

# 네트워크 관점에서 바라본 브랜드 이미지 측정에 대한 탐색적 연구

## An Exploratory Study on Measuring Brand Image from a Network Perspective

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### 초 록

스마트폰의 등장으로 우리는 언제 어디서나 쇼핑이 가능하고, 소셜미디어로 연결된 광범위한 인적 네트워크와 웹사이트를 통해 손쉽게 다양한 정보와 전문가들의 의견을 살펴볼 수 있게 되었다. 제한된 정보 창구로 인해 브랜드 인지도에 의존하였던 과거와는 다르게, 다양한 창구를 통해 제품과 서비스에 대한 정보를 손쉽게 얻을 수 있는 시대가 도래한 것이다. 그 결과, 디지털 시대의 소비자들은 과거와는 다르게 기업의 일방적인 의도대로 브랜드 이미지를 수용하는 것에서 벗어나, 소비자들 간의 소통을 통해 브랜드 이미지의 형성에 영향을 미칠 정도로 그 영향력이 증대되었다. 소비자들은 더 이상은 그 브랜드를 안다고 해서 혹은 그 브랜드가 유명하다고 해서 바로 구매를 하지 않는다. 따라서, 이렇게 변화한 시대에 전통적인 브랜드 측정 방법의 유효성에 대해 의문을 제시하게 되었다. 그러나 아직까지 변화한 사회환경을 반영한 측정 방법은 논의된 바가 없으며, 실무자들은 현재까지 전통적인 측정 방법을 이용해 오고 있는 것이 현실이다.

따라서 본 연구에서는 기존 브랜드의 정의와 측정방법에 대해 한번 살펴보고, 디지털 시대에 보다 적합하면서 직접적인 측정 방법을 제안하고자 한다. 본 연구에서 제안하는 측정 방법은 “친구를 보면 그 사람을 알 수 있다”는 속담처럼, 함께 구매되는 상품의 브랜드를 통해 해당 브랜드의 진정한 위치와 이미지를 파악하는 방법이다. 이를 위해 온라인 커머스 사이트인 아마존에서 함께 구매되는 화장품 데이터를 브랜드 단위의 네트워크로 구축하고, 이를 토대로 브랜드 이미지를 평가하는 방법을 제시하였다. 기존에는 소비자의 인식 혹은 인지적인 측면을 설문조사로 파악하거나 기업의 재무상태를 통해 브랜드를 측정했던 과거와는 달리, 본 연구에서 제시하는 방법은 실질적인 구매 행동을 통해 구축된 제품의 네트워크를 분석함으로써 관련 브랜드 지표와 실질적인 구매 행동 간의 간극을 좁히고자 한 데에 의미가 있다. 또한 연결된 세상의 네트워크 관점을 바탕으로 전통적인 브랜드 개념을 보다 확장하였으며, 이를 통해 보다 현실에 적합한 측정도구를 제시하였다는 것에 의의가 있다.

### ABSTRACT

Along with the rapid advance in internet technologies, ubiquitous mobile device usage has enabled consumers to access real-time information and increased interaction with others

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through various social media. Consumers can now get information more easily when making purchase decisions, and these changes are affecting the brand landscape. In a digitally connected world, brand image is not communicated to the consumers one-sidedly. Rather, with consumers' growing influence, it is a result of co-creation where consumers have an active role in building brand image. This explains a reality where people no longer purchase products just because they know the brand or because it is a famous brand. However, there has been little discussion on the matter, and many practitioners still rely on the traditional measures of brand indicators.

The goal of this research is to present the limitations of traditional definition and measurement of brand and brand image, and propose a more direct and adequate measure that reflects the nature of a connected world. Inspired by the proverb, "A man is known by the company he keeps," the proposed measurement offers insight to the position of brand (or brand image) through co-purchased product networks. This paper suggests a framework of network analysis that clusters brands of cosmetics by the frequency of other products purchased together. This is done by analyzing product networks of a brand extracted from actual purchase data on Amazon.com. This is a more direct approach, compared to past measures where consumers' intention or cognitive aspects are examined through survey. The practical implication is that our research attempts to close the gap between brand indicators and actual purchase behavior. From a theoretical standpoint, this paper extends the traditional conceptualization of brand image to a network perspective that reflects the nature of a digitally connected society.

**키워드** : 브랜드, 브랜드 자산, 브랜드 이미지, 전자상거래, 네트워크 분석, 공동 구매 네트워크  
Brand, Brand Equity, Brand Image, Electronic Commerce, Network Analysis, Co-Purchase Network

## 1. Introduction

As Kotler and Armstrong [36] acknowledge, "The explosive growth in digital technology has fundamentally changed the way we live-how we communicate, share information, access entertainment, and shop." Along with the rapid advance in internet technologies, ubiquitous mobile device usage has enabled consumers to access real-time information and interact with others through various social media [21, 23]. That is, with the increasing rate of mobile device penetration and with the amount of time spent on such devices, consumers can get information more easily through tremendous channels. Since it

has become possible to engage consumers anywhere, anytime via their computers, tablets, smart phones and other digital devices [36], these changes are affecting the brand landscape.

Recent studies suggest that nowadays consumers have more information power compared to the past [10, 18, 23, 38]. The new technological advances mentioned above have reshaped market structures in various ways and transformed the dynamic between consumers and brands [22]. An article from Forbes [28] illustrated how more and more consumers share their experiences online (and/or on social media) and demand faster and more effective responses as well. Therefore, though

much of brand concepts have taken a unilateral and aspirational perspective from the firm, “the increasingly dynamic environment and the rising role of consumers as co-contributors to brand construction and development demand rethinking this perspective [10].”

Another important development due to the recent technological advances and growth of e-commerce is “the emergence of a number of visible hyperlinked electronic networks that connect products and their consumers [46].” For instance, Facebook connects people to each other, LinkedIn links professionals, and Amazon creates product networks, “in which a large number of items –represented by a collection of web pages– are linked to one another [47].” What used to be invisible, has become visible in the digital age and has emerged as a complex network [41].

It is this complex network that seems to hold the answer to the gap between reality and research. Nowadays, traditional perspective and measures of brand –such as brand power, brand equity, brand image– do not capture the reality. In other words, having a strong brand does not necessarily lead to actual purchase anymore. In a recent survey conducted by Trend Monitor in South Korea [56], a high percentage of consumers (89.8%) responded that they do not purchase items right away even though they know or are familiar with the brand. As they have access to a lot of information, purchase decisions are usually made after consideration of that information. In the

face of the gap between reality and academia, our paper attempts to explore the idea of properly measuring brand in a digitally connected world [59].

