Mining association rules between positive word-of-mouth on social network sites and consumer acceptance: A study for derivative product of animations, comics, and games

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ABSTRACT

In recent years, we can easily observe that animations, comics, and games (ACG) have great output value and market influence on the entertainment and digit media market. The ACG industry is not an industry of a single country or region but a global industry. In addition to its own revenue, the derivative products (or licensed merchandise) of ACG can extend the ACG industry to win more business opportunities. The ACG industry is mainly marketed towards younger people, who are the major users of social network sites. Hence, the electronic word-of-mouth (eWOM) on social network sites often becomes a reference basis of the young people's attitudinal acceptance and purchase intention in purchasing ACG-related derivative product.

In this paper, we analyze the influential factors of positive eWOM's communication motivations that affect consumer acceptance on social network sites, and apply the uncomplicated decision tree data mining algorithm to compute the association rules between these influential factors and consumer acceptance, expecting to understand the relationship between eWOM on social network sites and consumer acceptance. The results of this study can help the business decision-making in CRM and marketing of the industry of ACG-related derivative product. This study found that the degree of perception of ACG product and the degree of taking pleasure in sharing ACG-related information with others have a significant correlation with consumer acceptance.

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1. Introduction

The entertainment industry captures a wide variety of media to provide diversions or to amuse consumers, and it has become one of promising markets in the era of thriving development of digital convergence. PricewaterhouseCoopers's annual research on the global entertainment and media market pointed out that the global entertainment and media market would be worth approximately 1.77 trillion USD in 2013 and 2.21 trillion USD in 2017 (PWC, 2013). In recent years, we can easily observe that animations, comics, and games have great output value and market influence on the entertainment and digit media market. Take Hollywood for instance, a lot of blockbuster movies (for example, "Iron Man", "X-Men", "The Avengers", and so on) were adapted from the famous DC or Marvel comics over the past few years. Moreover, most of the yearly top 10 worldwide box office grosses were made by the movies related to animations or comics. For example, more

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than half of top 10 highest-grossing movies of 2013 accounted by Box Office Mojo were animations or adapted from comics: "Frozen", "Iron Man 3", "Despicable Me 2", "Monster University", "Man of Steel", and"Thor: The Dark World", which amounted to more than 5.5 billion USD (Box Office Mojo, 2013).

The animations, comics, games industry is not an industry of a single country or region but a global industry. Animations, comics, and games often have strong correlation with each other. For example, if a comic product is popular on the market, relevant animations and games will be introduced to the market soon, or it will even be adapted into a movie or TV show. Most games on video game consoles (for example, Wii, PlayStation 4, Xbox, and so on) are related to the popular animations. Such correlation makes it hard to separate them in consideration. Instead, animations, comics, games should be regarded as an industry of strong internal cohesiveness. Therefore, the term "ACG" is usually used to represent the industry of animations, comics, and games (Sheu et al., 2016). With digital presentation, the cultural and creative contents of ACG can realize convenient and more diversified dissemination.

The industry of ACG is not a regional industry but a worldwide industry. For example, the currently popular AR (Augmented Reality) mobile game "Pokémon GO", which was released in July 2016, has been creating an enormous success world widely. According to an official announcement by Niantic, Inc. on September 7, 2016, Pokémon GO surprisingly surpassed 500 million downloads around the world during the first eight weeks (http://pokemongolive.com/en/post/headsup/). However, this AR mobile game Pokémon GO was derived from the old game "Pokémon Red and Blue" of handheld game console "Game Boy" of Japan in 1996. Moreover, a series of "Pokémon" animations had created in Japan since 1997, which were extremely popular in North America, Europe, and Asia.

In addition to its own revenue, the derivative products (or licensed merchandise) of ACG can extend the ACG industry to win more business opportunities. For example, the worldwide box office income of Pixar animation movie "Cars" was about $462 million (Box Office Mojo, 2006). However, the licensed merchandise revenue of "Cars" amounted to more than $5 billion, which was ten times box office income. The Disney animation movie "Frozen" (shown in November 2013) made a worldwide box-office record of 1.2765 billion USD, which was the top-grossing movie in 2013. Moreover, "Frozen" also became the highest grossing movie in history of Disney. The author of "The Hollywood Economist: The Hidden Financial Reality Behind the Movies", Edward Jay Epstein, pointed out that derivative products' revenues of the Disney animation movie "Frozen" far exceeded its own box office income. For example, Wal-Mart and Toys "R" Us had 700 and 300 kinds of "Frozen" toys, respectively. More than three million clothes of "Frozen" had been sold out in North America. The hot sale of various licensed products of "Frozen" (such as toys, foods, stationery, dolls, clothes, books, consumer electronics, and so on) brought tremendous commercial value, which caused Disney's share price to rise by 3.5% and market capitalization to exceed 150 billion USD (China Business Network, 2015).

Word-of-mouth provides potential customers with a reference source of experience in use to reduce risk and uncertainty. Hence, the word-of-mouth has become an important source of reference information to consumers (Tanimoto and Fujii, 2003). Therefore, there are two ways of communication in the marketing field that can dominate the purchase intention, namely, advertising and word-of-mouth (WOM) (Money, 2004).

Compared with other forms of mass media, WOM is an important, alternative source of information (Swan and Oliver, 1989). In today's society, life is filled with various types of advertising information. However, interpersonal WOM communication is a source of information of considerable concern and attention. According to the SIMM VII released by BIGresearch in 2005 (BIGresearch, 2005), WOM has the greatest influence among the product-related information collected by the consumer prior to purchase followed by TV advertising.

