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Understanding millennial consumer's adoption of 3D printed fashion products by exploring personal values and innovativeness

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Abstract

The purpose of this study was to examine a hierarchical model of consumer innovativeness in the context of 3D fashion products. In particular, this study explored how different traits, such as personal values and innate innovativeness, predict a positive attitude towards 3D fashion products through domain-specific variables such as fashion innovativeness and fashion leadership. Using a convenience sample ($n = 250$), the data were collected through a self-administrated online survey. The results of this study identified personal values as an antecedent of innate innovativeness and found that fashion leadership played a critical mediating role between innate innovativeness and domain-specific innovativeness, in turn developing a positive attitude towards 3D fashion products which led to intention to use. Although the effect of innate innovativeness on domain-specific innovativeness (i.e., fashion innovativeness) was partially supported and no direct effects of personal values on domain-specific innovativeness was found, findings of this study contribute to existing literature on the Technology Acceptance Model and Consumer Innovativeness by examining additional predictors. The significant mediating role of fashion leadership was valuable as the result supported the key role of innovators as opinion leaders as discussed in the previous literature.

Keywords: 3D printed fashion products, Consumer innovativeness, Personal values-attitude-behavior hierarchy, Diffusion of innovation, Fashion leadership

Introduction

3D printing, also known as additive printing technology, is a new form of customization and production (Creasey 2014). Though additive printing technology is not new, a recent industry report found that the 3D print market reached $2.3 billion in 2013 and is expected to be worth $10.8 billion by 2021. The industry anticipates that every home in America will own a 3D printer by 2040 Allied Market Research (2015). Since 3D printing was invented in 1984, a variety of applications of 3D printing technology have been developed across several industries, including the automotive, aviation, manufacturing, medical, and jewelry industries (A Brief History 2015). Although 3D printing has been used by jewelry designers for some time, it is less common in fashion design due to the

difficulties of applying different materials. Only a few high fashion designers have introduced 3D printed fashion garments on the runway and/or as museum displays representing "the exclusive purview of Haute Couture" (Tarmy 2016, para. 2). However, in the near future, the fashion industry plans to utilize 3D printing technology in the production process, and there is little doubt that 3D printing will result in a new industrial revolution.

The advantages of adopting 3D printing for producing fashion products are countless. From fashion companies' perspective, the technology allows manufacturers to avoid the unnecessary use of materials, an advantage which can add economic value by reducing production costs (Morand 2016). In addition, mass customization using 3D printing could improve operating efficiency by reducing design, production, transportation, inventory, distribution, and store management costs, leading to sustainable industry practices that could revolutionize the whole fashion industry (Chabaud 2015; Kilbert 2016). Considering the changes that have occurred in the past 3 years in 3D printing applications in various fields, the fashion industry expects to adopt this technology to offer customized products within the next 5 years (Bensoussan 2017). From the consumer's perspective, 3D printing technology offers an opportunity to collaboratively produce and design a product (e.g., a tailored suit) at the end user's home (Parker 2016). Consumers' increased involvement in the production process and customizability through 3D printing can create authentic experiences related to the product, reduce fixed costs of tailoring, and provide the freedom to create a product (Lim and Cassidy 2014). Consequently, consumers will feel less frustrated with end products by reducing the discrepancy between the design and the user's body type and measurements (Kilbert 2016).

While 3D printing technologies have obvious advantages for consumers and businesses, the question still remains whether 3D printing technologies will take the place of current mass manufacturing processes and how consumers will perceive this technology (Rayna and Striukova 2016). Compared to the revolution in other technologies (e.g., the internet), the industry and consumers are concerned that 3D printing may not make significant progress in the fashion industry due to limited applicability to mass-consumed products (Gilpin 2014).

So far, a majority of the existing literature about 3D printing has focused on various processing technologies, materials, and system-related issues (Huang et al. 2013). Research on 3D printing in the context of business and fashion has paid little or no attention to why customers would accept or reject 3D-printed fashion goods (Parker 2016). Aforementioned, the extant 3D printing-related research in the context of fashion is focused on material and technology applications, which neglects consumers' perspective (Han et al. 2014). Therefore, this study aimed to explore potential drivers of intention to adopt 3D printed fashion products through combining three theoretical lenses: value-attitude hierarchy (Homer and Kahle 1988), the Theory of Reasoned Action (Fishbein and Ajzen 1977), and the hierarchical consumer innovativeness model (Hirschman 1980).

Similar to attitudes, values are a type of social cognition that explains one's adaptation into a certain environment and process of integrating/adapting environmental information (Kahle 1983). As the most abstract of the social cognitions, values reflect basic characteristics of adaption (Homer and Kahle 1988). As values are central and foundational

to a human's cognition, researchers have studied the role of personal values in lower-level consumer dispositions such as innovativeness (Burgess 1992). Consumer innovativeness has also been widely explored in the literature to explain consumers' propensity to use new technology (e.g., online shopping, computer technologies) (Hartman, et al. 2006; Venkatesh et al. 2012).

The current study aims to provide comprehensive insights into individual differences (e.g., personal values, consumer innovativeness) in relation to attitude toward intention to use 3D printed fashion products by exploring potential underlying motives in a multi-level construct which incorporates personal values and hierarchical innovativeness (i.e., innate, domain-specific). Because personal values are the fundamental source of human behaviors, are closely connected to human needs, and may be better indicators of consumer behavior than are demographic or psychographic variables, this study examines the role of personal values in adopting 3D fashion products (Schwartz 1994; Steenkamp et al. 1999).

Findings from this study will contribute to the literature and help practitioners by suggesting predictors of 3D printed product adoption among fashion consumers. The following three research questions were used to guide this study.

1. What are the underlying motivations of consumers' adoption of 3D printed fashion products?
2. Do personal traits such as personal values and innate innovativeness impact intention to use 3D printed fashion products through mid-range variables such as fashion innovativeness and fashion leadership?
3. Do domain-specific variables such as fashion innovativeness and fashion leadership mediate the relationship between personal values and intention to adopt 3D printed fashion products?