In this paper, we propose a method for assessing a brand more directly in the network environment: by comparing the networks of each brands in a given large-scale product network on an E-commerce website. Contrary to the traditional methods which are based on the cognitive aspect of consumer e.g. purchase intentions or the financial aspects of brand, the proposed method evaluates brand based on the actual purchase action of customers on the website. As this is a topic that has not been examined in prior research, we conducted exploratory research.

## 2. Literature Review

### 2.1 Brand

The subject of brand has always been a topic of interest to both researchers and practitioners. As the market becomes increasingly competitive and global, managing brand strategically has become of paramount importance as slight differences might just be the tipping point to success [4, 30, 31, 43, 57, 58]. In this kind of business environment, the focus of marketing has shifted as satisfying consumers’ needs is not sufficient enough to survive. Rather, it becomes necessary to achieve

competitive advantage [4]. As Kapferer [30] acknowledges, brand is one of the very few assets that can provide long-lasting competitive advantage in an age where the time span of the advantage is getting shorter and shorter.

### 2.1.1 Definition of Brand

Despite brands having been heavily debated and widely discussed in academia, a universally accepted definition of brand seems unattainable [11, 12, 30, 45, 57]. In the attempt to clarify the definition of brands, De Chernatony and Dall'Olmo Riley [12] and later on Maurya and Mishra [45] reviewed numerous definitions of the brand categorizing them into twelve themes. These themes are: 1) logo; 2) legal instrument; 3) company; 4) shorthand; 5) risk reducer; 6) identity system; 7) image in consumers' minds; 8) value system; 9) personality; 10) relationship; 11) adding value; and 12) evolving entity. These themes are not entirely mutually exclusive, i.e. there exists a certain degree of overlap regarding the tangible and intangible aspects of the brand. However, these twelve themes provide a useful frame to systematically understand the definitions of brands. It is more important that these themes were further synthesized into two approaches [45].

Drawing from existing literature, there are mainly two different approaches in defining the brand construct; a brand maybe defined from a consumer's-perspective and/or from

the firm's perspective [45, 57].

The following definition is the most widely known company-oriented definition proposed by The American Marketing Association [6].

“A name, term, sign, symbol, or design, or a combination of them, intended to identify the goods or services of one seller or group of sellers and to differentiate them from those of competitors.”

This definition has prevailed in modern literature, though in modified form as in Aaker [1], Kotler et al. [37], Stanton et al. [54] and Etzel et al. [17]. For instance, the adapted definition of Stanton et al. [54] and Etzel et al. [17] is as such: “A brand is a name and/or mark intended to identify the product of one seller or group of sellers and differentiate the product from competing products.” Stanton et al. [54] and Etzel et al. [17] use the term “mark” to refer “the form of symbol, design, or distinctive color or lettering.” Therefore, the distinguishing feature of these definitions is that its emphasis is on visual characteristics such as logo, symbol, design as a differentiating mechanism.

On the other hand, a consumer-oriented approach focuses on the consumers' mental association. For example, researchers such as Keller [32] and Aaker [2] define brand as a set of mental associations held by the consumer, which add to the perceived value of the product and/or service. In his book ‘Building Strong Brands [2]’ David Aaker proposes brand to be a ‘mental box’ and states “a brand

is the set of expectations, memories, stories and relationships that, taken together, account for a consumer’s decision to choose one product or service over another.”

As we embrace the age of web 2.0 and are on the verge of web 3.0 [25], the way in which consumers communicate to each other has been changing continuously [26]. There is a plethora of new media outlets to obtain, share, and consume information on products and services [21]. As Deighton and Kornfeld [14] explain, “The digital innovations of the last decade made it effortless, indeed second nature, for audiences to talk back and talk to each other (p. 4).” This omnipresence on the internet, as well as user-generated content, has opened up a connected world. Some researchers such as Kapferer [30], Yun [58, 59], and Ramaswamy and Ozcan [50] have defined brand in a network-oriented perspective to reflect this digital world. Kapferer [30] defines brand as “a focal point for all the positive and negative impressions created by the buyer over time as he or she comes into contact with the brand’s products, distribution channel, personnel and communication. (p.19)” Yun [59]

elucidates, brand is the mental associations and relationships built over time among customers, products, services, communications, or distributors which accumulates into a network. As this network is open and connected [58], acting upon one will impact others. In short, brand is being perceived as a system of mental associations that are interconnected.

In this paper, we use the term “brand” in alignment with the definition of Kapferer [30], Yun [58, 59] and Ramaswamy and Ozcan [50]’s concept.

### 2.1.2 Brand Equity and Measures

As the importance of brand grows, the question of brand equity also rises. Brand equity can be roughly translated into the value of a brand. That is, what gain does the brand bring and to whom? A general definition is offered by Leuthesser [42] and Farquhar [20]. Leuthesser [42] states brand equity is “the set of associations and behaviour on the part of a brand’s customers, channel members and parent corporation that permits the brand to earn greater volume or greater margins than

<Table 1> Overview of Brand Definition

Approach	Components of Definition	Related Research
Company-oriented	<b>Visual features</b> as differentiating mechanism (logo, symbol, design...)	AMA[6], Aaker[1] Stanton et al.[54], Etzel et al.[17]
Consumer-oriented	<b>A set of mental associations</b> as adding to the perceived value of a product or service	Aaker[2], Keller[32]
Network-oriented	<b>A system of mental associations <i>in a network</i></b> so that acting upon one impacts others	Kapferer[30], Yun[59], Ramaswamy and Ozcan[50]

<Table 2> Overview of Brand Equity

Brand Equity	Components	Related Research
Firm-based	Brand Strength Index(BSI), Brand Loyalty Rate, Brand Revenues	Interbrand, Brand Finance etc.
Consumer-based	Brand loyalty, Brand awareness, Perceived quality, Associations, Market Behavior	Aaker[1, 3]
	Brand awareness, Brand Image(characteristics of brand associations, relationships among brand associations)	Keller[32]

it could without the brand name.” In simpler terms, “the ‘added value’ with which a given brand endows a product” [20]. So far, brand equity has been viewed from two major perspectives (as presented in <Table 2>) depending on the recipients of brand value: firm-based brand equity and consumer-based brand equity.