The ACG industry is mainly marketed towards younger people, who are the major users of social network sites. The continuous development and innovation of Internet technology have significantly accelerated the passing of message among people, expanded social networks between consumers, and provided a new platform for the collection of consumer information. When WOM is disseminated through electronic media, the resulting "electronic WOM" (eWOM) refers to any information consumers share via these media. By the eWOM communication and experience sharing among people on the social network sites, it is more acceptable to the young people as compared with general advertising information, and often becomes a reference basis of the young people's attitudinal acceptance and purchase intention in purchasing ACG-related derivative product. The eWOM can be further divided into two categories (Henning-Thurau et al., 2004): (1) The positive eWOM: this category puts greater emphasis on positive motivation. (2) The negative eWOM: the main emphasis of this category is negative motivation. Considering the enthusiastic and active behavior characteristics of the ACG hobbyists, this study will focus on influence of positive eWOM on the purchasing behavior of ACG-related product consumers.

This research aims to analyze the associate impact of positive eWOM on buying behavior of consumers of ACG-related derivative product. We analyze the influential factors of eWOM's communication motivations that affect consumer acceptance on social network sites, and apply the uncomplicated decision tree data mining algorithm to compute the association rules between these influential factors and consumer acceptance, expecting to understand the relationship between eWOM on social network sites and consumer acceptance, in order to help the business decision-making in CRM and marketing of the industry of ACG-related derivative product. We summarize the major contribution of this research as follows:

(1) We study behavior of consumers of ACG-related derivative product to analyze the attributes in purchasing. Then, we locate and modify the critical attributes of eWOM's communication motivations which can affect consumers' attitudinal acceptance and purchase intention on social network sites. Moreover, we study consumer acceptance for the purchaser of ACG-related derivative product, and develop its influential factors.

(2) The market of ACG-related industry is highly profit-making and promising; however, the related research is somehow insufficient to understand this industry more deeply. The results of this paper could be used as a reference for enterprises in the industry of ACG-related derivative product to help the enterprises to improve consumer acceptance and thus increase total profits.

(3) The general statistical methods usually calculate only the distribution of the surface of data whereas the decision tree data mining methods can analyze the potential association rules between the attributes from the data. Moreover, by testing the related attributes' values according to those association rules, the class prediction of the unknown data samples could be further acquired. In this paper, the decision tree data mining method is applied to analyze the questionnaire data collected in Taiwan (one of the highly profitable ACG markets in Asia). We perform ID3 decision data mining algorithm to compute the hidden association rules between the critical attributes of eWOM on social network sites and the consumer acceptance for the purchaser of ACG derivative product. The resulted association rules could be used to predict the behavior of similar consumers in purchasing ACG product.

The remainder of this paper is organized as follow: Section 2 introduces the decision tree data mining method; Section 3 discusses the influential factors of eWOM and consumer acceptance of the customers of ACG derivative product; Section 4 describes the research framework of this paper; Section 5 discusses the results of data mining; Section 6 gives the conclusions and suggestions.

2. The decision tree data mining algorithm

In the related techniques of data mining, decision tree methods are the uncomplicated and visible ones upon the tree data structure. This study aims to analyze the effects of positive eWOM on consumer acceptance of ACG-related product by applying the uncomplicated decision tree data mining method. Among various decision tree algorithms, the Iterative Dichotmiser 3 (called ID3 for short) proposed by Quinlan is the most effective and well-known one (Quinlan, 1986, 2014). As compared with ID3's improved methods (for example, C4.5), Ohmann et al. indicated that the number of rules worked out by ID3 was not as numerous as that of C4.5 (Ohmann et al., 1996). Moreover, Stärk and Pfeiffer studied the performance of ID3 and pointed out that ID3 was better than other decision tree methods, such as C4.5, CHAID, and CART (Stärk and Pfeiffer, 1999). Hence, we choose ID3 algorithm as the major data mining method in this paper.

Let the concerned objective of our study (for example, "purchase intention") be the "Target Attribute". And let the other important attributes of ACG consumer's behavior be "Critical Attributes". The ID3 algorithm will compute the association rules between Critical Attributes and Target Attribute by analyzing data instances. Initially, all data instances are contained in the "root node". The construction process of decision tree will start from the root node, and ID3 algorithm will select an unselected Critical Attribute with the maximum "Information Gain". Then, all data instances will be divided into children nodes of root node according to their values of the selected Critical Attribute. Subsequently, the same process will be repeated respectively on each children node for its own data instances. Note that there are two stop conditions to end the construction process of each children node: (1) all Critical Attributes have been selected; (2) Target Attribute's values of all data instances in this children node are exactly the same. If any stop condition is satisfied, the current node will be signified as a "leaf node" and the construction process will be stopped. Note that each leaf node, say C, will be labeled by the value of Target Attribute possessed by the majority of data instances in C. Assume that the node C is labeled as $Label(C)$. Let $|Label(C)|$ denote the number of data instances whose Target Attribute's value is the same as $Label(C)$ in C. Then, we will compute C's degree of purity (denoted as $Purity(C)$) and degree of support (denoted as $Support(C)$) by the following formulas:

$$Support(C) = (|C|/N) * 100\%$$

$$Purity(C) = (|Label(C)|/|C|) * 100\%$$

where N is the number of total data instances of root node and $|C|$ is the number of data instances of C.

The detailed process of ID3 algorithm is summarized as follows (Quinlan, 1986, 2014). We have modified step 4 of ID3 algorithm by adding a stop condition to avoid the inordinate branching.

Step 0. Let node C be the root node, which contains all data instances;
Step 1. If the Target Attribute's values of all data instances of node C are the same, then set C as a leaf node, calculate $Purity(C)$ and $Support(C)$, and stop;
Step 2. If all Critical Attributes have been selected, then C will be signified as a leaf node, denote $Label(C)$ as the value of Target Attribute possessed by the majority of data instances in C, calculate $Purity(C)$ and $Support(C)$, and stop;
Step 3. For each unselected Critical Attribute A, compute the Information Gain $G(A)$ and select the one with maximum Information Gain. Then, divide all data instances in C into disjoint children nodes according their values of the selected Critical Attribute;
Step 4. Treat each children node branched in Step 3 as node C respectively. If $20\% > Purity(C)$ or $Purity(C) > 90\%$ or $Support(C) < 2.5\%$, then stop; else, recursively repeat the algorithm from step 1.