Theoretical foundation and conceptual framework

Several approaches exist to explore consumers' adoption of new technologies. One of the most well-known and widely used theories is the Theory of Reasoned Action (TRA), introduced by Fishbein and Ajzen (1977). This theory provides a theoretical foundation for researchers to understand consumers' attitudes and behavioral intentions, which are the immediate antecedents of behavior (Davis 1989). In particular, TRA suggests that individual motivational factors such as *subjective norms* and *attitude* are key determinants of the likelihood of performing specific behaviors (Ajzen and Fishbein 1980). Attitude is determined by individuals' beliefs about specific performance or attributes of performance, and subjective norms address individuals' normative beliefs about performing a specific behavior (Sheppardet al. 1988). In the innovation/technology adoption literature, TRA has been applied to investigate user acceptance and usage of technology (Davis 1989). Applying TRA in the context of technology adoption behavior, the Technology Acceptance Model (TAM) provides theoretical links between two factors that measure individuals' *perceptions*—specifically, Perceived Usefulness (PU) and Perceived Ease of Use (PEU)—and their effects on those individuals' attitudes and intention to use new technology. TAM is grounded in the assumption that the way consumers evaluate the attributes of an innovation is ultimately related to their decision to adopt

the innovation (Claudy et al. 2015). However, researchers are increasingly concerned about the TAM model because of its incomplete and parsimonious measures as well as the measures' lack of adaptability outside an organizational context (Bouwman et al. 2005). López-Nicolás et al. (2008) claimed that TAM is insufficient for explaining the effects of social influence and users' intention. Therefore, instead of examining individuals' *perceptions* of attributes of innovation (i.e., PU, PEU), this study incorporates the value-attitude-behavior hierarchy in conjunction with the diffusion of innovation theory as theoretical frameworks to examine how consumers' underlying motivations affect their intention to adopt 3D printed fashion products. Up to this point, the literature on new technology adoption has been dominated by TAM or the Theory of Planned Behavior (TPB), which is an extended version of TRA, while the impact of personal values on new technology adoption has gained much less attention (Paulssen et al. 2014).

Rokeach (1973) defined a value as "an *enduring belief* or *end-states of existence* that a specific mode of conduct or end-state is personally preferable to its opposite" (Homer and Kahle 1988, p. 638). Values are often used to explain one's behavior regarding changing environments, because values are the most abstract of the social cognitions and reflect the most basic characteristics of the adaptor (Kahle 1983). According to Kahle (1980), values guide individuals' attitudes and behaviors in a certain situation. Similarly, Williams (1979) identified values as a behavioral foundation, motivation, and criterion for judgment, preference, and choice. While attitudes and behaviors are affected by situations and change over time, values are stable and persistent beliefs that transcend objects and situations (Rokeach 1973; Schwartz 1994). Based on the generally accepted idea that values explain attitudes and behaviors, there are different approaches to capture values (Vinson et al. 1977). Mitchell (1983) developed the Values and Life Style (VALS) items to classify people into one of nine lifestyle groups based on their value orientation, but this model has been criticized because the measures lack robustness (Kahle et al. 1986). Theoretically grounded in Rokeach's (1973) Value Survey (RVS) and Feather's (1975) and Maslow's (1975) work, Kahle (1983) introduced the List of Values (LOV), now one of the most widely adopted value constructs. Closely tied to social adaptation theory and life's major roles (e.g., marriage), the LOV measures mental health; well-being; and adaption to society, roles and self (Kahle 1983). To compare VALS and LOV, Kahle et al. (1986) conducted statistical examination and concluded that LOV is a significant predictor of consumer behaviors. Consistent with Kahle's (1983) approach, Schwartz (1994) identified ten motivationally distinct types of values that describe individuals' values (i.e., motivational goals). These types of values include power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. This approach elucidates the importance of the hierarchical cognition-action process in comprehending individuals' behavior in relation to a social context (Schwartz 1994). Openness to change, which is part of an individual's perception of tradition, and self-enhancement, which is part of an individual's perception of self-direction have been used in the consumer innovativeness literature to explain the desire for new experience (Hartman et al. 2006; Steenkamp et al. 1999).

Consumer innovativeness refers to the tendency or willingness to embrace change and try new things (Cotte and Wood 2004; Park et al. 2010). Theoretically grounded in Roger's (1995) diffusion of innovation theory, the concept of innovativeness has been developed

to address how the characteristics of the adopter affect the process of purchasing new products or services (Midgley and Dowling 1978; Foxall 1988; Im et al. 2003). Because the time-of-adoption method which addresses timing as the key characteristics of innovativeness has been criticized as insufficient to predict a future behavior, Midgley and Dowling (1978) developed a new measure to assess consumer innovativeness based on an adopter's personality traits, situational factors, and characteristics of innovation: innate innovativeness, domain-specific innovativeness of interests, and actual innovation adoption intention (Goldsmith and Hofacker 1991). Roger's (1962) original approach to innovation discussed the impact of social systems, media, and the public on individuals' perception of innovation. Midgley and Dowling (1978) advanced this approach by using different levels of innovativeness to scrutinize an individual's general predisposition to seek new innovation, depending on product categories and domains of interest (Vandecasteele and Geuens 2010). Vandecasteele and Geuens (2010) developed a multi-dimensional scale that captures four levels of innate innovativeness. These levels include socially motivated innovativeness, which addresses the social need for differentiation; hedonic innovativeness, which focuses on expected positive emotional feelings after new product purchases; cognitive innovativeness, which describes how consumers perceive and experience new product purchases; and functional innovativeness, which centers on perception of the functionality of a new product. Compared to uni-level approaches to innate innovativeness, this approach provides a comprehensive understanding of consumers' motivation to adopt new products or ideas (Bartels and Reinders 2011).

Considering that few present consumers have purchased or experienced 3D printed fashion products, understanding the underlying motivations at different levels should help to better explain the novel nature of the study context (Parker 2016). For the same reason, this study adopted fashion leadership to examine a social influence on individuals' attitudes toward 3D printed fashion products.

The hierarchical perspective of consumer innovativeness

Innate innovativeness has been identified as a personal trait and the concept has been developed through a variety of psychological theories. Researchers have conceptualized innate innovativeness as a certain cognitive style (Foxall 1995; Kirton 1976), a desire for novelty, a need for stimulation, a tendency to engage in cognitively or sensory stimulating experiences (Hirschman 1980; Venkatesan 1973; Venkatraman and Price 1990), or a need to be unique (Burns and Krampf 1991). Although this innovativeness construct captures necessary psychometric properties of innovativeness, it lacks the ability to predict actual innovative behavior or intentions, because consumers who are innovative in one product category might not be innovative in others (Hoffmann and Soyez 2010). Therefore, researchers have introduced the concept of domain-specific innovativeness, which is defined as "the tendency to learn about and adopt innovations within a specific product category" (Goldsmith and Hofacker 1991, p. 210). This concept helps capture consumers with a higher degree of innovativeness on a specific domain of products, which, in turn, predicts actual behavior or intention. In an attempt to fill the gap between innate innovativeness and attitude, the domain-specific innovativeness of *fashion innovativeness* was included in this study. Figure 1 shows the research model for this study.