Simply put, firm-based brand equity discusses the financial value created to the business by brand [9]. For instance, Simon and Sullivan [52] attempts to estimate a firm’s brand equity based on the financial market value of the firm; they define brand equity as

“the incremental cash flows which accrue to branded products over and above the cash flows which would result from the scale of unbranded products.” The key point here is that the authors try to separate the value of brand equity from the value of the firm’s other assets. It is in this context that companies such as Interbrand or Brand Finance exist specializing in calculating the asset value of a brand. In fact, Brand Finance estimates brand value using the Royalty Relief methodology which “determines the value a company would be willing to pay to license its brand as if it did not own it. [7]”



<Figure 1> Brand Finance’s Methodology

On the other hand, consumer-based brand equity (CBBE) takes a different approach as “[brand] captivates customers, which is a prime reason that relationships develop between customer and brand [4].” So brand equity is a term describing the relationship between customers and brands [57]. Therefore, consumer-based brand equity suggests the consumers’ response to a brand name is the driving force of the success of the brand [9]. Aaker [2] defines brand equity as “a set of assets and liabilities linked to a brand’s name and symbol that adds to or subtracts from the value provided by a product or service to a firm and/or that firm’s customers.” For Keller [32, 33], customer-based brand equity is “the differential effect of brand knowledge on customer response to the marketing of the brand.” That is, whether there is brand involved or not causes different responses from the customer e.g. perceptions, preferences, behavior and the formation of mental brand associations since “Brand knowledge” can be broadly understood as “any type of mental brand association” [33].

Endeavors to empirically operationalize consumer-based equity can be categorized based on their approach to measurement: direct or indirect [9, 32]. In terms of Keller [32], to indirectly measure CBBE means to focus on potential sources of brand equity i.e. brand knowledge. Meanwhile, to directly measure CBBE is to measure the actual difference created by the impact of brand knowledge on

consumer response pertaining to different marketing activities. Whether it is indirect or direct, surveys [13, 39, 48, 51, 53, 55] have traditionally been the main method used for measuring and understanding consumer-based brand equity.

### 2.1.3 Brand Image and Measures

As a key driver of brand equity [15, 60], Brand image is important because it is the source of strengthening brand loyalty which in turn will increase both brand value and market power [20, 57]. As Plumeyer et al. [49] acknowledges, measuring brand image offers an opportunity for managers to identify and reflect desirable associations in their branding efforts.

Throughout the years, the definition and measurement of the construct brand image has proliferated. It was Gardner and Levy in their 1955 article who first captured the essence of and solidified the concept of brand image [16, 49] as ‘the sets of feelings, ideas and attitudes that consumers had about brands, their “image” of brands, were crucial to purchase choice [16].’ The review paper by Dobni and Zinkhan [16], encompassing 35 years of existing literature since then, gives a broad guideline regarding the definitions, components, and measurements of brand image. The definition of brand image can mainly be categorized into five perspectives depending on where the emphasis lies: blanket definitions, symbolism, meanings and messages, personification, cognitive

or psychological elements. Generally, brand image refers to a “consumer’s general perception and feeling about a brand and has an influence on consumer behavior [60].” Aaker [1] defines brand image as “a set of associations, usually organized in some meaningful way,” where brand association can be anything “‘linked’ in memory to a brand.” Similarly, Keller [32] defines brand image as “perceptions about a brand as reflected in by the brand associations held in consumer memory.” Therefore, it is the consumers’ perceptual beliefs about a brand’s attribute, benefit and so on that forms the base of overall evaluation of, or attitude toward, the brand [19].

Plumeyer et al. [49] offer a systematic review on brand image and its measurements. Up until recent studies, survey seems to appear as the predominant method but interviewing techniques were frequently observed as well [49]. As shown in <Table 3>, surveys would include a series of statement regarding the target brand or associations and ask the respondents to indicate the extent of agreement. In the case of interviews, interviewees would receive a stimulus (e.g., a brand name)

and would respond with words that immediately come to mind or receive open-ended questions to uncover in-depth information on brand associations. <Table 3> is an example of measurements for brand image.

### 2.1.4 Summary

There has been a growing schism between the behavior of purchase and brand image; nowadays, people rarely buy something right away because of seeing advertisement on TV or because they are familiar with the brand. As discussed before, rapid advances in internet technologies and ubiquitous usage of mobile devices have led to vigorous interaction among consumers and consumers have access to more information than ever before [21]. It has become increasingly common for consumers to look up online product reviews and gather information [5, 62] and form purchase intentions [29, 61]. “Simultaneously, there has been an accompanying evolution of the role of customers, beyond recipients of offerings to co-creators in the value creation process [50].” That is, consumers have become actors in creating “brands.”

<Table 3> Traditional Measurements of Brand Image

Self-Reports								
• Please name <i>all the brands of cosmetics</i> you can think of.								
• What makes <i>Christian Dior</i> more recognizable than competing brands?								
• Overall, I think that <i>Christian Dior</i> is charming:								
Disagree	1	2	3	4	5	6	7	Agree
• I will buy <i>Christian Dior</i> in the next three months:								
Disagree	1	2	3	4	5	6	7	Agree

However, there has been little recognition of this tidal change and of its relevance on understanding and measuring brands. Hence a gap between reality and research emerges. As we have elaborated above, most of the traditional measurement techniques for brand equity and brand image have limitations as they are mostly indirect measures and are heavily dependent on surveys. In other words, the measures are focused on asking purchase intention, rather than purchase action itself. And may not be adequate to measure the changes in the connected digital society. This research aims to bridge the gap and propose a more direct measure that reflects the connectivity of modern world. The scope of the study focuses on brand image as it is considered the driving power of brand equity.

## 2.2 Amazon's Co-Purchasing Network

The growth of e-commerce globally can be described as explosive as mobile devices have made it possible to buy and sell anything anytime anywhere. A unique and important consequence of the recent increase in electronic commerce is that online purchase data and interaction has now become visible; thus connecting products and their consumers into a network [46, 47]. Now, products are associated with each other when being purchased together, forming a network [27, 34, 35, 46, 47].

Online product networks refer to connected

links among “the landing pages of products or online content [46, 47].” As Oestreicher-Singer and Sundararajan [46] states it, “electronic network of interconnected products whose landing pages’ link to each other.” The webpages of products become the nodes of the product network, and the connecting hyperlinks become the edges. For instance, Amazon’s “co-purchase” network or co-viewed videos of YouTube are good examples.

