMSS to provide embedded marketing service as an example and reports experimental results.

2.3.1. System Implementation and Case Study

For system implementation, this study develops a Java-based app to simulate the TV app and designs an embedded marketing service for soft drink the brand of which is “微舒打(DemiSoda Lemon Drink)” as a case study. Figure 5 shows that IEMSS provides the merchandise information embedded in the top of screen and positive merchandise comments embedded in the down of screen.



Figure 5. The implementation of IEMSS

2.3.2 System Evaluation

In experiments, this study randomly selects 41 articles which include 138 sentences from forums. These articles are sent to 7 domain experts for summarization. Moreover, this study evaluates the performance of IEMSS in the way called k-fold cross-validation. In iteration j , forum sentence j which includes positive comments is selected as the test corpus, and the other 137 forum sentences are collectively used to train the values by the proposed method. Due to 6 positive-comment sentences, the training and testing are performed in 6 runs.

For feature selection, this study designs different experiments to evaluate topic

term, TF-IDF and position. Consider SA (Kaikhah, 2004) first; it can be observed that the highest accuracy of this classification is 83% when the features are TF-IDF and position (see Table 1). Moreover, the accuracy is lower than 20% when topic term of feature is selected. Therefore, the topic term is no significance for retrieving positive-comment sentences. Afterward the results also show that the highest accuracy of kNN algorithm (Lo et al., 2008) is 50% and lower than using SA method. Finally, this study uses ANN algorithm to classify these sentences as positive-comment sentences and non-positive-comment sentences. The results show the accuracy of IEMSS which considers TF-IDF and position and combines ANN algorithm is 100% and better than using SA method and kNN algorithm. Therefore, IEMSS can be successfully applied to automatic summarization for advertising.

Table 1. Experiment results

Feature Selection	Classifier	Parameter	Accuracy
TF-IDF	SA		67%
Topic Term and TF-IDF	SA		17%
TF-IDF and Position	SA		83%
Topic Term, TF-IDF and Position	SA		17%
TF-IDF	kNN	k = 3	50%
TF-IDF and Position	kNN	k = 3	50%
TF-IDF (includes ct_{jn} and st_{jn}) and Position	ANN	# of neurons in hidden layer = 200	100%

3. Study 2: Implementation of IEMSS for Product Placement in Idol Dramas

3.1. Literature Review

3.1.1. Product placement

Product placement involves paying for products, brand names, brand logos, or product messages to be subtly embedded in entertainment media vehicles, such as television plotlines, television programs, news, multiplayer online games, single-player games, and novels, to achieve advertising effects through media exposure (Ferraro & Avery, 2000; Friedman, 1986; Nelson,

2002; Russel & Belch, 2005). Regarding product placement methods, Gupta and Lord (1997) divided product placement strategies into three categories: (1) visual only: showing products, brands, or logos in the background of television programs or movies, but not verbally referencing product messages or including relevant audio; (2) audio only: characters verbally reference brand names or describe relevant brand information; and (3) combined audio-visual: verbally referencing brand names or product information while brand images appear on-screen. In addition, d'Astous and Seguin (1999) classified product placements into the following three categories based on the degree of prominence: implicit placement, integrated explicit placement, and non-integrated placement. Implicit placement refers to the presentation of a brand in a plotline, for example, a specific restaurant appearing in a scene. Integrated explicit placement involves the clear display and discussion of a product during plotlines. Non-integrated placement refers to the presentation of a product in a plotline without situational integration.

Based on the categorizations of product placement described previously, we referenced Gupta and Lord (1997) to design a product placement using a combined audio-visual approach. Most product placements occur in television, movies, and news reports. Relatively few studies have examined product placements in Internet television vehicles. In this study, we employed an IEMSS mechanism to provide product information and online product reviews when embedded products appeared in online television programs with product placements, thereby improving audience sentiment toward the embedded products and strengthening the effects of product placement.