Now we introduce the computation of Information Gain. Given a Critical Attribute A and a node (or data set) C, the computation of $G(A)$ will be related to the "Entropy" of C, which is denoted as $E(C)$ with the following formula:

$$E(C) = -\sum_{i=1}^{t} \frac{p_i}{n} \times \log_2 \frac{p_i}{n}$$

where t is the number of Target Attribute's values, p_i is the number of data instances corresponding to the ith value of the Target Attribute in C, and n is the number of data instances in C. Then $G(A)$ will be computed by the following formulas:

$$G(A) = E(C) - E^+(A)$$

$$E^+(A) = \sum_{j=1}^{k} (n_j/n) \times E(C_j)$$

where k is the number of values of Critical Attribute A, C_j with $1 \leqslant j \leqslant k$ is a subset of C including the data instances corresponding to the jth value of Critical Attribute A, and n_j is the total number of data instances contained in C_j.

In the resulted decision tree, each leaf node will be labeled by a value of the Target Attribute (i.e., $Label(C)$). Each path from root node to the leaf node in this decision tree will form an association rule. More precisely, all internal nodes on the path form a row of "if" judgment of associated Critical Attributes. With the "then" result presented by the labeled value of the leaf node, we will obtain the association rules of "if-then" pattern between Critical Attribute and the Target Attribute.

3. The influential factors of positive eWOM and consumer acceptance of ACG customers

3.1. Various communication types of the positive eWOM

Early studies have divided communication types of the positive WOM into four categories (Dichter, 1966): (1) Product involvement: after using the product or service, the user will have a sense of anxiety and has to regain psychological balance by talking with others or recommending the product; it mainly occurs in case of products of high involvement; (2) Self-involvement: also known as self-enhancement, meaning that the main purpose of WOM is the recognition of self-image or win the recognition of others to improve the status in the hearts of others; (3) Other involvement or altruistic behavior: the communicator wants to share the joy with others on the basis of care for others, and thus, carries out several kinds of WOM recommending behavior including helping the WOM receiver or enterprise; when the consumer is satisfied with the product or service, he expects friends and family can share the benefits and thus wants to help other making the best decision by communication of WOM; (4) Message involvement: the WOM behavior is originated from media advertising or public discussion while the communicator has no experience of using the product.

Moreover, some studies have proposed different categories of WOM communications. Engel et al. proposed the following motivations (Engel et al., 1993): (1) Involvement: when the product is of high involvement (e.g., car), the communication of the message to others can bring joy and sense of happiness to the user; (2) Self-enhancement: The purpose is to improve the status in the hearts of others. And the communication behavior can win public attention, establish an image of having internal information, status as well as the sense of excellence; (3) Care for others: similar to altruism, when the consumer is satisfied with the product or service, he expects to win the benefits and help others in making the best decisions by the WOM communication; (4) Fun in message: when the consumer feels the event as funny or curious, the event is likely to become a topic to share and discuss with others by the WOM communicating behavior; (5) Reduce imbalance: the unsatisfied consumer will let off dissatisfaction by derogating the product or brand; the negative information has a decisive impact on the attitudinal acceptance and purchase intention of potential buyers.

With the daily advancement of technology, Internet, computer, and smart handheld devices have become an inalienable part of modern life. Moreover, social network sites enable users to create relationships and flows with other users or groups within that websites. Therefore, the mode of WOM communication is different from the previous ways and CMC (Computer-mediated Communication) has become one of the popular ways of communications at present (Romiszowski and Mason, 1996). CMC refers to the interpersonal message transmission from one computer terminal to another via Internet without face-to-face communication to exchange information through the computer mediation. Hence, the electronic WOM (eWOM) in social networking sites is a type of CMC.

The eWOM can be further divided into positive and negative motivations as follows. Regarding the positive WOM, Henning-Thurau et al. divided the motivations into: (1) Altruistic behaviors: the consumer shares with other the experience without asking for returns; (2) Product involvement: the consumer sends out positive evaluation of the commodity based on experience; (3) Self-strengthening: the consumer wants to win the respect and attention of others by telling them the product information and purchase behavior; (4) Help to the enterprise: purely helping the enterprise to improve its image rather than helping other consumers (Henning-Thurau et al., 2004). Sundaram et al. pointed out four motivations of the positive eWOM: (1) Altruism: do things for others without asking for returns. (2) Product involvement: interested in product and is excited with having or using the product. (3) Self-enhancement: become smart consumer to enhance the imagination of others. (4) Help the enterprise: willing to help the enterprise (Sundaram et al., 1998).

Regarding the negative eWOM, Henning-Thurau et al. divided the motivations into: (1) Altruistic behaviors: help and tell other consumers to prevent them from being harmed; (2) Lower anxiety: to let off the dissatisfaction, frustration and anxiety caused by purchasing the product or service; (3) Retaliation: the retaliation against the enterprise based on the dissatisfaction of consumption experience; (4) Asking for opinions: by negative eWOM, ask other consumers for help (Henning-Thurau et al., 2004). Sundaram et al. proposed the following motivations: (1) Altruism: prevent others from negative experience. (2) Alleviate depression: alleviate anger, depression and frustration. (3) Retaliation: retaliation against the enterprise having negative consumption experience. (4) Ask for suggestions: how to obtain suggestions to solve the problem. (Sundaram et al., 1998).