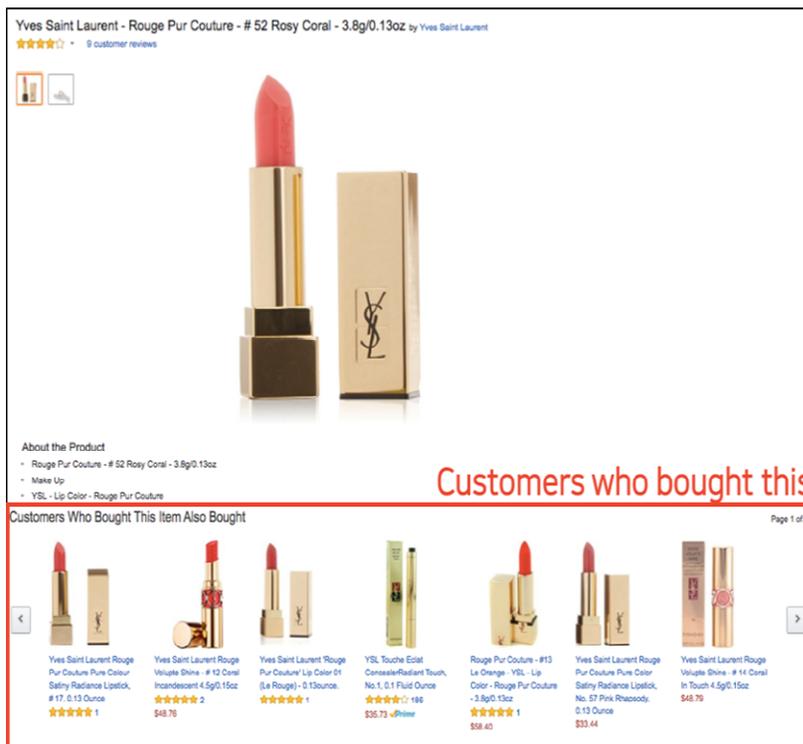
Only a handful of researchers have explored electronic product network as their research agenda. Hao et al. [24] devised the “Directed Association Visualization (DAV)” system which takes in large volumes of e-commerce transaction data and visualizes the product affinities and relationships. In other words, “DAV maps transaction data items and their relationships to vertices, edges, and positions on a visual spherical surface. [24]” It was a basic attempt to define co-purchased networks. The main stream of research regarding co-purchasing networks focus on recommendations systems. Huang et al. [27] analyzed bipartite consumer-product graphs to examine the underlying mechanism that governs consumer-purchase behavior. That is, “by representing consumers and products as vertices, and sales transactions as edges linking consumer and product vertices, we view the entire transaction history as a growing consumer-product graph. [27]” Similarly, Kim et al. [34] extended the market basket analysis (MBN) into a network level and proposed a co-pur-

chased product network (CPN) which is extracted from the customer-product bipartite network from the sales transaction data.

A visible electronic product network is especially evident in the case of Amazon's co-purchase network, "in which each product page shows prospective customers the other products that were purchased by buyers of the same product [47]." Under the label of "Consumer who bought this item also bought...", we can see dynamic snapshots of co-purchases by consumers presented with links to complementary products made visible [46]. This is illustrated in <Figure 2>.

Our research follows in the footsteps of

previous studies in a sense that we are also trying to construct a network of products. Therefore, nodes represent products, and links represent the frequency of two products being bought together. However, we propose a different approach in utilizing co-purchased product networks (CPN). Instead of analyzing the impact of the network itself, we focus on visualizing networks where products are clustered on brand level (when modeling the data as product network.) This approach is in alignment with attempting to define and measure brand in a network perspective, reflecting the changes of a digitized world where inter-connection is the key aspect.



<Figure 2> Amazon.com's Co-Purchase Links

### 3. Methodology

#### 3.1 Overall Procedure

In the previous section, we summarized the classic approaches to brand and product networks. The gap between reality and academia motivated us to propose a new methodology on evaluating brands based on product networks. That is, to cluster frequently co-purchased items as a set and measure brand as a connected network. As the saying goes, “A man is known by the company he keeps.” This paper posits that brand can be perceived as the co-purchased product networks that are linked together.

In this section, we discuss how the product network is constructed and how it relates to evaluating brands. <Table 4> shows an overall procedure of this study.

<Table 4> The Overall Procedure

Step 1	Data Collection
Step 2	Data Preparation
Step 3	Network Visualization
Step 4	Network Analysis
Step 5	Comparison

#### 3.2 Specification of Procedure

##### Step 1: Data Collection

This research is based on a set of actual co-purchased data for over 10,000 products sold on Amazon.com. As this is an exploratory at-

tempt to evaluate brand as a network, the category of the product was limited to lipstick only.

The data was collected by using a Python-based crawler, which started from each cosmetic product and crawled to the co-purchased links. For lipsticks, there were a total of 922 pages which contained 48 products. For each product, a maximum of 30 items were recommended.

At each page, the crawler gathered and recorded information for each item: the webpage the item is on, co-purchased links on that page, etc. The crawling process ended when the whole connected component of the data set was collected. The same process was repeated for each brand. The data collection began in November 2016 and ended in December 2016.

##### Step 2: Data Preparation

Product data is composed of Amazon Standard Identification Number (ASIN), name, price, brand, category, and a list of co-purchased items. Similarly, co-purchased items' data is also composed of ASIN, name, price, brand, and category.

- ASIN (Amazon Standard Identification Number): A unique alphanumeric identifier assigned to each product by Amazon.com. Different series, colors, or nations have different ASIN numbers.
- Price: The price on Amazon.com that day.
- Co-purchased items: ASINs of the item which appear under the category of ‘Customers who bought this also bought’ or ‘Customers buy together’.

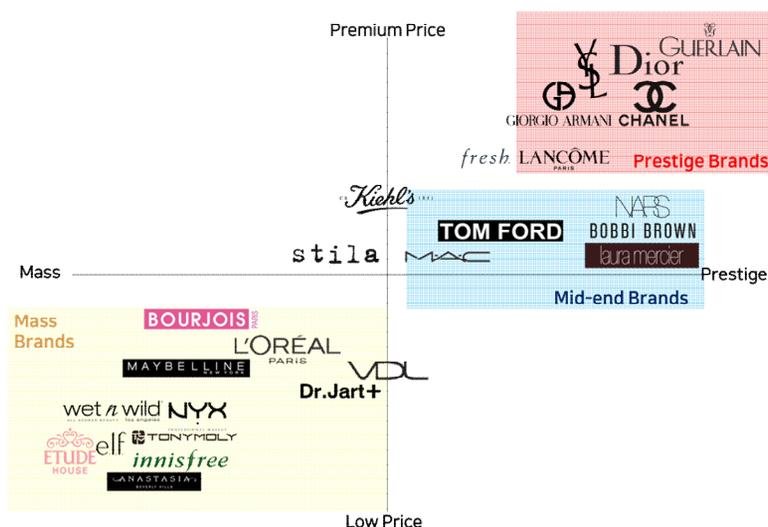
- Names: The name of the cosmetic which contains information such as brand name, category, series and color.
- Brands: The brand name of the cosmetic. Unavailable to obtain by crawling, we parsed the information from the product name.