3.1.2. Media Richness Theory

Media richness theory was proposed by Daft and Lengel in 1984. The core concept of this theory is that media richness and message complexity should be two criteria for medium selection. In other words, when organization members seek to reduce message vagueness and uncertainty, they use the appropriate channels to reduce the gap between the amount of information needed and the actual amount received (Daft & Lengel, 1984). Byrne and Lemay (2006) used media richness theory to explore the influence that various types of media had on satisfaction with internal organizational communication. Their results showed that receivers were more satisfied when messages were received from multiple media than from a single medium. Extending this

concept to advertising, media richness also influences advertising effects. Otondo, Van Scotter, Allen, and Palvia (2008) used experimental methodology to explore the influence that various advertising message characteristics had on the effectiveness of communication, as perceived by message receivers. Their research included three types of messages: text, audio, and audio/video. They also used the message length (1 min versus 3 min) and message content (subjective & instrumental) to manipulate the messages. The results showed that the consumer satisfaction produced by advertising messages with high-media richness exceeded that produced by low-media richness advertising messages.

Similarly, Jacob, Guéguen, and Petr (2010) examined the influence that media richness in travel Web sites, such as the navigation perspectives and actual street-sounds, had on the reviews, frequency of use, and travel intentions of the Web site users. Using random sampling, we controlled whether street sounds (e.g., bird calls and human voices) would be played as the web site was being used and whether photographs of locales could be controlled using 360° mouse-driven navigation. The research results showed that travel web sites with the highest media richness (i.e., those that included 360° photograph navigation and integrated street sounds in the browsing experience) received the best reviews from users. These results indicate that media richness has a significantly positive influence on travel web sites, thus increasing the benefits for the participating cities. Therefore, we used media richness theory as the theoretical basis for assessing whether showing online user reviews of embedded products directly on television screens when the product appears through IEMSS functionality can produce stronger advertising effects by presenting review messages using two types of media to enhance the marketing effects of product placement.

3.1.3.Hypotheses

Brands or product information, when presented to audiences through program plotlines, directly stimulate and accelerate cognitive information processing and influence brand salience as audience members assess the efficacy of advertising (Hong, Wang, & De Los Santos, 2008). We contended that using IEMSS functionality to provide product description messages when products appear on-screen can produce stronger advertising effects. Thus, Hypothesis 1 was as developed follows:

Hypothesis 1: *When audiences watch idol dramas, compared to product placement marketing without product description messages, product placement with product description messages will produce superior brand and advertising attitudes as well a stronger purchase intentions.*

By showing their functionality through plotlines, the exceptional performance of products can be conveyed to achieve good product placement effects. For example, an actor may use a phone to download files and take pictures in a movie, demonstrating the product's potential benefits to the audience. This approach is known as demonstrative product placement. Conversely, product placements without demonstrative aspects, where products merely appear in movies, do not explain or highlight a product's benefits. Research has shown that of these two product placement types, demonstrative product placements are more effective compared to non-demonstrative product placements (Hong, Wang, & De Los Santos, 2008). Rungpaka et al. (2005) also found that product placements were more effective when the product's benefits and features are shown through the movie or television plotlines. This is because product features can provide information directly, which accelerates audience cognition and thereby reduces the time and effort needed to obtain, recall, and retrieve relevant information. Compared to product placements that do not demonstrate the product, demonstrative product placements can better accelerate the audiences' cognition of a brand, influencing their attitudes toward products.

In addition, Simon and Peppas (2004) examined whether the messages conveyed by media with differing degrees of information richness (information-poor Web sites versus information-rich Web sites) caused the test participants to develop differing media attitudes and satisfaction. The results showed that, compared to media-poor Web sites, media-rich Web sites generated higher levels of satisfaction and positive attitudes in the test participants, indicating that greater completeness in messages and richer media provide positive benefits. Therefore, we inferred that using IEMSS functionality to directly display online product reviews on the television screen during product placements, although not a demonstration of product functionality through the plotline, still communicates the product benefits and features of through online user reviews. By displaying both the product and online reviews simultaneously, greater advertising effects can be achieved.