Since the major behavior characteristics of ACG consumers are enthusiastic, optimistic, and active, this study will focus on influence of positive eWOM on the purchasing behavior of consumers of ACG-related product. Based on the above factors influencing word-of-mouth communication, we propose four influential factors of positive eWOM to illustrate the potential communication motivations of ACG consumers on social network sites. These four influential factors are elaborated as follows:

1. *Involvement of ACG derivative product:* it refers to the recognition and perception of the certain ACG related product or the real experience, evaluation, and feelings about purchasing the ACG derivative product. Consumers would send out positive evaluation of the ACG derivative product based on their satisfactory experience and perception.
2. *Self-enhancement:* the communication motivation of this influential factor is to win the recognition, respect, and attention of other consumers of ACG derivative product. Therefore, the ACG derivative product is a tool to attract the attention of other consumers by using eWOM communication on social network sites to improve the status in the minds of others, shaping the image of excellence in the field of ACG.
3. *Care for other consumers:* the communication motivation of this influential factor is to care for other consumers simply. The communicator sincerely shares with others the joy and satisfaction of using the ACG product for the reference of other consumers in purchasing ACG derivative product, and provides opinions to help other in making better decisions.
4. *Take pleasure in communication:* the communication motivation of this influential factor is to find pleasure by sharing ACG-related information with others on social network sites. For example, the communicator might enjoy discussing attractive commercial program or specific advertising information about ACG product with others on social network sites. Such enthusiastic discussions might trigger curiosity of other consumers and affect their purchase behavior. Therefore, the communicator will afford pleasure.

3.2. Consumer acceptance of ACG-related industry

Acceptance refers to changes in mood and attitude of a person indicating recognition and identification. Scholars regarded consumer acceptance as the strength of relationship between personal attitude and repurchase behavior (Dick and Basu, 1994). Similarly, some studies further pointed out that the repurchase intention of a specific product or service of the customer is the consumer acceptance (Jones and Sasser Jr., 1995). Although the customer is subject to the influence of external environment and marketing method to trigger the potential conversion behavior, the repurchase intention of the preferred product or service of the customer remains unchanged (Oliver, 1997). Some studies defined consumer acceptance as the customer being satisfied with the product or service of the company, resulting in unconditional willingness to carry out positive publicity of the company (Bhote, 1996).

Many studies used repurchase intention, price tolerance as the measurement dimensions of consumer acceptance (Dick and Basu, 1994). The measurement dimensions were classified into three categories: (1) repurchase intention; (2) basic behavior, including the latest purchase time, purchase times and purchase quantity; (3) derivative behavior including open word-of-mouth recommendation (Jones and Sasser, 1995). Other studies suggested that consumer acceptance can be measured by measuring indicators, including repeat purchase, purchase of other products of the company, and behavior of recommending the product to others (Prus and Brandt, 1995).

Based on the above acceptance measurement dimensions, this study has summarized the following three major indicators to evaluate the consumer acceptance for the customers of ACG-related product.

1. *Purchase intention:* when the consumer learns about the word-of-mouth information about the ACG derivative product on the social network sites, and thus becomes interested and is willing to purchase.
2. *Public praise and recommendation intention:* also known as the willing of word-of-mouth and recommending to others. After using the ACG derivative product, the consumer is satisfied and is willing to recommend this product to his friends and family for positive publicity in any forms.
3. *Cross purchase intention:* after the use of the ACG derivative product, the consumer is satisfied and has the purchase intention of peripheral commodities relating to this product or other merchandise of the same manufacturer.

4. The research architecture

The research subjects of this study are the customer's behavior of the industry of ACG-related derivative commodities. By applying the decision tree data mining algorithm, we aim to analyze the effects of various communication motivations of positive eWOM on the consumer's acceptance of ACG-related product.

4.1. The analysis method

In this paper, we evaluate the positive eWOM through four influential factors, which illustrate the communication motivations of ACG consumers on social network sites. Moreover, we evaluate the consumer acceptance through three major indicators of ACG customer's behavior. In this study, online questionnaires are used to collect the data from ACG consumers in Taiwan (one of the highly profitable ACG markets in Asia).

The framework of the proposed analysis method is described in Fig. 1. The Critical Attributes include the four influential factors of the positive eWOM (i.e., "Involvement of ACG derivative product", "Self-enhancement", "Care for other consumers", and "Take pleasure in communication") and basic demographic variables of ACG consumers (gender, age, education level, occupation, monthly income, and average amount of money spent on ACG derivative product per month), while the Target Attributes are the three major indicators of ACG consumers' acceptance (i.e., "Purchase intention", "Public praise and recommendation intention", and "Cross purchase intention"). The decision tree data mining algorithm, ID3, is employed for analysis to compute the association rules of "if-then" pattern between the Critical Attributes and the Target Attribute, which will identify the impact of the key influencing factors of positive eWOM on the consumer acceptance as well as the hidden co-relational rules.

4.2. The design of influential factors for positive eWOM and consumer acceptance of ACG consumers

According to the behavior characteristics of consumers of ACG derivative product, we located and modified the important influential factors for positive eWOM and consumer acceptance respectively as follows.

4.2.1. The influential factors of positive eWOM

This research evaluates the positive eWOM through the four influential factors: (1) Involvement of ACG derivative product; (2) Self-enhancement; (3) Care for other consumers; (4) Take pleasure in communication. As mentioned earlier, these influential factors illustrate the potential communication motivations of ACG consumers on social network sites. Based on these communication motivations of consumers of ACG derivative product, we design some criteria, described as follows, to evaluate the intensity for these four influential factors of positive eWOM. Each of the following criteria would be taken as a question of the online questionnaire in this study.