There were numerous brands included in the data. We decided to focus on a certain number of brands for the sake of simplicity. That is, to thoroughly investigate how each cosmetic brand has a different formation of co-purchased network, the number of brands were reduced to 9 brands. These 9 brands were chosen based on the traditional brand positioning map shown in <Figure 3> [44]: Chanel, Christian Dior, Bobbi Brown, Yves Saint Laurent (YSL), Laura Mercier, Giorgio Armani, MAC, Nars, and Maybelline New York. Prestige brands refer to the brand of the product

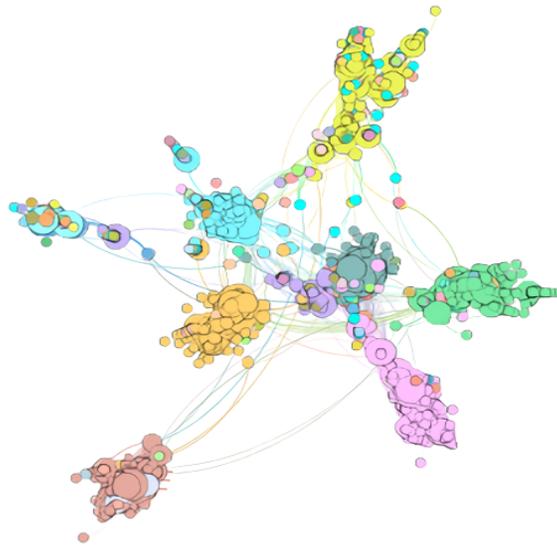
where it is sold at premium price for a few special customers. In <Figure 3> [44], prestige brands are composed of Christian Dior, Chanel, Yves Saint Laurent and Giorgio Armani. On the other hand, there are mass brands where products are sold at a low price for the mass. A brand like Maybelline is one of the representative examples. Mid- end brands are in between prestige and mass brands: Bobbi brown, Nars, MAC, Laura Mercier.

### Step 3: Network Visualization

The brands' networks were visualized by using Python's library "NetworkX" and Gephi software employing the Yifan Hu Propositional algorithm. These tools provided not only efficient network visualization and exploration techniques but also network analytics for a deeper understanding. An illustrative example of the overall graph is presented in <Figure 4>.



<Figure 3> Traditional Positioning Map of Cosmetics

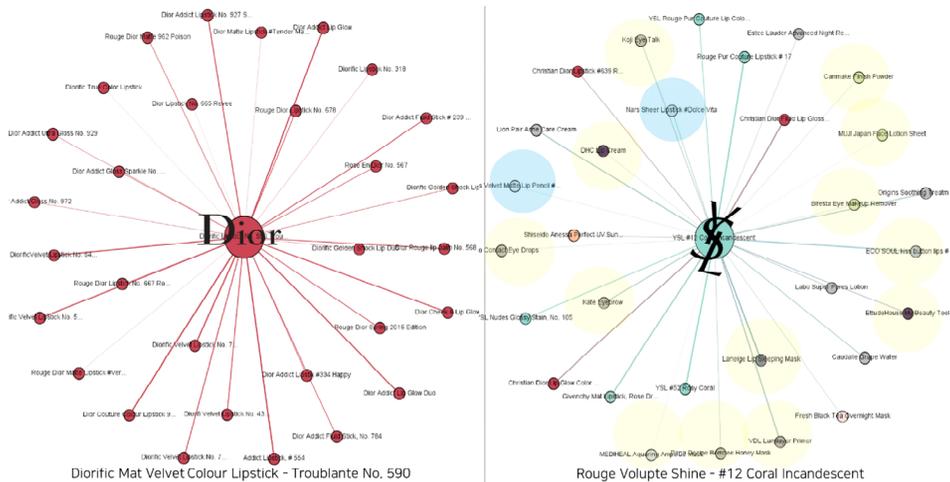


<Figure 4> The Overall Graph of the Cosmetic Co-Purchase Network

Step 4: Network Analysis

In this study, we clustered the data first by giving different colors according to brands. Brands were then clustered by traditionally perceived image. The information regarding the composing brands by percentage are given in the top left of the figure. The percentage

of the composing brands gave us a map of associated brands. <Figure 5> is an example of network analysis. Each product's co-purchased items of Christian Dior and Yves Saint Laurant (YSL) are visualized. We can easily see that Dior and YSL have totally different co-purchased brands.



<Figure 5> Example of Network Analysis

Step 5: Comparison

To compare the proposed method with the traditional method in evaluating brand, we adopted a traditional positioning map and categorization of cosmetics extracted by survey.

Following the traditional categorization, Christian Dior, Chanel, Yves Saint Laurent, and Giorgio Armani were categorized as Prestige brands that customers perceived as prestigious with premium prices. Laura Mercier, Nars, Bobbi Brown, and MAC were categorized as Mid-end brands which customers perceived as renowned but affordable compared to prestige brands. Mass brands were usually sold at drug stores at a lower price, which were Maybelline New York and L'Oréal in this study.

By drawing a comparison, we seek to see if the traditional map corresponds with our measurement of association of brands. To elaborate, if a prestige brand, such as Christian Dior, has a high percentage of products from the same category of brands, we can suggest that consumers actually perceive Christian Dior as

a prestige brand. However, as in the case of Yves Saint Laurent (YSL), when a prestige brand is associated with different category brands with a high percentage, it could be understood that there exists a gap between brand communication and customer perception.

### 4. Results

By visualizing co-purchased networks, different forms of networks were revealed. It seems like some brands are actually perceived by the consumers as the company intends, but some are in a completely different position. <Figure 6> summarizes the result of network analysis and the networks of each brand are shown from <Figure 7> to <Figure 15>. From <Figure 7> to <Figure 15>, different colors are assigned to each brand to visualize the distribution ratio of brands. The top left of each figure shows the percentage of each composing brand.

