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Consumer acceptance of a quick response (QR) code for the food traceability system: Application of an extended technology acceptance model (TAM)

Yeong Gug Kim, Eunju Woo *

Department of Tourism Administration, Kangwon National University, 24341 Chuncheon-si, South Korea

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ABSTRACT

The objectives of this study are to apply the TAM using the addition of perceived information to individuals' behavioral intention to use the QR code for the food traceability system; and to determine the moderating effects of food involvement on the relationship between perceived information and perceived usefulness. Results from a survey of 420 respondents are analyzed using structural equation modeling. The study findings reveal that the extended TAM has a satisfactory fit to the data and that the underlying dimensions have a significant effect on consumers' intention to use the QR code for the food traceability system. In addition, food involvement plays a significant moderating function in the relationship between perceived information and perceived usefulness. The implications of this study for future research are discussed.

1. Introduction

With the development of information technology, the food traceability system which can reduce individuals' concerns about food safety by providing unambiguous information about the safety and quality of the whole process, from producers to consumers—has been broadly disseminated in the food industries (e.g., Badia-Melis, Mishra, & Ruiz-García, 2015; Cozzolino, 2014; Lin, Mark, Zetian, Trebar, & Xiaoshuan, 2014; Melo, Andrew, & Faleiro, 2015).

The policy makers in the public health sectors of many countries have accepted the food traceability system. For instance, the EU Rapid Alert System for Food and Feed (RASFF) employed the tracking software system Grapenet, an internet-based electronic service for certification of grapes for export from India to the EU (Badia-Melis et al., 2015). In the US, food traceability information has been mandatory since 2002, and facilities, transport organizations, storage facilities, and other food handlers have been responsible for recording information, including product descriptions and providers' and recipients' addresses and phone numbers if the goods cross state lines (US FMSA, 2011). South Korea also introduced a beef traceability system, which traces the distribution channel for beef (Badia-Melis et al., 2015).

The Quick Response (QR) code, one of the traceability systems, has been introduced to the food industries as a two-dimensional barcode (e.g., Shin, Jung, & Chang, 2012; Tarjan et al., 2011; Tarjan, Senk, Srdjan, Stankovski, & Ostojic, 2015). The QR code can hold considerably more information than the one-dimensional code, as it can embed text, video, advertisements, personal information, etc.

The QR code can be integrated into users' smartphone applications; that is, the smartphone can scan and decode information and messages about products that the QR code provides. The use of the QR code is increasing globally (Shin et al., 2012; Tarjan et al., 2011), but even with its introduction for food traceability in the food industry (Fig. 1), there has been limited research on consumer acceptance of its usefulness for providing food information or the use of the QR code for the food traceability system in the context of food research.

A significant number of studies have indicated that the technology acceptance model (TAM) is a suitable psychometric tool with which to assess consumers' acceptance of technology, determined by the individual's perception of the new technology's usefulness (e.g., Venkatesh & Davis, 1996). Therefore, the first purpose of this study is to apply the TAM to individuals' acceptance of the QR code for the food traceability system.

While, Chen and Huang (2013) examined the moderating effect of involvement between uncertainty, formed by the lack of information on foods, and consumer behavior. They found that the higher one's degree of involvement and the more the food traceability system mitigates their uncertainty, the greater their intention to buy a food. Other previous studies have also stressed that the function of consumer involvement in foods is a topic worth investigation (Karlsen, Sorensen, Foras, & Olsen, 2011; Verbeke & Vackier, 2004). Therefore, the other purpose of the present study is to determine the moderating effects of food involvement on the relationship between constructs of the TAM.

* Corresponding author.
E-mail addresses: yeongkim@kangwon.ac.kr (Y.G. Kim), ejwoo@kangwon.ac.kr (E. Woo).

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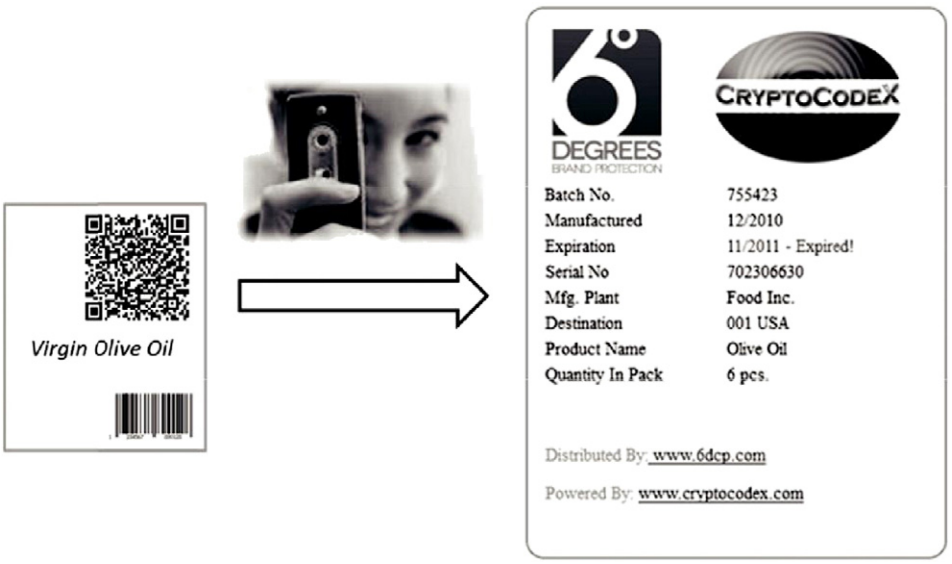