(1) Involvement of ACG derivative product: the intensity of this influential factor is evaluated through the following three criteria.
    (A) If I am familiar with a certain ACG product and possessed of enough recognition and perception, I would like to share with others.
    (B) On social network sites, I am willing to believe the credibility of information posted up by experienced consumers of ACG derivative product.
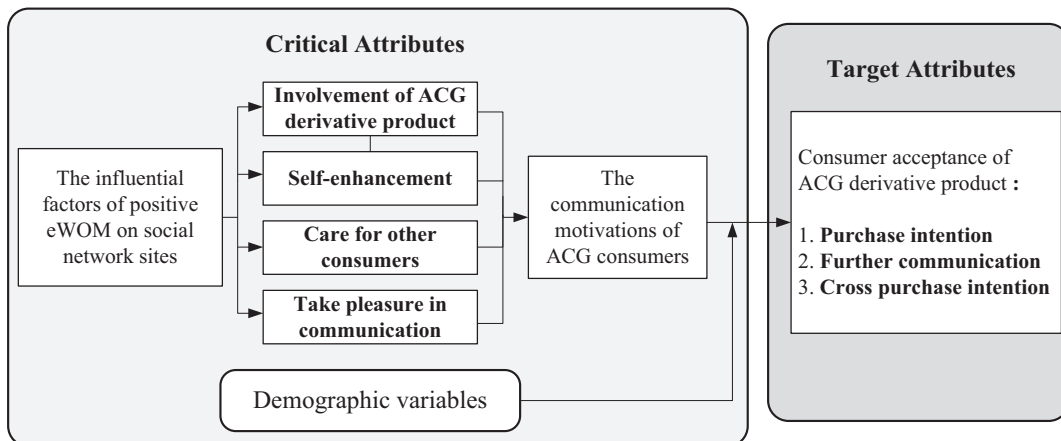

Fig. 1. The concept of research architecture.

    (C) I will be willing to post up related information on social network sites when I have purchased a satisfactory ACG derivative product.
  (2) Self-enhancement: the intensity of this influential factor is evaluated through the three criteria as follows.
    (A) I would like to post up information about ACG derivative product on social network sites in order to attract the attention of other consumers.
    (B) On social network sites, I praise highly the insightful comments on ACG product that would earn the recognition, respect, and attention from other consumers.
    (C) I would like to pay close attention to the currently popular ACG product in order to participate in the discussion with other consumers on related topics of ACG derivative product.
  (3) Care for other consumers: the following three criteria are used to evaluate the intensity of this influential factor.
    (A) In order to help other consumers to make decision in purchasing ACG derivative product, I am willing to collect and share others the reliable related messages on social network sites instead of the exaggerated and misleading ones.
    (B) On social network sites, I appreciate the messages about ACG product without deceiving and damaging other consumers. Such messages will be contributive to purchase intention of other consumers
    (C) I am willing to post up warning information on social network sites to remind other consumers when I purchase an unsatisfactory ACG derivative product.
  (4) Take pleasure in communication: the intensity of this influential factor is evaluated by the following three criteria.
    (A) I enjoy discussing attractive commercial program or specific advertising information about ACG derivative product with others on social network sites.
    (B) I usually take pleasure in sharing related information about ACG derivative product with other consumers on social network sites.
    (C) I will find pleasure in bringing about an enthusiastic discussion about ACG-related product to trigger curiosity of other consumers and affect their buying decisions.

4.2.2. The influential factors of consumer acceptance

As mentioned earlier, this study concentrates on the behavioral aspect of consumer acceptance and evaluates the consumer acceptance through the following three influential factors: (1) Purchase intention; (2) Public praise and recommendation intention; (3) Cross purchase intention. Summarizing behavioral characteristics of consumers of ACG derivative product, we have designed the following criteria to evaluate the intensity of three influential factors of consumer acceptance. Note that each of the following criteria would be taken as a question of the online questionnaire in this study.

  (1) Purchase intention: the following two criteria are used to evaluate the intensity of this influential factor.
    (A) When I learn about the positive evaluation of an ACG derivative product on the social network sites, I would become interested and be willing to purchase it.
    (B) If comments about an ACG derivative product are all positive, I would like to purchase it preferentially.
  (2) Public praise and recommendation intention: the intensity of this influential factor is evaluated by the following two criteria.
    (A) When I am satisfied with an ACG derivative product, I am willing to post up favorable comments on social network to recommend this product to my familiar friends.
    (B) I would like to recommend the most popular ACG product praised and appreciated by the consuming public when someone asked on social network.
  (3) Cross purchase intention: the intensity of this influential factor is evaluated through the following two criteria.
    (A) After using a satisfactory ACG product, I am willing to purchase its related extended products on the market.
    (B) After using a satisfactory ACG product, I would like to use or purchase any other extended products created by the same manufacturer.

5. Analysis of data mining

5.1. Data collection and distribution

According to the concept of research design and the evaluation criteria of influential factors controlling consumer acceptance and positive eWOM of ACG consumers (as mentioned above), this study designed and conducted an online questionnaire. We distributed the questionnaires on the ACG related social network websites in Taiwan through Internet. A total of 356 copies of questionnaires were collected, and 319 of them were valid, with a valid return rate of 89.6%. In the questionnaires, we applied the Likert five-point scale to examine the degree of ACG consumer's assent to each question of our questionnaire.

In this study, we adopted the most commonly used Cronbach's α reliability coefficient to measure the reliability of questionnaires. Generally speaking, a reliability coefficient of 0.70 or higher is considered acceptable in most researches (DeVellis, 2012; Nunnally, 1978). Table 1 shows that the Cronbach's α value of each influential factor is greater than 0.70. Thus, the questions designed in this study have good internal consistency. Moreover, the questionnaire used in this study is reliable.

Table 1
Reliability of influential factors.