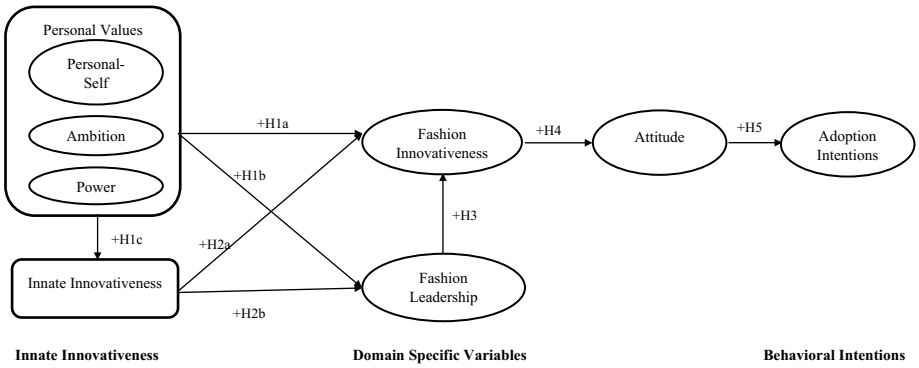

Fig. 1 Proposed research model

Literature review and hypotheses development

The effects of personal values on innate innovativeness, fashion innovativeness, and fashion leadership

Personal values are *learned* beliefs about certain behaviors and serve as a guiding principle of an individual's life (Rokeach 1973; Schwartz 1994). As guiding principles, personal values are the part of the domain of motivational goals and represent underlying needs that influence attitudes, action selection, and behaviors (Schwartz and Bilsky 1987). According to Schwartz and Bilsky (1987), personal values are cognitive representations of a person's basic needs, including biological, interpersonal, and institutional support. Conceptually similar, personality traits are "*enduring characteristics*" of the individual, which explain consistency of behavior in response to the environment (Allport 1961). Since both concepts assess the individual's personality and priorities regardless of the situation or environment, these two concepts have been widely discussed in the literature (Olver and Mooradian 2003; Roccas et al. 2002).

Although the causal relationship between values and personality traits is still being discussed, some researchers have elaborated the distinction between the two constructs (Blisky and Schwartz 1994; Costa and McCrae 1992). Values are assessed by asking what people *believe* is important and *why* they act in a certain way; on the other hand, personality traits describe tendencies and feelings that reflect what people are like (Roccas et al. 2002). In other words, values describe a person's goals and underlying motivations, which may or may not be reflected in behavior without a mediating variable; on the other hand, personality traits explain different levels of behavioral tendencies and patterns of attitude, thoughts, and feelings (McAdams 1995; Parks-Leduc et al. 2014; Schwartz 1994). Since values tend to be consistent, Fulton et al. (1996) also demonstrated the indirect effects of values on attitude and behavior via other variables in the cognitive hierarchy. When other conditions remain the same, people tend to behave in ways consistent with their values (Rokeach 1973; Schwartz 1994). Accordingly, values serve as ideals that guide one's behavioral outcomes as the basis of one's cognitive structure (Burgess 1992; Steenkamp et al. 1999).

As previously mentioned, different approaches and dimensions exist to operationalize/conceptualize personal values and traits. Consistent with the findings of Steenkamp et al. (1999) and Hartman and Samra (2008), this study examined personal values as

an antecedent of innate consumer innovativeness and domain-specific innovativeness. Steenkamp et al. (1999) identified the positive effects of personal values on consumer innovativeness using consumer data from 11 countries. Considering that personal values often contribute to understanding consumers' cognitive properties, which in turn lead to behavioral decisions, researchers often use personal values to predict consumers' predisposition towards attitudes (Goldsmith and Hofacker 1991). Our study used a shortened version of the personal values scale demonstrated by Hartman et al. (2006), which has three sub-constructs: personal-self, ambition, and power. This shortened version was developed from Schwartz's (1994) Value Survey (SVS).

As permanent beliefs of an individual, values symbolize one's needs and behavior (Daghfous et al. 1999). When consumers are open to change and are not afraid of unknown situations or risks, they are likely to evaluate changes in the market as acceptable (Hartman et al. 2006). According to Kahle's (1980) theoretical approach to values, there are intervening variables between personal values and behaviors (Homer and Kahle 1988; Shim and Eastlick 1998). Although researchers have not agreed on whether or not innovativeness is the highest abstract trait, several studies have shown values to be a central feature of a person's cognitive structure (Burgess 1992; Hartman et al. 2006). For example, Steenkamp et al. (1999) confirmed the link between personal values and all domains of innovativeness. Also, Hartman et al. (2006) identified personal values as a predictor of domain-specific innovativeness (e.g., vicarious innovativeness) among adolescents in the context of web-consumption. In sum, regardless of the measures used, values have been shown to be an influential factor in explaining consumers' innovativeness.

Opinion leadership in fashion (i.e., fashion leadership) is strongly related to individuals' characteristics and socio-economic variables (Kahle and Shoham 1995). Rose et al. (1995) discussed the idea that women who are high in self-fulfillment and self-oriented values are likely to be opinion leaders in business and fashion related issues. Previous research on fashion leadership has identified fashion as a tool to express the concept of self or self-image; for example, people who tend to pay attention to others' evaluation (i.e., people who are high in self-consciousness) are likely to select new fashion to impress others (Goldsmith et al. 1991). In this regard, values differentiate fashion leaders from non-leaders (Rokeach 1973). Goldsmith et al. (1991) reported the positive effects of several value items (e.g., excitement) on fashion consciousness and fashion leadership. Because fashion items are symbolic objects that enhance self-image, fashion items represent consumers' values and lifestyle (Cowan and Dai 2014). Individuals who desire excitement (i.e., who exhibit hedonism) and new experiences (i.e., are open to change) are likely to buy more new fashion items and enjoy the process (Goldsmith and Stith 1992). However, no previous research has sufficiently explained how fashion leadership influences purchase intention of 3D printed fashion products. Therefore, we can surmise that fashion leaders are likely to be more open to new products such as 3D fashion goods and more ambitious to try them. In sum, the following hypotheses are proposed:

H1a: Personal values positively influence a domain-specific fashion innovativeness.
H1b: Personal values positively influence fashion leadership.
H1c: Personal values are positively related to innate innovativeness.