	Prestige				Mid-end				
	Dior	YSL	CHANEL	GIORGIO ARMANI	NARS	BOBBI BROWN	LAURAMERCIER	MAC	MAYBELLINE
Prestige_total	92.77%	68.84%	60.74%	24.99%	4%	0.5%	0.5%	0.9%	0%
Prestige_Self	87.86%	61.32%	46.67%	15%	-	-	-	-	-
Mid-end_total	2.32%	7.24%	14.07%	22.49%	77.69%	91.28%	74.09%	88.48%	0.3%
Mid-End_Self	-	-	-	-	73.31%	82.54%	70.99%	85.15%	-
Mass_total	2.03%	17.34%	19.32%	49.13%	18.17%	7.97%	25.33%	11.15%	98.5%
Mass_Self	-	-	-	-	-	-	-	-	58.98%

<Figure 6> Overview of the Results

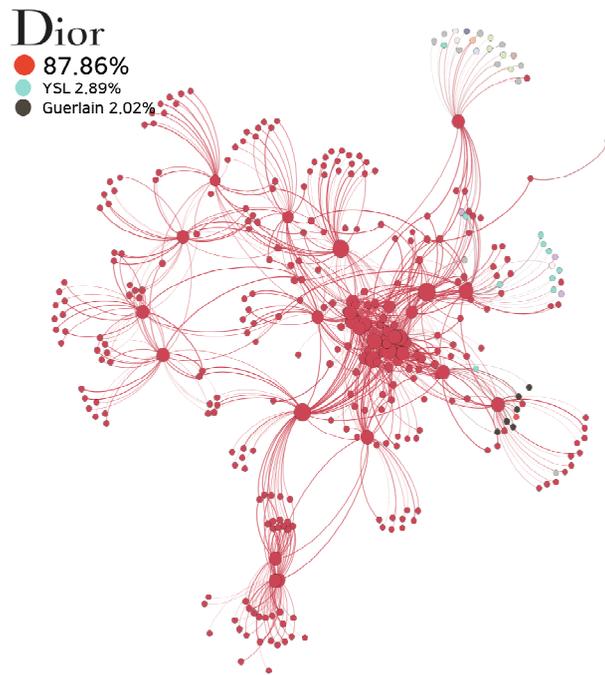
In detail, <Figure 6> illustrates how a certain brand can be identified as being a prestige, mid-end, or mass brand by showing the composition and proportion of the co-purchased products' brands. For example, in the case of a certain product, "Prestige\_total" refers to the percentage of that product being co-purchased with a product from a prestige brand (i.e. Dior, Yves Saint Laurent, Chanel, Armani). "Prestige\_self" refers to the percentage of that product being related to a product from the same prestige brand. The same logic applies to "Mid-end\_total," "Mid-end\_self," "Mass\_total" and "Mass\_self."

In the case of Dior (c.f. <Figure 7>), for a certain Dior product: 92.77% of the co-purchased items are a prestige brand item, 87.86% are the same brand (i.e. Dior), and only 2.32% of the co-purchased items are from a mid-end brand. As displayed in <Figure 8>, Yves Saint Laurent's network shows a high proportion of prestige brands (68.84%) but surprisingly, mass brands such as VDL, Innisfree, and Tonymoly show a stronger presence than expected. In the case of <Figure 9>, with Chanel, the percentage of prestige brand is lower whereas the percentages of mid-end brand and mass brand are significantly higher compared to Dior and Yves Saint Laurent. For <Figure 10> Giorgio Armani's network, the colorful pattern depicts the large proportion of mass brands when prestige brands only take up to 25%.

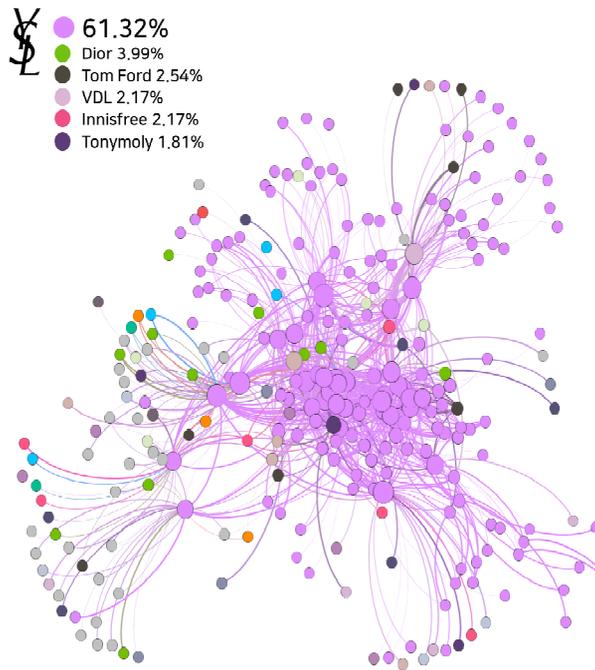
To summarize, among prestige brands, it is clear that Christian Dior consists of the highest percentage of prestige brands, which are

mostly Dior itself (87.86%). In other words, Dior's network is composed of similar levels of brands. However, Yves Saint Laurent and Chanel show a different pattern of network as they consist of approximately 60% of prestige brands, which is lower than Dior. The components of the network include many mass brands such as VDL, Innisfree, and so on. Surprisingly, Giorgio Armani reveals to possess the lowest percentage of prestige brands; only 25%. Through network visualization and <Figure 8>, we can understand that most of the peer brands of Giorgio Armani are from the mass brand category. Therefore, it could be argued that if traditional methods were to be conducted to measure the brand position of Giorgio Armani there would have been a high possibility of incorrect evaluation despite the advertisement or intention of the firm.

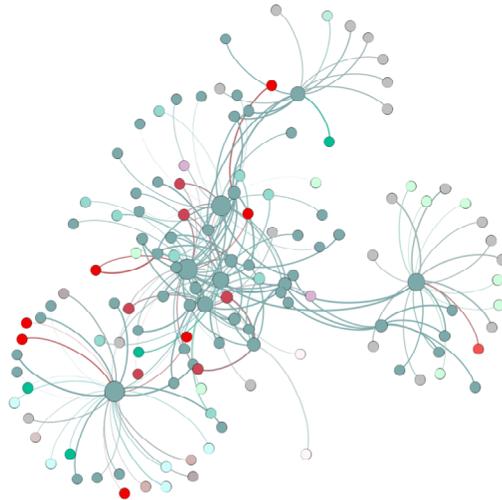
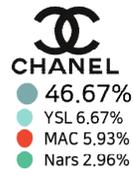
In the mid-end brand category, Bobbi Brown stands out with the consistently highest percentage of mid-end brands. That is, the network of Bobbi Brown (<Figure 11>) is highly composed of mid-end brands, not only just of itself but also other mid-end brands such as Mac and Nars. Through <Figure 12>, <Figure 13> and <Figure 14>, we can also see that Nars, Laura Mercier, and MAC have around 70% to 80% of mid-end brands. That is, most of the peer brands of Nars, Laura Mercier, and MAC are from the mid-end brand category. Considering the comparatively high level of peer brands constituting each other, we can assume that consumers have perceived accordingly with the companies' brand communications strategies.