Thus, Hypothesis 2 was as follows:

Hypothesis 2: *When audiences view television idol dramas, compared to product placements not paired with online reviews, product placement presented with online reviews generate superior product and advertising attitudes as well as stronger intentions to purchase.*

Regarding interaction effects, based on media richness theory, we contend that simultaneously displaying product descriptions provided by the producer and online product reviews extracted using IEMSS on the television screen is more persuasive than product placements shown without description messages and online reviews. Therefore, the following Hypothesis 3 was advanced:

Hypothesis 3: *When audiences view television idol dramas, compared to product placements shown without product descriptions and online reviews, product placements with product description messages and online reviews generate superior brand and advertising attitudes as well as stronger intentions to purchase.*

3.2. Research Methods

An experiment was conducted with a 2 (product description messages: shown versus not shown) x 2 (online reviews: shown versus not shown) between-subjects design. The participants of this study were recruited from a national university in northern Taiwan. Overall, 98 people participated in this study, that is, 31 men and 67 women. Each participant was randomly assigned to an experimental group and shown an approximately 1 min edited television idol drama clip, after which he/she was asked to complete a questionnaire.

3.2.1. Selection of experimental video

This study selected *To the Beautiful you*, a 2006 Taiwanese idol drama, for use as the experimental video. This drama received good viewership ratings and has numerous examples of product placement. The drama comprised 15 60-min episodes. Regarding the criteria for selecting the experimental video clips, when product messages that met the following conditions were shown in the drama, that video segment was selected: Product messages are communicated through the dialogue, and the product's exterior can be identified in the visual images.

Beverages are a low-involvement product type (Lockshin, Quester, & Spawton, 2001). To prevent excessive involvement and participants' personal preferences influencing the experimental results, DemiSoda Lemon Drink, a beverage embedded in the plot, was used as the stimulus for the experiment. The video clip was approximately 1 min in duration. The dialogue in the clip was as follows:

Female protagonist A: You're back.

Male protagonist A: This is for you.

Female protagonist A: This is my favorite drink! I didn't expect Quan to remember – does his giving me a drink mean that he saw the note and scarf I gave him?

Male protagonist A: Should I say that I got the note and scarf she gave me? After all, she is a considerate girl.

This study selected a segment where DemiSoda Lemon Drink was embedded, primarily because DemiSoda Lemon Drink is not well-known in the market. To verify that the participants did not have a particular preference for the DemiSoda Lemon Drink brand, an online pretest survey was conducted to determine the brand awareness of the drink. A total of 15 participants completed the pretest, answering five questions each. These questions were based on the scale of brand awareness developed by Yoo and Donthu (2001). The survey items included "I can recognize DemiSoda Lemon Drink from among other competing brands," "I am aware of DemiSoda Lemon Drink," "A number of characteristics of DemiSoda Lemon Drink rapidly come to mind," "I can rapidly recall the symbol or logo of DemiSoda Lemon Drink," and "I have difficulty imagining DemiSoda Lemon Drink." A 7-point Likert scale was used for measurement. Of the 15 participants who completed the pretest, 3 were male and 12 were female. Additionally, the participants' age ranged between 20 and 27 years. Regarding educational level, 7 participants were undergraduate university students and 8 were graduate students. The results from one samples *t*-test indicated that the participants' responses regarding brand awareness ($M = 2.89$, $SD = .90$) differed significantly from the neutral value of 4, $t(14) = -4.76$, $p < .001$. Thus, the pretest showed that the brand awareness for DemiSoda Lemon Drink was relatively low. Accordingly, brand awareness would not influence the measurement of other variables in the primary experiment.

3.2.2. Independent variables

Product description messages: Product description messages appeared at the top of the television screen, similar to a news ticker, during the product placement. The product message was “This product uses high-quality lemons – the sweet and sour taste and the bubbles provide you with an unbeatably refreshing sensation.

Online reviews: Online reviews appeared at the bottom of the television screen, similar to a news ticker, during the product placement. The content was online reviews of the DemiSoda Lemon Drink. Appropriate reviews were extracted using the IEMSS program. The following six items remained after filtering:

1. Reviewer “Xiaojin”: Cool in the mouth, refreshing for the heart.
2. Reviewer “momo”: Drinking a bottle on a hot summer day is super refreshing!!
3. Reviewer “malle”: Very cooling on a summer day.
4. Reviewer “Lemon lover”: I like this type of DemiSoda drink a lot, although it is a little hard to choose between this and the grape flavor. However, drinking a cup of this lemon drink after exercising is super refreshing; I enjoy the sour and sweet taste a lot.
5. Reviewer “jean”: The best choice for a summer day.
6. Reviewer “cisual”: Thirst-quenching and great-tasting on a summer day.