The effects of innate innovativeness on fashion leadership and fashion innovativeness

Innovativeness is defined as the degree to which a person is relatively earlier in adopting an innovation than the general population within his or her social system (Rogers 1962; Rogers and Shoemaker 1971). Previous research has claimed that measures of innate innovativeness can be used to classify the general population into different categories based on individuals' varying perceptions of innovation (Steenkamp et al. 1999).

Researchers agree that innate innovativeness is a predisposition that is correlated with risk taking, impulsivity, and using new products/services over previous consumption patterns (Venkatesan 1973). As a trans-situational personality trait, innate innovativeness is relatively stable and reflects individuals' willingness to try a new idea, product, or service independently (Hoffmann and Soyez 2010; Midgley and Dowling 1978). While domain-specific innovativeness emphasizes a specific domain of interest in adoption (Goldsmith and Flynn 1995), innate innovativeness presents consumers' general traits related to innovation (Hirschman 1980). Prior research on innate innovativeness indicates that every individual possesses innate innovativeness to some degree, since it is a trait-like construct (Im et al. 2003). Previous research has shown the effects of an individual's innate innovativeness on adoption of innovations (Foxall 1995; Im et al. 2003; Lim and Park 2013). However, previous studies on innate innovativeness reveal inconsistent findings about the direct relationship between innate innovativeness and behavioral outcomes (Im et al. 2003; Lim and Park 2013). For instance, Midgley and Dowling (1978, 1993) as well as Hirschman (1980) argued that general innovativeness does not adequately explain specific innovation adoption behaviors due to the abstract and hypothetical nature of measurements.

Since innate innovativeness is a personality-like trait, the direct "trait-behavior" relationship is not sufficient to explain possible effects of social influences such as interpersonal communications (Im et al. 2007), personal characteristics (Midgley and Dowling 1978), or product categories (Goldsmith and Hofacker 1991). For instance, a consumer who is willing to buy an innovative consumer electronic product is not necessarily willing to purchase an innovative fashion product. Muzinich et al. (2003) described the difficulties of generalizing innovative behavior across product categories.

In addition to examining general tendency to adopt innovation (i.e., innate innovativeness), this study adopted the scale for motivated consumer innovativeness (MCI) which was introduced by Vandecasteele and Geunes (2010) to measure different aspects of innate innovativeness. Also, domain-specific (i.e., specific context/interests) innovativeness was added as a mediating variable that strengthens the relationship between innate innovativeness and actual adoption behavior (Mowen et al. 2009). Thus, it is plausible that individuals with higher levels of innate innovativeness are likely to positively perceive 3D fashion products.

Rogers (1962) enumerated six aspects of the characteristics of innovation adopters: security-anxiety, values, mental ability and conceptual skills, social status, cosmopolitanism, and opinion leadership. Among these characteristics, opinion leadership has frequently been studied and reported to be positively related to adoption behavior (Schrank and Lois Gilmore 1973). In general, innovators tend to share information and make changes in society (Rogers 1962). For example, Eastman et al. (2014) posited that a person with a higher level of innovativeness will have a stronger tendency to share

information or their own experience related to the products or services. This characteristic is similar to that of leaders in fashion (Schrank and Lois Gilmore 1973). Workman and Johnson (1993) suggested that fashion innovators seek variety that can stimulate them and are interested in new clothing styles.

Although 3D printing technology has been proliferating among product designers for more than a decade, the adoption of 3D printing in the fashion industry and consumer purchases of 3D-printed fashion products have been minimal. Since the 3D fashion product manufacturing process may be the next revolutionary manufacturing process, consumers' tendency to accept or perceive new changes (i.e., their tendency towards new innovation) can predict adoption intention (Baskin 2014). Thus, we hypothesize:

H2a: Innate innovativeness positively influences domain-specific fashion innovativeness.
H2b: Innate innovativeness positively influences fashion leadership.

The effects of fashion leadership on fashion innovativeness

Rogers (1962) noted that opinion leadership is one of the critical determinants of the adoption of innovation. Opinion leadership refers to "the degree to which an individual is able to influence other individuals" (Rogers 1962, p.331). As a domain-specific variable, opinion leadership affects others' adoption decisions, attitudes, and opinions via interpersonal communications (Tellis et al. 2009). Since opinion leaders are more likely than the general public to seek out more information about products and services related to their interests, they are likely to try new products in their particular domain (Flynn et al. 1996). Eastman et al. (2014) confirmed that millennials with high opinion leadership show a strong relationship between product involvement and actual purchase of mobile technology. Grewal et al. (2000) also stated that innovative consumers tend to share their experiences and knowledge about a new product with others, influencing the purchase decisions of others. In order for innovative consumers to share, try, and purchase specific innovative products, they must be willing to experience new technology (Im et al. 2007). Researchers have identified opinion leadership as a mediating variable between the content of interests and other consumers (Ribeiro-Cardoso et al. 2016).

Extant studies have documented the effects of innovativeness and opinion leadership on adoption behavior, but there are mixed results on the relationship between innovativeness and opinion leadership (Flynn et al. 1996; Hoffmann and Soyez 2010). For example, Summers (1971) suggested that innovators and opinion leaders are one and the same, whereas Grewal et al. (2000) argued that innovativeness is a predictor of opinion leadership. Schrank and Lois Gilmore (1973) confirmed that innovators are not opinion leaders all the time, but some individuals may play a dual role as influencers and innovators. As opinion leaders are likely to be knowledgeable about products in their domain of interest, it is highly likely that they will adopt an innovation earlier than others and then pass on the information (Shi and Fernandes 2014).

Sproles (1979) applied the diffusion of innovation theory in the context of fashion. Because not every consumer purchases the latest fashion products or newest styles before their commercial introduction in the marketplace, fashion adoption follows a path similar to that of diffusion of innovation (Noh et al. 2014). Sproles (1979) confirmed the role of innovativeness and fashion opinion leadership in the adoption of a new

fashion. Workman and Johnson (1993) found positive relationships between fashion opinion leadership and fashion innovativeness. Also, Muzinich et al. (2003) postulated individual personality and information seeking behavior as key determinants of fashion innovativeness. The study by Ruvio and Shoham (2007) on consumers' fashion product shopping demonstrated a positive correlation between generalized innovativeness and opinion leadership.

Though several studies consider innovativeness and opinion leadership as one construct, consistent with Rogers' (1962) perspective, this study presumed a potential relationship between innovativeness and opinion leadership as separate constructs. Considering that individuals with a strong interest in recent fashion trends have more exposure to recent technology in fashion, as well as more willingness than others to explore the latest trends, it is plausible that individuals who tend to be opinion leaders are likely to try innovative fashion products (e.g., 3D printed fashion products). Therefore, the following hypothesis is suggested:

H3: Fashion leadership positively influences domain-specific fashion innovativeness.