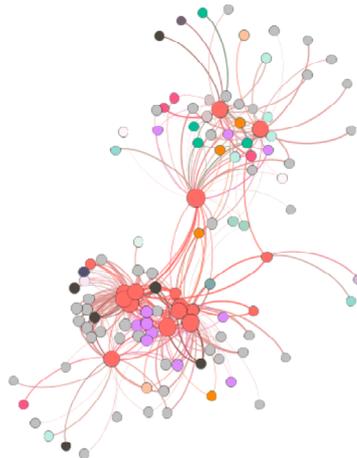
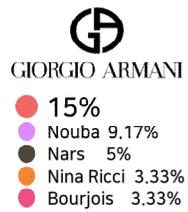
〈Figure 7〉 Christian Dior's Network



〈Figure 8〉 Yves Saint Laurent's Network



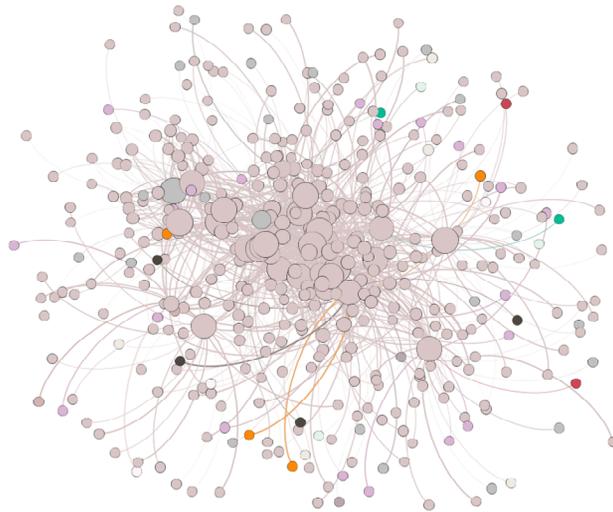
<Figure 9> Chanel's Network



<Figure 10> Giorgio Armani's Network

### BOBBI BROWN

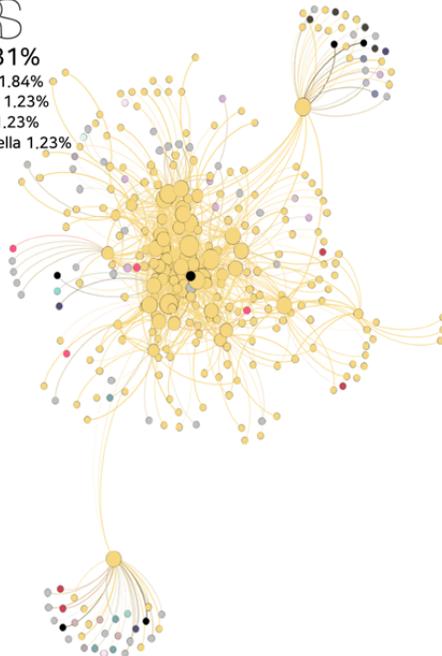
- 82.54%
- MAC 4.99%
- Nars 1.25%



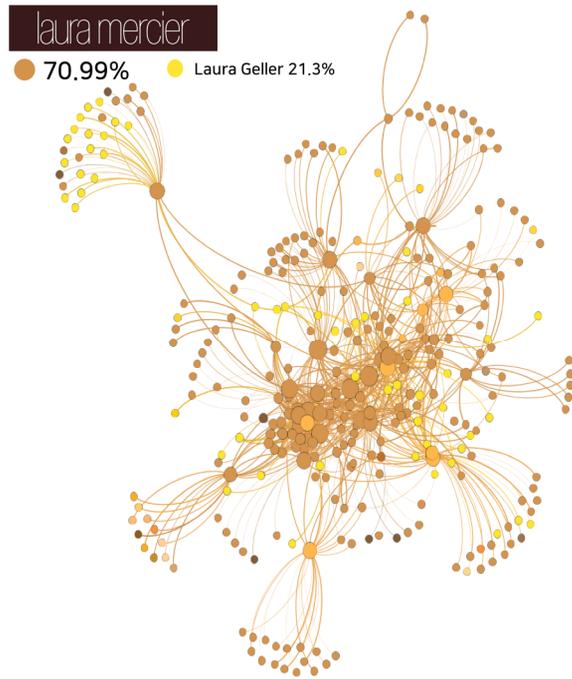
<Figure 11> Bobbi Brown's Network

### NARS

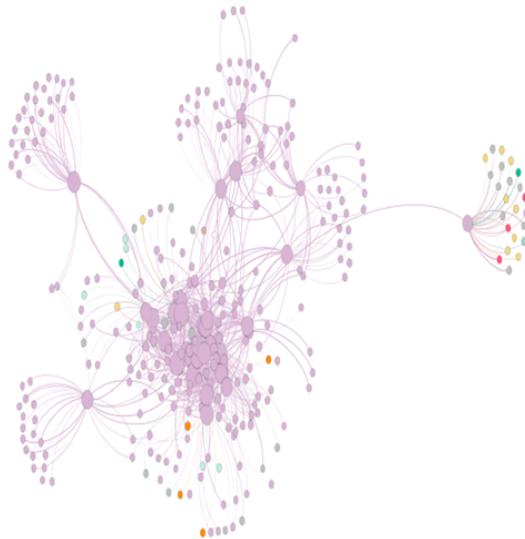
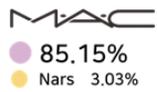
- 73.31%
- MAC 1.84%
- Milani 1.23%
- Dior 1.23%
- Mirabella 1.23%