Attributes	Influential factors	Reliability
Consumer acceptance	Purchase intention	0.78
	Public praise and recommendation intention	0.72
	Cross purchase intention	0.76
Positive eWOM	Involvement of ACG derivative product	0.74
	Self-enhancement	0.73
	Care for other consumers	0.74
	Take pleasure in communication	0.82

Here we compiled the demographic variables from the valid questionnaires and analyzed the data distribution to understand the data distribution of the effective samples:

(1) Gender: 51.5% of the effective samples were male, 48.5% were female, an approximate ratio of 1:1.
(2) Age: Younger people were the main targeted group of ACG derivative product in this study, with 32.5% under the age of 20, 57.4% between the ages of 21 and 30, and the remaining 10.1% were over the age of 31.
(3) Education level: 11.4% of effective samples completed graduate school, 82.1% completed (or were currently studying) college degree, 5.1% completed high school, and 1.4% completed middle school or lower.
(4) Occupation: In this survey, the majority (76.1%) of effective samples were students; the remaining 23.9% included teachers, civil servants, members of the military, farmers, businessmen, freelancers, and the unemployed (including retired workers).
(5) Monthly income: Since the main target group of this questionnaire was students and young people, monthly income of 87.4% of effective samples in this study was under US$8000.
(6) Average amount of money spent on ACG derivative product per month: As the main targets in this study were students with lower income, 70.6% of effective samples spent less than US$30 per month on ACG derivative product, 18.3% spent between US$30 and US$100 per month, and 11.1% spent more than US$100 per month.
(7) Major source of information about the ACG derivative product: 76.6% of effective samples obtained related information of ACG product from the Internet, 16.5% from friends, 4.1% from television advertisements, and 2.8% from newspapers, journals, or magazines.

5.2. Decision tree analysis

Since different attributes usually have different measure scales, we should normalize the original data collected from questionnaires (such as transforming the patterns of original data and properly quantifying it) in order to carry out decision tree data mining analysis successfully.

Based on the Likert five-point scale, the score of each non-numerical attribute was computed by averaging the scores of related questions. Then, we would normalized the scores as three kinds of values: "low", "middle", and "high", with "low" denoting "not important" and "high" denoting "very important". Moreover, the values of numerical attributes should be classified into proper number of clusters according to the distribution of values.

Then, the influential factors of the positive eWOM and some basic demographic variables were taken simultaneously as the Critical Attributes. Moreover, the three influential factors of consumer acceptance ("Purchase intention", "Public praise and recommendation intention", and "Cross purchase intention") were set as the Target Attributes, which would be used to construct three decision trees. Eventually, we executed ID3 data mining algorithm to analyze the association rules between the Critical Attributes and each of the three Target Attributes respectively. Thus, three decision trees would be constructed, and the association rules should be schematically illustrated in the resulted decision trees. A path from the root node to a leaf node in each decision tree formed an association rule of "if-then" between all internal nodes (chosen Critical Attributes) and the leaf node (a Target Attribute).

In the rest of this section, the three decision trees of taking "Purchase intention", "Public praise and recommendation intention", and "Cross purchase intention" as the Target Attributes would be discussed respectively as follows. Note that we retain only the rules with degree of purity more than 70%.

(1) The decision tree of taking "Purchase intention" as the Target Attribute:

The decision tree resulted from taking "Purchase intention" as the Target Attribute is shown in Fig. 2, wherein there are four paths (association rules) from the root node to leaf nodes. The four association rules are detailed as follows.
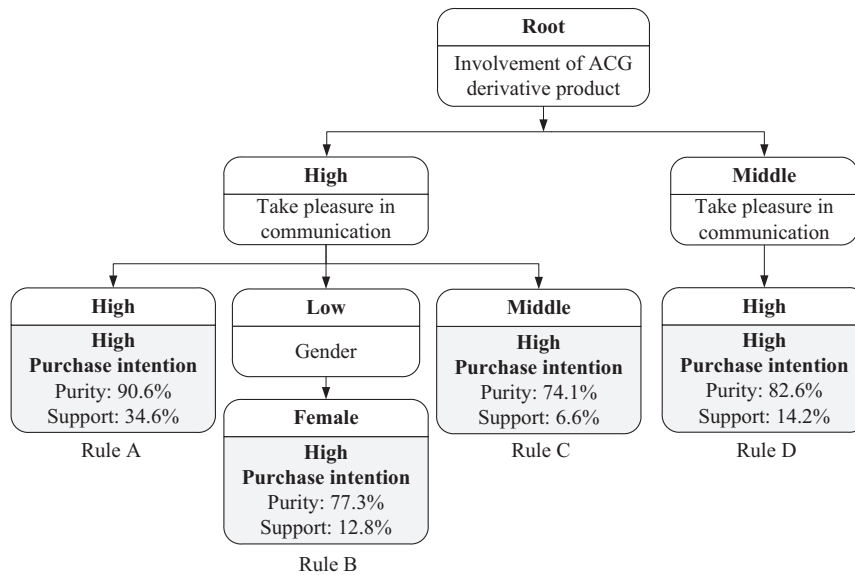
Fig. 2. Decision tree of purchase intention.