The effects of fashion innovativeness on attitudes towards 3D printed fashion products

Domain-specific innovativeness refers to an individual's preference or interests regarding a new product in a certain category and reflects the tendency to seek information about that new product (Goldsmith and Hofacker 1991). Given that innate innovativeness is a trait-like construct, domain-specific innovativeness serves as an intervening variable between a trait and actual behavior (Eastman et al. 2014; Hirunyawipada and Paswan 2006). Previous research on innovativeness has verified that domain-specific innovativeness is a strong predictor of consumers' adoption behavior (Rahman et al. 2014). In the context of the fashion industry, fashion innovativeness has been discussed as a determinant of new fashion adoption and intention behavior (Goldsmith and Hofacker 1991). Goldsmith (2000) asserted that fashion innovativeness is a predictor of consumers' tendency to purchase new fashionable clothing. In a recent study by Choo et al. (2014), consumers with high fashion innovativeness were found to be more likely to purchase new and trendy products/services. Accordingly, consumers with high fashion innovativeness are likely to perceive a new technology (e.g., 3D printing) positively and favorably and thus to develop the intention to try it. Thus, the following hypothesis is proposed:

H4: Domain-specific fashion innovativeness positively influences attitude toward 3D printed fashion products.

The effects of attitude on intention to use 3d printed fashion products

Extensive research on technology adoption shows that people's motives to adopt innovation may differ, but their motivations influence their decisions (Claudy et al. 2015). In general, attitudes represent individuals' motives, which influence behavioral outcomes. An attitude is defined as a "psychological tendency that is expressed by evaluating a particular entity (e.g., innovation) with some degree of favor or disfavor" (Eagly and Chaiken 1998, p. 1). Many studies in marketing have presented the critical role of attitude in an individual's behavioral intention and adoption behavior (Bagozzi 1992; Claudy et al.

2015). Consistent with findings from previous studies, the present study posits that positive attitude towards 3D printed fashion products leads to the intention to purchase the product by creating a positive perception or belief. Thus, we postulate:

H5: Attitude toward 3D printed fashion products positively influences intention to adopt 3D printed fashion products.

Methods

A quantitative research design, and more particularly a survey based approach, was implemented for this study. As the main purpose of this study was to examine a widely adopted innovation theory in the context of 3D printed fashion goods, as well as to explore relationships between variables (e.g., personal values and domain-specific variables), the survey method was appropriate for this study (Creswell 2013). In particular, this study aimed to investigate potential predictors of consumers' adoption of 3D printed fashion goods (e.g., personal values, innate innovativeness) and the effects of innovativeness on attitude and intention toward 3D fashion goods in a millennial population as described in the research question.

In order to develop the current research model, we conducted a thorough literature search and review from various sources such as Google Scholar and EBSCO. Through the literature review, we found that little research has investigated consumer behaviors in the context of 3D printing. Thus, we have implemented two widely adopted and examined research frameworks: value-attitude-intention hierarchy (Homer and Kahle 1988) and diffusion of innovation (Rogers 1962). Personal values have been adopted to explore consumers' underlying motivation to perform a certain behavior, and Roger's diffusion model is a seminal theoretical foundation which explains new adoption behavior. Since we hoped to see what leads consumers to use 3D printed fashion goods, these two research frameworks are appropriate for investigating underlying motives of consumers.

Sample and data collection procedure

Data were collected through an online survey administered to undergraduate students enrolled in the fashion program at a large Midwestern university. Since the purpose of this study was to investigate the adoption of 3D printed *fashion* goods among millennials, participants were recruited from the fashion discipline. Selection of young consumers was appropriate because the context of this study is new. Prior research on consumer innovativeness and new product adoption has confirmed that age is an important factor in adopting new products or ideas (Goldsmith and Stith 1992). For example, Dickerson and Gentry (1983) demonstrated that demographic variables such as age and income are related to new computer adoption behavior. The convenience student sample consisted of male and female consumers aged 18 and over who were invited to participate in the survey. Participants were recruited from several classes, where a link to the online survey was distributed. Participants were given extra credit as an incentive for their participation upon completion of the survey or had the choice to submit an alternative assignment if the student chose not to participate in the survey. The study was approved by the university's Institutional Review Board (IRB) prior to collecting the data. A total of 299 surveys were collected, and 250 responses were useable after excluding incomplete surveys (response rate of 83.6%).

Instrument development

Because of the novel nature of the study topic, the survey began with a brief description of 3D printing technology and products. After completing the consent form, participants were given the following definition of 3D printing: "additive manufacturing, where very fine layers of material are superimposed according to a digital design to the point where they end up building a distinct object (ASTM standard)." Examples of 3D printed fashion products such as shoes, shoe soles, bags, and accessories were also given.

Followed by the general description on 3D printed fashion products, participants were asked a screener question: "Are you aware of 3D printing technology?" Participants who answered "yes" to the screener question were allowed to proceed further to take the survey. Measurement items for the questionnaire were generated from the existing literature.

Measurement items for personal values were adapted from Schwartz's (1994) Value Survey (SVS). In particular, twelve items were used to evaluate openness to change and reluctance to accept change (Hartman et al. 2006). Participants were asked to rate these items using a 5-point Likert-type scale (1 = not at all important to 5 = extremely important). Consumer innovativeness was measured on two levels: 21 items for innate innovativeness (e.g., "I love to use innovations that impress others") (Vandecasteele and Geuens 2010) and six items for domain-specific innovativeness (e.g., "In general, I am among the first in my circle of friends to try 3D printed fashion products") using a 7-point Likert scale anchored with "strongly disagree" and "strongly agree" (Goldsmith and Hofacker 1991). As a mediating variable, four items were adapted to evaluate fashion leadership (Goldsmith et al. 1993) using 7-point Likert-type scales (1 = Strongly disagree, 7 = Strongly agree) (e.g., "I am aware of fashion trends and want to be one of the first to try them"). Attitude toward 3D printed fashion products was measured via five semantic differential scales (Wansink 1994), and intention to adopt 3D printed fashion products was measured via six items adapted from Ajzen and Fishbein (1980). Cronbach's α reliabilities of all measurement items were reported to be .70 or greater. Demographic questions (e.g., age, gender, and ethnicity) were also included toward the end of the survey.