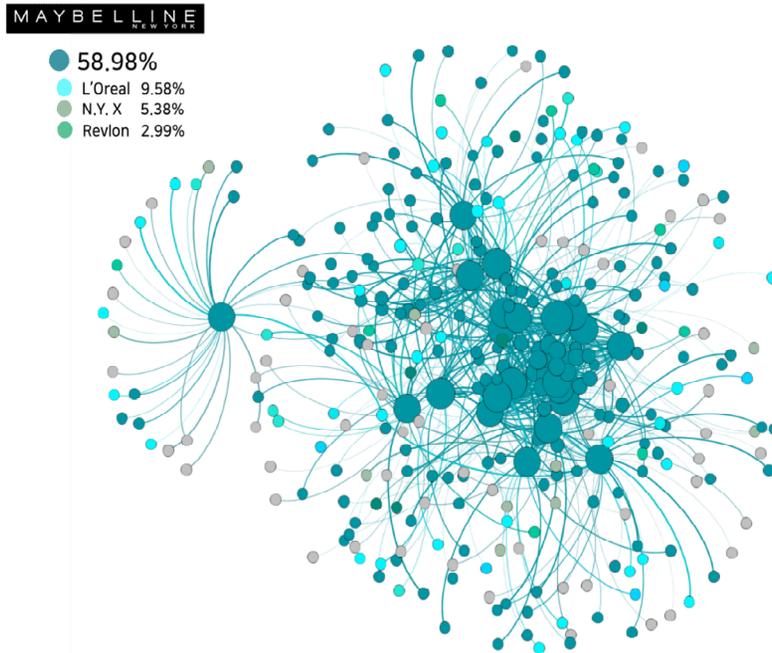
<Figure 12> Nars' Network



〈Figure 13〉 Laura Mercier's Network



〈Figure 14〉 MAC's Network

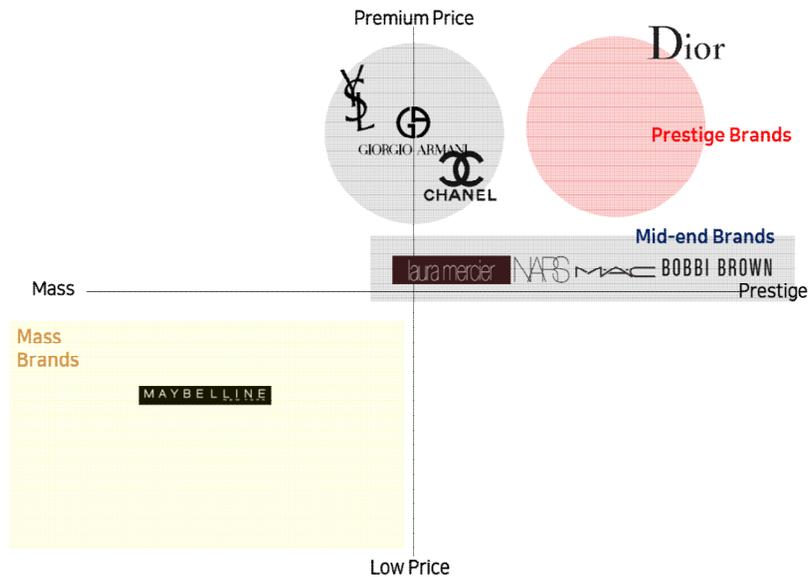


<Figure 15> Maybelline's Network

Lastly, from <Figure 15>, in the mass brand category we can see that Maybelline has almost 100% of mass brands' products such as L'Oreal, N.Y.X., and Revlon. This is a similar result from mid-end brands where the peer brands seem to be from the same category indicating that the company's brand strategy corresponds to the perception of consumers.

In summary, we can reach the conclusion that traditional methods of measuring brand image can have short-comings in a connected network society. From our analysis, it turned out that some brands are not in the expected position when measured by traditional methods: YSL, Chanel, and Giorgio Armani. In other words, though being thought of as prestige brands and being communicated as luxu-

rious and high-class, they are actually being purchased with mid-end brands or mass brands often. Furthermore, through observation we discovered that interestingly many prestige brands are sold arm in arm with mid-end or mass brands, while that is not the case vice-versa. That is, it is rarely seen where a mid-end brand is bought with a prestige brand or a mass brand product bought with a mid-end brand product. The overall results of our network-based analysis is shown in <Figure 16>. As the network analysis from above figures illustrate (c.f. from <Figure 7> to <Figure 15>), mid-end brands and mass brands proved to be valid even in the network perspective. Compared to <Figure 3> [44] the traditional positioning map, pestige brands such as Yves



〈Figure 16〉 The Result of Network Analysis

Saint Laurent, Giorgio Armani, and Chanel moved towards the mid-end brands. Through this approach, managers can empirically find out how their branding strategy is directly affecting consumers’ purchase behavior.

## 5. Conclusion

This research started from the question: “Is the traditional measure of brand still valid in a connected society?” As the explosive growth in digital technology enabled consumers to share and consume information in a different manner than before, the role of the consumers changed from a receiver to a co-contributor. Furthermore, the digital advance also connected products and their consumers to a bigger network. These changes inevitably influ-

enced the way of constructing and conveying “brand.” Consumers no longer one-sidedly received brand as the company intended, but proactively made the decision of purchase with all the information available. However, this tidal change has received little attention in academia, and a schism between reality and research emerged.

Therefore, the theoretical contribution of this study is twofold. First, to the best of our knowledge this is the first study to propose a measure of brand image from a network perspective. Based upon an extended conceptualization of brand image, this paper attempts to reflect the social change where consumers have become more active in the brand creation process and consumers and their experience and products are visibly connected. Therefore, the proposed measure is a more

adequate measure of brand image in a digitally connected world. Secondly, traditional measures have limitations as brand equity and brand image are mostly measured by indirect measures and are heavily dependent on surveys. That is, the focus of the measure is on asking purchase intention, rather than directly observing purchase behavior itself. This research attempts to propose a more direct measure by reflecting the connectivity of the modern world.

There are also practical implications for both the practitioners in the marketing and information systems field. As the proposed measure is focused towards actual purchase action rather than purchase intentions, it is possible to reveal direct influences of brand image on purchase. Furthermore, managers can recognize how the brand communication or creation process is forming and react to it accordingly. Most importantly, in a networked society the connectivity and information that creates brand image in reality maybe different from the intention of the company. Therefore, the proposed measure provides a more accurate picture of reality. The positioning against other brands will also help develop a more precise strategy in marketing and building competitive advantage.

However, this paper is not without limitations. For future research, we suggest that a larger data source should be considered. Not only the amount of data, but also the content of data could be more augmented. For in-

stance, data could include more information such as other brands or categories or even offline purchase data to enrich the context of the research. Another possible stream of research is not only to include products but also to include the interaction among consumers in the construction of a brand network. As consumers share information, experience, and emotions on the process of pre-purchase and post-purchase, in some cases a strong sense of belongingness burgeons for the brand. For instance, it is a very famous story of how the buyer of Tesla becomes a sales-person; no need for a car sales-person [38]. Similarly, Apple and Xiaomi fans spontaneously share useful information and tips on using their device, acting as a sales-person or a technician when needed. As it is possible to track information among consumers on the web, this framework can be expanded to encompass both brands' product and consumers' network, achieving a more comprehensive understanding.

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