Fig. 1. An example of the QR code for the food traceability.
Source: 6 Degrees Counterfeit Prevention (2013) (www.6dcp.com).

2. Conceptual framework and hypotheses development

2.1. Technology acceptance model (TAM) and perceived information

Derived from the theory of human reasonability developed by Ajzen and Fishbein (1980), the TAM explains the determinants of users' acceptance of technology (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). The TAM shows that a user's attitude toward a particular technology is determined by the individual's perceived usefulness (PU) and perceived ease of use (PEOU) of the technology. The TAM is supported by the relationships among belief, attitude, and behavior (Davis et al., 1989).

PU refers to the degree to which a person believes that using a particular technology will enhance his or her job performance. Davis et al. (1989) found that there was a positive relationship between PU and the intention to use a word processing system and indicated that PU appeared to have a more significant relationship with usage behavior and intention than with variables like attitude, satisfaction, and perception. PEOU refers to the degree to which a person believes that using a particular technology will be effortless. A number of studies have found that PEOU is significantly correlated with current usage and future usage (Davis, 1989) and with a user's attitude toward acceptance of a system (e.g., Venkatesh & Davis, 1996). Behavioral intention (BI) refers to the strength of a user's intention to undertake a particular behavior, and attitude refers to the user's overall feeling about performing the target behavior. Hence, the TAM describes how an individual's beliefs, such as PU and PEOU, affect his or her attitude toward using a system, and BI is determined by those attitudes (Davis, 1989; Davis et al., 1989). Given these findings, this study hypothesizes that:

H1. Perceived ease of use (PEOU) positively affects perceived usefulness (PU).

H2. Perceived usefulness (PU) positively affects attitude toward using (ATT).

H3. Perceived ease of use (PEOU) positively affects attitude toward using (ATT).

H4. Attitude toward using (ATT) positively affects behavioral intention to use (BI).

While, research has noted the significance of perceived information (PI) in the acceptance of innovative technology and its link to consumers' intentions to use a new technology system (Amoako-Gyampah, 2007). In the context of food goods and services, Cox and Evans (2008) pointed out that the use of a new system is related to "credence qualities"; therefore, the purpose of a novel system is to provide the food-related information—such as naturalness, brand, origin, packaging, price, nutrition, ingredients, safety, sustainability, and environmental effects that satisfies people's informational needs. Several studies have also revealed that PI could have a significant effect on consumers' food choices and how well they like particular food products (Lee, Lusk, Mirosa, & Oey, 2016; Stolzenbach, Bredie, Christensen, & Byrne, 2013).

PI has been linked in empirical studies to influencing individuals' PU positively (e.g., Chen & Huang, 2013; Legris, Ingham, & Collerette, 2003; Rese, Screnie, & Baier, 2014). More specifically, Chen and Huang (2013) emphasized that the well-informed system must ensure that the information asymmetry between people and providers of food products can be eliminated, since people have begun to want information about what they eat. In addition, Rese et al. (2014) found a positive influence of information on users' consumption choice and on their confidence in the usefulness of the information provided by the innovative technology. Thus, the present study adds PI to the original TAM as an important variable to examine the PU of the QR code for the food traceability system.

Form this point of views, this study seeks to expand the TAM including PI in order to determine the effect of the constructs on the intention to use the QR code for the food traceability system, and given these findings, hypothesis is further proposed.

H5. Perceived information (PI) positively affects perceived usefulness (PU).

2.2. Food involvement

Involvement refers to the users' perceptions of the degree of goods' and services' significance, interest, and relevance (e.g., Mollet & Rowland, 2002; Pavlou & Gefen, 2004). According to Mollet and Rowland (2002), people tend to believe that foods contribute either directly or indirectly to their health, so consumers are interested in information on nutrition, calories, and ingredients. Involvement in food and information is one of the key determinants in consumers' decisions related to purchasing foods (Karlsen et al., 2011). Verbeke and Vackier