Data analysis procedure

A variety of statistical techniques were used to analyze the survey data. First, descriptive statistics were performed on participants' demographic characteristics. Second, as most of the items were adapted from existing, well-established scales, the internal consistency was tested using Cronbach's α coefficient. Third, confirmatory factor analysis (CFA) was conducted to address the construct validity. To analyze the hypothesized relationships, structural equation modeling (SEM) was used to test research hypotheses (*H1–H5*). Hayes' (2012) process tool was used to test for mediation as a post hoc analysis. SPSS 22.0 was used for running descriptive statistics, reliability analysis, and Hayes' process, and MPlus 7.0 was used for conducting CFA and SEM (Table 1).

Results

Preliminary analysis

A total of 250 complete surveys were deemed suitable for the analysis. The participants' ages ranged from 18 to 34, with the majority being younger than 25. Thus, our sample was a primarily millennial sample. The majority of the participants were female (94.0%) and Caucasian (68.8%). See Table 2 for more details on the demographic characteristics

Table 1 Survey instrument measurements

Construct/sub-constructs	Items	Standardized factor loading	Cronbach's α	AVE	CR
Innate Innovativeness	(Strongly disagree–strongly agree)			.66	.88
Social					
	1. I love to use innovations that impress others	.763	.87		
	2. I like to own a new product that distinguishes me from others who do not own this new product	.899			
	3. I prefer to try new products with which I can present myself to my friends and neighbors	.863			
	4. I like to outdo others, and I prefer to do this by buying new products which my friends do not have	.608			
Functional					
	1. If a new product gives me more comfort than my current product, I would not hesitate to buy it	.812	.91		
	2. If a new time-saving product is launched, I will buy it right away	.711			
	3. If an innovation is more functional, then I will usually buy it	.875			
	4. If I discover a new product in a more convenient size, I am very inclined to buy this	.859			
	5. If a new product makes my work easier, then this new product is a "must" for me	.838			
Hedonic					
	1. I am an intellectual thinker who buys new products because they set my brain to work	.685	.89		
	2. It gives me a good feeling to acquire new products	.785			
	3. Innovations make my life exciting and stimulating	.843			
	4. Acquiring an innovation makes me happier	.876			
	5. The discovery of novelties makes me playful and cheerful	.817			
Cognitive					
	1. I mostly buy those innovations that satisfy my analytical mind	.728	.93		

Table 1 continued

Construct/sub-constructs	Items	Standardized factor loading	Cronbach's α	AVE	CR
	2. I find innovations that need a lot of thinking intellectually challenging and therefore I buy them instantly	.824			
	3. I often buy new products that make me think logically	.891			
	4. I often buy innovative products that challenge the strengths and weaknesses of my intellectual skills	.882			
	5. I am an intellectual thinker who buys new products because they set my brain to work	.903			
Fashion leadership	(Strongly disagree–strongly agree)		.78	.53	.77
	1. I am aware of fashion trends and want to be one of the first to try them	.714			
	2. I am the first to try new fashion; therefore, many people regard me as being a fashionable leader	.700			
	3. It is important for me to be a fashion leader	.763			
Domain specific fashion innovativeness	(Strongly disagree–strongly agree)		.74	.50	.71
	1. If I heard that a 3D printed fashion product was available in the store, I would be interested enough to buy it	.779			
	2. I will research 3D printed fashion products even if I have not heard of it before	.638			
	3. I know 3D printed fashion products before most other people in my circle know	.591			
Personal values	(not at all important to extremely important)			.65	.84
Personal-self	1. Having exciting and stimulating experience	.738	.92		
	2. Being imaginative, creative, unique	.839			
	3. Being curious, interested in many things	.824			
	4. Enjoying leisure time, friends, food	.796			
	5. Being free to think and do what I want	.823			
Ambition	1. Choosing my goals, deciding what I become	.939	.95		

Table 1 continued

Construct/sub-constructs	Items	Standardized factor loading	Cronbach's α	AVE	CR
	2. Achieving goals	.916			
	3. Being capable, effective, efficient	.916			
Power	1. Having people seek my opinion	.862	.83		
	2. Being a leader, commanding	.757			
	3. Getting recognition from friends, peers	.745			
Attitude	(7 point semantic scale)		.92	.67	.91
	1. Bad: good	.773			
	2. Unappealing: appealing	.774			
	3. Inappropriate: Appropriate	.847			
	4. Unreasonable: reasonable	.832			
	5. Incongruent: congruent	.858			
Intentions	(7 point semantic scale)		.95	.78	.95
	1. Unlikely: likely	.942			
	2. Nonexistent: existent	.939			
	3. Improbable: probable	.947			
	4. Impossible: possible	.857			
	5. Uncertain: certain	.803			
	6. Definitely would not use: definitely would use	.781			

AVE average variance extracted, *CR* composite reliability

$p \leq .05$

Table 2 Characteristics of the sample ($n = 250$)

Demographics	%
Gender	
Male	4.8
Female	94.0
Age	
18–24	98.8
25–34	1.2
Ethnicity	
White or Caucasian	68.8
Pacific Islander or Hawaiian	1.6
Native American or Alaskan Native	.4
Black or African American	14.4
Hispanic, Latino or Spanish origin	2.8
Multiracial	3.6
Asian	8.4

of the participants. The Cronbach's α for all variables ranged from .74 to .95, indicating the required internal consistency (Hair et al. 1998). Two items for domain-specific fashion innovativeness were deleted to meet the criteria of internal consistency (α > .70) for that variable.

Results of the measurement model

To test the construct validity, the proposed model (Fig. 1) was tested through CFA using the maximum-likelihood estimation procedure. The measurement model through CFA resulted in an acceptable model fit ($\chi^2 = 1975.176$, $d_f = 1010$, $p < .001$; CFI = .90; RMSEA = .06, SRMR = .06) after deleting four items with factor loadings less than .60. Convergent validity for each construct was found, as all standardized factor loadings were greater than .70 and significant (t values ranged from 10.264 to 114.065, $p < .001$). Average variance extracted for each construct (AVE) was higher than or equal to .50 (Hair et al. 1998). AVE ranged from .50 to .78 (See Table 3). When AVE was compared with the squared correlation between constructs (Fornell and Larcker 1981), for each pair of constructs, the squared correlations between the two constructs were less than the AVE for each construct. Hence, the conditions for discriminant validity were satisfied. See Table 3 for the correlations among all the research variables.