3.2.3. Dependent Variables

Brand Attitude

We measured brand attitudes based on the extremes of “negative/positive, unfavorable/favorable, and bad/good” (Lee and Aaker, 2004, p215) by using a 7-point Likert scale to calculate the average score for brand attitude (Cronbach’s = .93).

Attitude toward product placement

Attitudes toward product placement was measured by modifying items that were originally developed by Cesario, Grant, and Higgins (2004) for advertising attitudes: persuasive, convincing, effective, and coherent. A 7-point Likert scale was used for measurements. The question scores were then summed and averaged to produce the score for attitudes toward product placement; reliability $\alpha = .84$.

Purchase Intention

We measured the participants' purchase intentions toward a product embedded in a television idol drama using a 7-point Likert scale (where 1 denoted *strongly disagree* and 7 denoted *strongly agree*) and modified questions that were originally developed by Meyers-Levy and Maheswaran (2004). Examples of the questionnaire items include "The brand embedded in this television drama produces a desire to purchase this product," "I will immediately consider purchasing the brand shown in this television idol drama," and "Maybe in the future I will consider purchasing the brand shown in the television idol drama." Scores for all the questions were summed and averaged to produce the score for purchase intentions; reliability $\alpha = .86$.

3.3. Research Results

3.3.1. Manipulation Check

The results of an independent *t*-test indicate that the average score for products with a description and products without a description was 3.81 and 4.65, respectively. Results of the Levene's test of homogeneity showed that variance was not significant ($F = .007, p > .05$), indicating no significant difference in dispersion existed between the two samples. The *t*-value and significance equal to the hypothesis indicated that the experiment results have reached significance ($t_{(95)} = -3.11, p < .01$), indicating that the manipulation of the presence/non-presence of product description messages was successful. The average score for online reviews shown and online reviews not shown was 3.60 and 4.20. Results of the Levene's test of homogeneity showed that variance was not significant ($F = .247, p > .05$), indicating that no significant difference in dispersion existed between the two samples. The *t*-value and significance results for the hypothetically equal variance were significant ($t_{(95)} = -1.99, p < .05$), indicating that the manipulation of the presence/non-presence of online reviews was successful (see Table 2 for further details).

Table 2. Manipulation test for the presence/non-presence of product description messages and presence/non-presence of online reviews

Levene's test of equal variance					
<i>F</i> -test	Significance	<i>t</i>	Degrees	Significance	

				of freedom	(two-tailed)
Product description message	.007	.936	-3.109	95	.002
Online product review	2.474	.119	-1.999	95	.048

3.3.2. Hypothesis Testing

For this study, we employed a 2x2 multivariate analysis of variance (MANOVA). Product messages and product reviews were used as independent variables. The dependent variables were brand attitude, attitudes toward product placement, and purchase intentions. The results for product description messages were Wilks' $\Lambda = 0.92$, $F(3, 92) = 2.73$, $p < .05$, and partial $\eta^2 = 0.08$; and that for online product reviews were Wilks' $\Lambda = 0.88$, $F(3, 92) = 4.31$, $p < .1$, and partial $\eta^2 = 0.12$. Both had a significant and main effect on the dependent variables (see Table 1). For product description messages \times online product reviews, the Wilks' $\Lambda = 0.99$, $F(3, 92) = 0.4$, $p = .75$, and partial $\eta^2 = 0.13$, indicating no significant interaction effects (see Table 3).

Univariate analysis was used to assess the influence that product description messages had on attitudes toward product placement; the results were $F(1, 94) = 4.39$, $p < .05$, and $\eta^2 = 0.05$. For intentions to purchase, the results were $F(1, 94) = 4.48$, $p < .05$, and $\eta^2 = 0.05$. Thus, the influence on both aspects was significant. However, the influence on brand attitude, $F(1, 94) = 1.59$, $p > .05$, and $\eta^2 = 0.17$, was not significant. Further comparison of the results showed that product description messages presented with the product on screen produced more positive attitudes toward product placement than product description messages presented without the actual product, $M: 4.19$ versus 3.69. Messages presented with the product also produced higher intentions to purchase compared to that of messages presented without the product, $M: 3.36$ versus 2.82.