(A) **If** "Involvement of ACG derivative product" is **High and** "Take pleasure in communication" is **High**, **then** the "Purchase intention" is **High**:
    If ACG consumers possess high level of ACG product involvement and high level of taking pleasure in communication with others, their purchase intention will be higher. The Purity of this rule is 90.6%, and the Support is 34.6%. That is, 90.6% of samples associated with this leaf node match this rule, accounting for 90.6% * 34.6% = 31.35% of total samples.
(B) **If** "Involvement of ACG derivative product" is **High and** "Take pleasure in communication" is **Low and** "Gender" is **Female, then** the "Purchase intention" is **High**:
    If a female ACG consumer possesses high level of ACG product involvement and takes low level of pleasure in communication with others, her purchase intention will be high. The Purity of this rule is 77.3%, and the Support is 12.8%.
(C) **If** "Involvement of ACG derivative product" is **High and** "Take pleasure in communication" is **Middle**, **then** the "Purchase intention" is **High**:
    If ACG consumers possess high level of ACG product involvement and middle level of taking pleasure in communication with others, their purchase intention will be high. The Purity of this rule is 74.1%, and the Support is 6.6%.
(D) **If** "Involvement of ACG derivative product" is **Middle and** "Take pleasure in communication" is **High**, **then** the "Purchase intention" is **High**:
    If ACG consumers possess middle level of ACG product involvement and high level of taking pleasure in communication with others, their purchase intention will be high. The Purity of this rule is 82.6%, and the Support is 14.2%.
(2) The decision tree of taking "Public praise and recommendation intention" as the Target Attribute:

The decision tree of taking "Public praise and recommendation intention" as the Target Attribute is shown in Fig. 3, wherein there exist two paths from the root node to leaf nodes. The two association rules found in this decision tree are detailed below.

(A) **If** "Involvement of ACG derivative product" is **Low**, **then** the "Public praise and recommendation intention" is **Low**:
    If ACG consumers possess low level of ACG product involvement, their willingness of public praise and recommendation will be low. The Purity of this rule is 81.3%, and the Support is 9.9%. That is, 81.3% of samples associated with this leaf node match this rule, accounting for 81.3% * 9.9% = 8.05% of total samples.
(B) **If** "Involvement of ACG derivative product" is **High and** "Self-enhancement" is **High**, **then** the "Public praise and recommendation intention" is **High**:
    If ACG consumers possess high level of ACG product involvement and high level of self-enhancement, their willingness of public praise and recommendation will be high. The Purity of this rule is 86.3%, and the Support is 21.8%. That is, 86.3% of samples associated with this leaf node match this rule, accounting for 86.3% * 21.8% = 18.81% of total samples.
(3) The decision tree of taking "Cross purchase intention" as the Target Attribute:

The decision tree resulted from taking "Cross purchase intention" as the Target Attribute is shown in Fig. 4, wherein there are three paths from the root node to leaf nodes. The three association rules are detailed below.
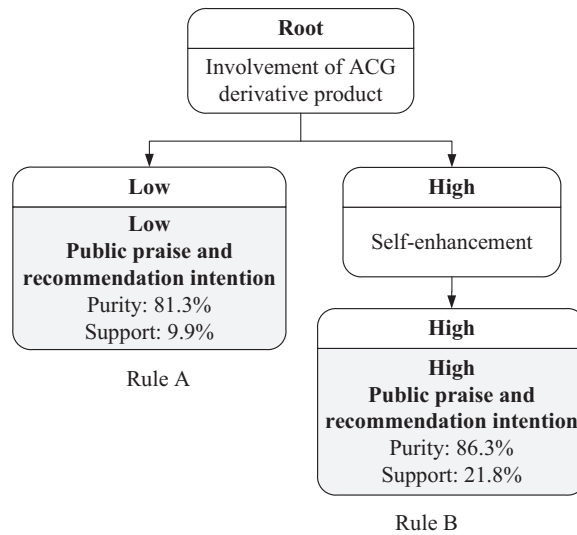
Fig. 3. Decision tree of public praise and recommendation intention.

(A) **If** "Take pleasure in communication" is **High and** "Self-enhancement" is **High**, **then** the "Cross purchase intention" is **High**:

If ACG consumers possess high level of taking pleasure in communication with others and high level of self-enhancement, their willingness to cross purchase will be higher. The Purity of this rule is 85.2%, and the Support is 19.8%. That is, 85.2% of samples associated with this leaf node match this rule, accounting for 85.2% * 19.8% = 16.87% of total samples.

(B) **If** "Take pleasure in communication" is **High and** "Self-enhancement" is **Middle and** "Gender" is **Male**, **then** the "Cross purchase intention" is **High**:

If an ACG consumer is male, takes high level of pleasure in communication with others, and possesses middle level of self-enhancement, his willingness to cross purchase will be high. The Purity of this rule is 73.3%, and the Support is 7.2%.
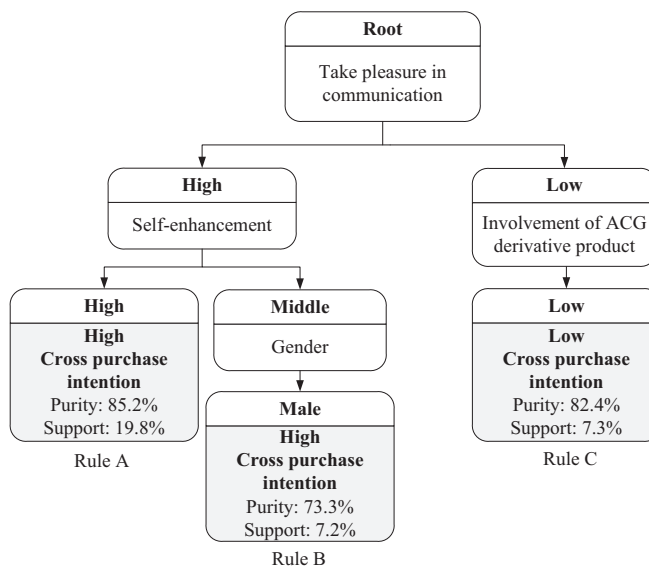

Fig. 4. Decision tree of cross purchase intention.

(C) **If** "Take pleasure in communication" is **Low and** "Involvement of ACG derivative product" is **Low**, **then** the "Cross purchase intention" is **Low**:

If ACG consumers possess low level of taking pleasure in communication with others and low level of ACG product involvement, their willingness to cross purchase will be low. The Purity of this rule is 82.4%, and the Support is 7.3%.