Results of hypothesis testing

To test the proposed hypotheses (*H1–H5*), Structural Equation Modeling (SEM) was conducted. The results of structural model showed an acceptable fit ($\chi^2 = 2017.624$, $d_f = 1017$, $p < .001$; CFI = .90; RMSEA = .06, SRMR = .09) based on the comparison with the established fit indices. SEM analysis supported the following hypotheses: H1c, H2b, H3, H4, and H5. The rest of the hypotheses (i.e., H1a, H1b, and H2a) were not supported. See Table 4 for the SEM results. Personal values positively influenced innate innovativeness ($\beta = .793$, $p = .000$). Innate innovativeness positively influenced fashion leadership ($\beta = .637$, $p = .000$). Fashion leadership positively influenced domain-specific fashion innovativeness ($\beta = .331$, $p = .000$). Domain-specific fashion innovativeness positively influenced attitude toward 3D printed fashion products ($\beta = .415$, $p = .000$). Finally, attitude toward 3D printed fashion products positively influenced intention to adopt 3D printed fashion products ($\beta = .648$, $p = .000$). The model explained 42% of the variance in the intention to adopt 3D printed fashion products ($R^2 = .42$, $p = .000$).

Post-hoc analysis of mediation using Hayes' process

To test the mediating role of fashion leadership, Hayes' (2012) process tool was used. See Table 5 for results. Mediation analysis revealed that fashion leadership mediated the relationship between innate innovativeness and domain-specific fashion innovativeness. The indirect effect of innate innovativeness on domain-specific fashion innovativeness

Table 3 Correlation coefficients between research variables

Variables	1	2	3	4	5	6
1. Innate innovativeness	*.66*					
2. Fashion leadership	.299**	*.53*				
3. Domain-specific fashion innovativeness	.274**	.306**	*.50*			
4. Personal values	.512**	.107	.159*	*.65*		
5. Attitude	.264**	.191**	.229**	.195**	*.67*	
6. Intentions	.311**	.218**	.423**	.164*	.602**	*.78*

Average variance extracted (AVE) is shown on the diagonal

* $p \leq .05$; ** $p \leq .01$

Table 4 Summary of support for hypotheses

Hypothesis	Hypothesized effect	*p*-value	Standardized β	*t*-value	Result	Supported
H1a	Personal values ➞ fashion innovativeness	.857	.032	.181	NS	No
H1b	Personal values ➞ fashion leadership	.031	− .376	− 2.161	S but negative	No
H1c	Personal values ➞ innate innovativeness	.000	.793	18.513	S	Yes
H2a	Innate innovativeness ➞ domain specific fashion innovativeness	.170	.243	1.371	NS	No
H2b	Innate innovativeness ➞ fashion leadership	.000	.637	3.893	S	Yes
H3	Fashion leadership ➞ fashion innovativeness	.000	.331	3.715	S	Yes
H4	Fashion innovativeness ➞ attitude	.000	.415	6.052	S	Yes
H5	Attitude ➞ intention to adopt	.000	.648	15.555	S	Yes

S significant, *NS* non-significant

Table 5 Results of Hayes' mediation analysis

Hypothesized effect	*p*-value	Result
Fashion leadership mediates the relationship between innate innovativeness and domain-specific fashion innovativeness	.0092 (LLCI) to .0342 (UPCI)	S

S significant

was significant (LLCI = .0092 and ULCI = .0342). Thus, the results demonstrated a mediating role of fashion leadership.

Discussion

3D printing technology in fashion has been widely discussed among industry professionals (Brooke 2013). As the benefits of adopting 3D printing in fashion are recognized, the industry expects that 3D printing will revolutionize the fashion industry by reducing production, transportation, and stock costs as well as by actualizing a "mass customization" where consumers will no longer struggle to find the right size clothing and will be able to customize a design to fit their exact body type in their own homes (Chabaud 2015; Kilbert 2016).

Despite increasing interest in 3D printing technology in the fashion industry, few studies have investigated consumers' adoption of 3D printed fashion products. So far, the existing research on 3D printing has tended to address technological specifications (e.g., Gibson et al. 2014), new chemical/material applications (Studart 2016), medical field applications (e.g., Melchels et al. 2012), or prototyping (Gibson et al. 2014). To extend the current theoretical and empirical knowledge, this study aimed to explore determinants of the intention to use 3D printed fashion products. In particular, this study examined how individuals' underlying motivations (i.e., personal values, consumer innovativeness) led to positive attitudes toward 3D printed fashion products through two domain-specific variables (i.e., fashion innovativeness, fashion leadership). Theoretically grounded in TRA (Fishbein and Ajzen 1977), personal values-attitude-behavior

hierarchy (Kahle 1983; Schwartz 1992), and the hierarchical consumer innovativeness model (Im et al. 2003), the results demonstrated that personal values had a significant indirect effect on domain-specific variables (i.e., fashion leadership, fashion innovativeness) through innate innovativeness.

The findings revealed a link between personal values and innate innovativeness, as well as the role of innate innovativeness in developing a positive attitude toward 3D printed fashion products. However, the effect of innate innovativeness was only partially supported. Interestingly, contrary to findings from existing literature, innate innovativeness did not directly affect domain-specific innovativeness (i.e., fashion innovativeness). In addition, personal values were not directly related to domain-specific variables, though a previous study reported that personal values had significant positive effects on innovativeness (Hartman et al. 2006). One possible explanation may be that consumers who tend to be open to change and confident in taking risks and trying new things in general are not necessarily willing to try innovative fashion products. Personal values are situation-neutral measures, so it may be difficult to find a strong direct effect on product-category-specific variables.

Although previous studies have confirmed that individuals with high personal values on innovativeness tend to have positive perceptions of domain-specific innovative products (Agarwal and Prasad 1998; Lu et al. 2005), the result of this study was different. This finding may be due to the fact that people still do not have much or any knowledge of or experience with 3D products to help them foster clear beliefs about this technology. Contrary to hypothesis 2, which proposed that personal values have a direct positive effect on context-specific variables, the results showed that personal values have a significant negative effect on fashion leadership. It seems that one can be open to new experiences and ideas without being a fashion opinion leader.

Similar to the findings of Hartman and Samra (2008), the results showed a significant effect of personal values on innate innovativeness. Consumers who are open to many new things, are willing to take risks, and want to be recognized as a leader among their peers may have high innate innovativeness. Consistent with previous literature, this study supports the idea that personal values such as openness to change and self-enhancement can be strong positive determinants of innate innovativeness (Hartman et al. 2006).