In addition, univariate analysis showed that online product reviews had a significantly positive influence on brand attitude, $F(1, 94) = 7.54$, $p < .01$, and $\eta^2 = 0.07$; attitudes toward product placement, $F(1, 94) = 5.35$, $p < .05$, and $\eta^2 = 0.05$; and purchase intentions, $F(1, 94) = 4.95$, $p < .05$, and $\eta^2 = 0.05$ (see Table 3). Further comparisons also showed that online reviews presented with the product on screen produced more positive brand attitudes ($M = 4.75$ versus 4.08, $t = 2.75$, $p < .01$), attitudes toward product placement ($M = 4.22$

versus 3.66, $t = 2.31$, $p < .05$), and purchase intentions ($M = 3.37$ versus 2.80, $t = 2.22$, $p < .05$) compared to online reviews presented without the product on screen.

Thus, the test results supported H2. However, regarding brand attitude in H1, although product description messages generated higher attitude scores compared to an absence of product description messages, $M: 4.57$ versus 4.27, the difference was not significant; thus, H1 was only partially supported. Interaction effects were not significant; thus, H3 was not supported.

Table 3. The main and interaction effects of MANOVA

Source of variance	<i>df</i>	<i>F</i>	<i>partial η^2</i>	<i>p</i>
Main effect				
Product description message (A)	3	2.73	0.08	0.04
Online product reviews (B)	3	4.31	0.12	0.01
Interaction effect				
A x B	3	0.40	0.13	0.75
Error	92			

Table 3. Main effects of univariate analysis

Source of variance	<i>df</i>	<i>F</i>	Attitudes toward product placement	
			Brand attitudes	Purchase intentions
		<i>F</i>	<i>F</i>	<i>F</i>
Main effect				
Product description message	1	1.59	4.39*	4.48*
Online product reviews	1	7.54**	5.35*	4.95*
Error	94			

* = $p < .05$, ** = $p < .01$, and *** = $p < .001$

4. Discussion and Conclusion

In this research, we introduced IEMSS, and then used this system to implement product placement strategies for idol dramas in interactive television. Empirical research was performed to examine the effectiveness of

this system for actual application. Study 1 proposes an IEMSS which combines the TV apps (e.g., Yahoo TV Widgets or Android apps) and includes TVAU, MRS, and ADS to provide the introduction and comments of merchandise for embedded marketing services. MRS considers TF-IDF and position and combines ANN algorithm to improve the MDS technique. In experiments, this study randomly selects 41 articles which include 138 sentences from forums and uses the k-fold cross-validation method to evaluate the performance of IEMSS. Experiment results show that the accuracy of IEMSS which combines ANN algorithm is 100%. Therefore, IEMSS is enough to help users to understand the merchandise and improve purchase intention.

In the study 2, the results indicated that when product description messages appeared onscreen as the participants were watching the video clip, more positive attitudes toward the product placement and higher purchase intentions were generated compared to when product description messages did not appear. However, no significant influence on brand attitude was observed. A possible reason for this may be that although a product description message appeared on screen, the description was written by the producer. Thus, the audience may have detected the advertising intention, which did not lead to a significantly more positive assessment of the brand. However, when online reviews of the embedded product appeared with the product simultaneously, more positive brand attitudes, attitudes toward product placement, and higher purchase intentions were produced compared to when reviews were not shown. As found by Bickart & Schindler (2001) and Gruen, Osmonbekov, & Czaplewski (2006), electronic word-of-mouth (eWOM) information is considered more trustworthy, relevant, and powerful compared to manufacturer-provided marketing information. Consumer-to-consumer knowledge exchanges can become an additional source of product messages. The participants also have the opportunity to notice product-relevant messages and reliable user reviews that they had not previously noticed. Accordingly, we infer that because eWOM includes anonymous and broad usage content, consistent product messages can obtain consumers' trust, providing an opportunity to increase consumers' preference for the marketed product (Doh & Hwang, 2009).

Furthermore, the results of the study 2 indicate that product-related messages shown on television and online generate stronger advertising effects compared to only showing messages on television. This validates the concept of media

richness theory that holds high-media richness messages are more capable of increasing audience satisfaction compared to low-media richness messages. Therefore, displaying reviews of embedded products obtained from the Internet using IEMSS functionality can provide audiences with the views of others who have used the embedded product while they are watching idol dramas, improving their attitudes toward the brand and product placement, and stimulating their purchase intentions. This approach can be considered an extension of eWOM marketing and an application of media richness theory, which thereby increases the effectiveness of product placement.