6. Conclusion and suggestion

As mentioned above, this research took simultaneously the influential factors of the positive eWOM and some basic demographic variables as the Critical Attributes, and used each of the three influential factors of consumer acceptance as Target Attributes to construct decision tree individually. The association rules resulted from the three decision trees were detailed in the previous section.

By performing the analysis of decision tree data mining to examine all influential factors of the positive eWOM, this study found that "Involvement of ACG derivative product" (the degree of perception of the ACG product or the real purchasing experience) and "Take pleasure in communication" (the degree of taking pleasure in sharing ACG-related information with others) have a significant correlation with consumer acceptance. On the other hand, it can be observed that only "gender" has a significant influence upon consumer acceptance among the basic demographic variables. In other words, most of the basic demographic variables (age, education level, occupation, monthly income, and average amount of money spent on ACG derivative product per month) would not possess conspicuous influence upon ACG consumer's acceptance.

According to the analysis results of this study, the critical factors which impact the three indices of consumer acceptance are respectively listed below along with suggestions.

(1) The Critical factors influencing consumers' purchase intention:

The questionnaire survey found that consumers' willingness of purchase intention would be mainly dominated by the degree of involvement of ACG derivative product and taking pleasure in communication. When involvement of ACG derivative product is high and the level of taking pleasure in communication is not low, the consumers will possess higher purchase intention. Even though some female consumers do not enjoy taking pleasure in communication with others, the high degree of ACG product involvement will cause them to possess high level of purchase intention. That is, compared with pleasure in communication, involvement of ACG would have more impact on purchase intention for female consumers. Moreover, we can observed that the consumers with high level of taking pleasure in communication will have high purchase intention, even though the degree of ACG product involvement is only middle.

Therefore, if manufacturers of ACG derivative product wish to improve consumers' willingness to purchase, this study suggests improving consumers' recognition and perception about certain products or real purchasing experience to raise their involvement of ACG, and encouraging the consumers to share joyfully the positive messages with others on social network sites. This can be accomplished by, for example, proposing relevant advertisements to remind consumers of the fascinating or impressive plots of ACG and the positive experiences of derivative products. Moreover, the manufacturers should try to initiate relevant discussions about ACG products (for example, fond remembrance of times past, fascinating ACG story, and pleasant user experience of ACG products) in order to create a popular and cheerful topic trend among users on social network sites and increase willingness to repurchase.

(2) The Critical factors influencing consumers' Public praise and recommendation intention:

According to the questionnaire survey results, consumers' willingness of public praise and recommendation would be directly dominated by involvement of ACG derivative product. When degree of ACG product's involvement is low, the consumer will neither share the positive message to others nor recommend the ACG product. In addition, when the consumers are deeply involved in ACG derivative product and desirous of wining the recognition of others, they would be highly willing to publicly praise and recommend the ACG product to others. That is, for improving the status in the minds of others, the consumers with high degree of ACG product's involvement would be happy to recommend relevant information about ACG derivative product and even encourage further purchase to the family and friends.

Hence, if the manufacturers of ACG product wish to enhance consumers' willingness of public praise and recommendation, this paper suggests improving consumers' recognition about their favorite ACG related products and delightful purchasing experiences to raise their involvement of ACG, and encouraging consumers to pursue a sense of self-assurance and achievement by sharing with others on social network sites. It can be carried out by, for instance, emphasizing the good impression about ACG contents in advertisements to remind consumers of their fanaticism for those ACG works, creating a remarkable brand image connected with the impressive ACG works to make a good impression on consumers, and encouraging and rewarding consumers to share their pleasant purchasing experience of ACG products with others.

(3) The Critical factors influencing consumers' cross purchase intention:

According to the survey results of this study, consumers' willingness of cross purchase would be basically influenced by the degree of taking pleasure in communication. When the consumers enjoy taking pleasure in communication with others

and care about recognition and respect of others, they will possess high degree of cross purchase intention. That is, in addition to purchasing the desirable ACG product, those consumers are willing to buy peripheral commodities relating to this product or other merchandise of the same manufacturer. On the contrary, when the consumers neither take pleasure in communication with others nor enthuse over the certain ACG product, their intention of cross purchase would be lower. The survey results also suggested that, male consumers generally have higher cross purchase intention for related products as long as taking highly pleasure in communication with others, regardless whether they would successfully win the recognition and attention from other consumers.

If the manufacturers try to improve consumers' willingness to purchase more extended products, this study suggests improving the degree of entertainment of ACG product and relevant advertisements, praising consumers for their confidence gained from relational experiences, and encouraging consumers to share actively their positive purchasing experience with others on social network sites. These can be achieved by, for example, increasing the entertainment materials of the new extended product, emphasizing this aspect of diverting entertainment in advertisements, and offering bonuses or prizes to reward consumers to share actively their pleasant purchasing experience with others.

On the whole, we found that two influential factors, the degree of perception of the ACG product and the degree of taking delight in communication with others, have a great impact on consumer acceptance. Let's take the mobile game "Pokémon GO" as an example. Obviously, these two influential factors found in this study are just the key success factors of "Pokémon GO". First, the plentiful stories and enchanting monsters of a series of "Pokémon" animations created since 1997 have become great memories and caused the game players to possess high involvement in the Pokémons. Hence, the game players with perception of Pokémons are apt to accept and enjoy the mobile game "Pokémon GO". Secondly, the great enthusiasm for "Pokémon GO" created a terrific splash in the popular press, which would encourage the game players to pay attention to news topics, start up enthusiastic discussions about Pokémons, and be eager to catch up with this fad. Therefore, the two key success factors of "Pokémon GO" and result of this study could corroborate each other approximately.

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