The effects of innate innovativeness on domain-specific variables, such as fashion innovativeness and fashion leadership, were mixed. This finding was unexpected, since prior research has shown a positive relationship between innate and domain-specific innovativeness (Im et al. 2003; Lim and Park 2013). The lack of a direct relationship between innate innovativeness and domain-specific innovativeness suggests that the adoption of 3D printed fashion products may still be in too early a stage for consumers to have much knowledge and experience about 3D printed fashion goods, and today's emerging consumers' innate innovativeness needs to be reexamined in the context of new technology adoption.

However, it is interesting to find that fashion leadership served as a mediating variable between innate innovativeness and domain-specific fashion innovativeness. In other words, innate innovativeness indirectly impacted domain-specific innovativeness through fashion leadership, in turn developing a positive attitude towards 3D printed

fashion products. This finding may be explained by the characteristics of the survey participants in this study. For the purpose of convenience, the survey was distributed to students in the fashion school, who were likely be aware of recent fashion industry trends in general. Therefore, the participants who were highly innovative in nature seemed to be knowledgeable about innovative fashion trends as well. Accordingly, those with high innate innovativeness tended to possess high fashion leadership, which in turn led them to a positive attitude toward adopting new 3D fashion products.

As predicted and supported by previous studies, domain-specific fashion innovativeness positively influenced attitude toward 3D fashion products (Im et al. 2003). This finding was consistent with previous studies, which have shown that although consumer innovativeness had a weak influence on adoption behavior, domain-specific innovativeness was strongly related to adopting new fashion and electronic products (Goldsmith and Hofacker 1991). As predicted and supported by the Theory of Reasoned Action, positive attitudes toward 3D printed fashion products predicted respondents' intention to purchase 3D printed fashion products.

Conclusions and future study

The findings of this study provide both theoretical and practical implications. First, this study examined the value-attitude-behavior hierarchy and diffusion of innovation in the context of 3D printed fashion goods. In particular, by evaluating current millennials' personal values, innate innovativeness in relation to domain-specific innovativeness, and attitude toward adoption of 3D printed fashion products, this study theoretically contributes to understanding contemporary millennial consumers' perception of adopting a new technology fashion product. By exploring potential underlying motives in a multi-level (i.e., personal values in a different level), which incorporates personal values and hierarchical innovativeness (i.e., innate, domain-specific) in conjunction with consumer's attitude and intention to use 3D printed fashion products, the current study contributes to provide comprehensive insights to fashion industry and discipline.

In addition, the results of this study demonstrate the important role of fashion leadership, accounting for the relationship between innate innovativeness and domain-specific innovativeness for adopting 3D printed fashion products. Fashion innovators' acceptance of a new product is important in the fashion industry as it predicts the success of the new product early in the product lifecycle, and fashion innovators influence later adopters to purchase products (Mathur et al. 2015). In contrast to existing studies on fashion innovativeness which investigated fashion innovativeness as one critical factor to understand new fashion adoption behavior, this study examined a hierarchy of innovativeness and confirmed the relationships among personal values, innate innovativeness, fashion innovativeness, and fashion leadership.

Similar to findings from prior research on consumer innovativeness, this study demonstrated the role of innate innovativeness and its influence on domain-specific innovativeness. In particular, the results of hierarchical relationships among personal values, innate innovativeness, fashion leadership, and fashion innovativeness shed light on the diffusion of innovation. This study incorporated different levels of innovation constructs and confirmed their relationships theoretically. When innate innovativeness and domain-specific innovativeness (i.e., fashion innovativeness, fashion leadership) were

separated in a multi-level construct, fashion leadership served as a critical determinant at a mid-range variable that affected the success of new 3D printed fashion products. The findings suggest the need to develop a comprehensive and hierarchical research model of consumer innovativeness in relation to the adoption of new technology-driven products.

By developing an extended hierarchy model of consumer innovativeness with personal values, this study provides practical insights to fashion retailers by demonstrating how personal values (i.e., traits) and intention to adopt innovation are linked (Burgess 1992). The unexpectedly weak relationship between personal values and domain-specific innovativeness, as well as the negative effect of personal values on fashion leadership, suggest that the current understanding of young consumers' personal values may need to be reevaluated. It is possible that another trait predicts young consumers' fashion leadership. Due to the increased exposure to stimuli such as entertainment social media sites and other media sources, it is possible that most of today's young consumers already possess high openness or risk-taking tendencies and consider themselves trendsetters. Thus, young consumers' choices may not necessarily be predicted by their personal values. In addition, due to current young consumers' limited knowledge of and experience with 3D printed fashion products, it may be difficult to predict the previously demonstrated relationship between domain-specific innovativeness and their personal values. Similar to the findings of existing research on innovation, the results of this study suggest that fashion retailers need to pay attention to consumers who are highly innovative in nature as well as opinion leaders in order to market 3D printed fashion products to them.

Although this study contributes to the existing literature and to practitioners, it has a few limitations which call for future research. First, this study used a convenience sample of college students from a certain program (i.e., a fashion program). Though current millennial college students were appropriate for this study, as they will be main consumption actors in the future, it would be worthwhile to examine the research model with other age groups to generalize the findings of this study. Also, due to the nature of the fashion program, 94% of the participants in this study were female, so a future study is encouraged to see whether gender influences the results. Given that the research topic was novel and participants tended have no experience with 3D printing, it would be beneficial to have a future study with experiments that would allow study participants to experience and examine 3D printing technology.

A future study is also suggested to more fully examine measurements of personal values and innate innovativeness. Because the present study used only measurement items which fitted with the study context (i.e., innovation), a further study with a full list of Schwartz's value inventory would bring valuable insights to the researchers. In addition, a future study that explores the reciprocal relationship between personal values and traits (i.e., innovativeness) would be beneficial, because this interactive relationship is an ongoing discussion in the literature.

Finally, this study discusses a potential effect of media exposure on innovativeness to explain the results of study. As we did not include the media exposure measures, such as vicarious innovativeness, developed by Im et al. (2003), further investigation is needed to find out how social variables such as vicarious innovativeness influence other variables

such as domain-specific innovativeness, fashion leadership, and attitude toward adoption of 3D printed fashion products.

Authors' contributions
JL is the leading author of this article, developed the research, collecte the data and drafted the manuscript. AS conducted the analysis of this study and KH developed part of the manuscript. All authors read and approvd the final manuscript.

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Competing interests
The authors declare that they have no competing interests.

Ethics approval and consent to participate
This study was based on the survey and no experiment which might cause a potential issue with participants were involved. The participants were requested to sign consent to participate at the beginning of survey by clicking "agree" or "disagree".

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