Regarding the interaction effects, the interaction between product descriptions and online reviews was not significant because 56% of participants considered it distracting when both appeared on screen, diverting their attention away from the idol drama. When both product descriptions and online reviews appeared simultaneously, that is, if other messages appeared on screen in addition to the online reviews, cognitive overload and distraction resulted, which increase the audiences' irritation of the mechanism. This result echoes the research of Xu, Oh, and Teo (2009), who indicated that MMS is a double-edged sword that can increase the audiences' perceived sense of invasion even if the perceived information and entertainment value is also increased. Another interesting finding was that 68% of the participants believed that if the embedded product and online reviews appeared simultaneously, the online review was relevant to the product. Thus, based on the interference and correlation data, the participants held these two extreme views of the system simultaneously. Therefore, eliminating the interference produced by the system and maintaining the relevance of the system for audiences are subjects worthy of examination by industry.

Another finding worth noting was that of the 73 participants who experienced the three conditions of only product description shown, only online product review shown, and product description and online review shown simultaneously, 22% did not notice the IEMSS function shown on screen. The limited capacity model of attention suggests that when an individual faces two or more stimuli, they divide their attention between a main task and a spare task. The main task requires most of the cognitive space of the individual, with only a small portion of cognitive space allocated to the spare task (Kahneman 1973; Nebenzahl & Secunda, 1993). Participants allocate most of their attention to the main task – program plotlines – when they watch idol dramas.

Only a small portion of attention is allocated to the spare task – the product-relevant description messages or online product reviews shown on screen. Some people may not even notice these messages on screen. Therefore, we suggest that when IEMSS is formally employed for product placement in television programs, the audio and combined audio-visual methods described by Gupta and Lord (1997) are used to design product placement. Characters appearing in the program can verbally mention the brand or integrate explicit placement as defined by d'Astous and Seguin (1999) to clearly reference and discuss the product in the plotline. These approaches would be more effective than merely including the product, brand, or logos in the background. Thus, when the audience sees products integrated into the plotline, they will already have an initial understanding of the product and do not have to allocate excessive cognitive capacity to the spare task. In summary, when implementing IEMSS functionality, industry players should carefully consider their methods of presentation and execution to ensure that audiences feel that product placements are relevant rather than out-of-place, which will more effectively attract their attention.

Regarding the theoretical implications, although a fair number of studies have examined effects of product placement, few studies have examined the persuasive effects of product placement combined with the on-screen presentation of online reviews. Product placement was the core topic of this research. However, increasing media richness using the IEMSS program developed in this study facilitated the discussion of various aspects and a more comprehensive understanding of product placement effects. Regarding practical applications, the experimental results can provide a reference for future uses of IEMSS in product placement strategies for interactive television. Specifically, in an environment of widespread product placement, the results of this research provide industry players with another method of employing product placement.

Regarding the limitations and suggestions for future research, this research emphasized the R&D of IEMSS and the planning of product placement, but we only examined product placement in the context of idol dramas. This approach can be expanded to other applications in the future. For example, television shopping programs that typically feature a host marketing a product often face audience skepticism and criticisms of exaggerated marketing. The IEMSS mechanism could be employed to show online user reviews, producing more

persuasive results. In addition, how to display summaries of online reviews extracted using IEMSS on screen is another important topic. In this research, online reviews were displayed in a news ticker style. Other methods of displaying these messages that do not interfere with the image but provide adequate information to the audience can be considered. Regarding the design of IEMSS, in the future, this system can combine cloud computing techniques to analyze a huge amount of internet information and be applied to different types of merchandises for embedded marketing services. In summary, numerous advertising methods currently exist. Thus, the development of alternative advertising display methods using the advancements in technology to reduce resistance and eliminate the commercialism of advertising is an area worthy of further research.

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Appendix A. Methods of presenting IEMSS in television idol dramas

1. Only product description messages appear



2. Only online product reviews appear



3. Product messages and online product reviews appear simultaneously

