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Served as Social Actors or Instrumental Role? Understanding the Usage of Smart Product from the Dual Processing Perspective

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Research-in-Progress

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Abstract

Based on the Dual processing theory, this study proposes that customers form their decision of smart products usage through two paths of: emotional and functional, at the same time. These paths are related to two types of behavior modes: affect-oriented which reflects the emotional or psychological demands we need, and the task-oriented which reflects essential needs for us to make use of these products. The behavior modes, represented by anthropomorphism cues and functional cues respectively, influence different kinds of trust, affect-based and cognition-based, and then determine the usage of smart products. The results will be examine through data collection in the near future. And we hope that the results could unravel several important findings and bring some managerial implications for manufacturers to improve their products.

Keywords: smart product usage, anthropomorphism, affect-based trust, cognition-based trust

Introduction

With the flourish of Artificial Intelligence (AI), the world has stepped into Era of AI, which is changing our life throughout (Shulevitz 2018). Tremendous improvements in technology and applications have hastened social progress, reform of traditional industries and birth of new products and services. For example, intelligent society is built rapidly, manufacturing industry is introducing robots to help production and smart products (e.g. smart speaker, smart headphones, smart home, etc.) are producing. Take smart speaker as example, more than 53 million (21%) adults in the United States now have smart speakers, and the number of adults who got acquainted with it has reached to 77%, which got an incensement of 15% (Research 2019). According to Voicebot.ai (2018), it was used extensively from living room, kitchen, bedroom to garage and work office. When it comes to China, the shipments of smart speaker in 2018 amounted to 21.9 million (Canalys 2019). However, from the data of Voicebot.ai (2018) we can find that more than 50% users never touched it after the first try. Attracting and stimulating consumers to use continuously become core conundrum for manufacturers at home and abroad.

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Related research on smart products is divided into two streams. One stream treats smart products as social actors (Tay et al. 2014), which mainly deal things with emotional or psychological demands (Agustin and Singh 2005), "getting along with the smart agent" alternatively speaking. Customers under this research stream usually represented a behavior mode of "affect-oriented" (Madhusudan and Sharma 2016) . Piçarra and Giger (2018) studied behavior intention of people who worked with robots and found that valence of emotion affect their behavior mode. Another important item of this stream is anthropomorphism, which may be studied from a motivational perspective: sociality need and affectance motive (Chen et al. 2018). The other stream treats smart products as instrumental role, making full use of it， which mainly settle down things related to essential needs. Customers under this research stream often represented a behavior mode of "task-oriented" (Backhaus and Reinhart 2017). Although each stream has their own mechanism, they are closely related to a key factor: trust. The difference of mechanism decided their different emphasis: the former focuses on affective concern, and the latter on functional and cognitive concern, namely affect-based trust (Schaubroeck et al. 2011) and cognition-based trust (Schaubroeck et al. 2011). However, there are two questions to these research. The first is the small number of studies, due to short time period constrain. The second is the narrow scope of research because most of the current research studied partially. Therefore, research gap still exists which needs future research.

Addressing the gap existing in previous studies, we adopted a Dual processing perspective to investigate the antecedents and outcomes of two types of trust in the AI context. This research will use *smart speakers* as representative of smart product to collect and analyze data. Two research questions are addressed:

(1) *How does the cues of affect-oriented mode and task-oriented mode influence trust while using smart products?*

(2) *What is the influence mechanism of these two modes on smart products usage in the AI context?*

This study contributes by improving researchers' understanding of trusts (affect-based trust and cognition-based trust), constructs that have attracted much attention but still needs renew further. Still this study contributes by giving a holistic view of examine smart products' usage. Finally, the results of this study may help smart products providers to better design their products, which has managerial implications.

The paper is organized as follows. In part 2, we review the theoretical background. Then, we present the research model and hypothesis part 3 and research methodology in part 4. The discussion and implications, at the same time limitation need to be completed in the near future.

Literature review

Smart product usage

Manufacturers of smart services, such as Amazon, Apple, Google, Baidu, Alibaba and Mi, have empowered rich and diverse features to their products for consumers to use and explore. For example, people could ask questions, listen to music, acquire information, control home devices and call someone, et.al (of which questions, music and weather were most common used), and they even used most of these features monthly (Voicebot.ai 2018). Then, the role of a smart product may become consumers' ideal servant, friend (Shulevitz 2018), or partner to provide emotional support (Gao et al. 2018). Therefore, smart products design need to take people's demands into consideration. Hence, in order to inspire better design of home robot, Gao et al. (2018) take Google Home, Mi AI, Gatebox and HoloEra as representative and proposed design advice for manufacturers from three aspects: lifestyle, intelligence and sense.

Whatever these demands are, the usage of smart products can be divided into two kinds, namely, making full use of and getting along with the smart agent. And the division is coincided with researchers results, that is: affect-oriented (Madhusudan and Sharma 2016) and task-oriented mode (Backhaus and Reinhart 2017). Furthermore, a smart product, taking smart speaker as an example, is neither solely affective nor functional (Tay et al. 2014), it is a community of both. The key difference

between these two modes is the usage purpose, which definitely reflect consumers' essential needs and extra psychological demands (Agustin and Singh 2005). In this article, we propose that they are coexist and together influence consumers' perception of smart product usage.

Dual processing theory

The coexist of affect-oriented and task-oriented mode of smart products usage must be activated synchronously and collectively, which make it immanently suitable to analyze by using Dual Processing Theory (DPT) (Evans 2009).

DPT is one of the most important theory in the field of cognitive psychology and social psychology, which tries to explain different cognitive activities in our brain. It is rooted in a sizable theory streams and absorbed the essence of the following theories: Cognitive Experiential Self Theory (CEST), Heuristic-Analytical Processing Model, Implicit-Explicit Theory and Dual system theory. Evans (2009) demonstrated that each people is processing two cognitive processes path: one path is named type I which is spontaneous, paralleled, emotional, and associative. It is an implicit learning process, which is not depend on cognitive processing ability. Another path is named type II which is serial. To make it work, one must take cognitive effort and have high level cognitive ability. It reflects the high level of rationality in the decision-making process of human reasoning. When type I is triggered, then it is executed. Otherwise, when type II dominates main position, decision makers need to process and analyze information comprehensively and thoroughly.

To better explain and understand these two types of cognitive process path, it is inevitable to talk about the term—*Anthropomorphism*. Most of the time, anthropomorphism is thought to originate from human nature of attributing human-like characters to nonhuman. Dacey (2017) called it *intuitive anthropomorphism*, which is thought to be heuristic, unconscious and can arise anthropomorphism bias. So the definition of anthropomorphism can be defined as people endow the nonhuman unconsciously with human-like traits that they do not have, and treat them as living, sensible, and thoughtful individuals, at the same time interprets their behavior in the way of ours (Dacey 2017). Anthropomorphism has been used in many fields and research areas, such as brands (Puzakova and Aggarwal 2018; Puzakova and Kwak 2017), products (Aggarwal and McGill 2007; Maeng and Aggarwal 2018), advertising (Susianto et al. 2017), intelligent/ smart products like smart speakers (e.g. Alexa, Siri, Alice, etc.) , robot (Eyssel and Kuchenbrandt 2012), and so on. Through anthropomorphize smart products give consumer ways to get emotional support, it also bring side effect, such as self-control destruction (Hur et al. 2015). Thus anthropomorphism is a double-edge sword (Caporael 1986), and its effect related to emotion should be empirically examined (Gao et al. 2018).
In terms of measuring anthropomorphism, researchers have tried to theorize and manipulate anthropomorphism in many aspects and dimensions. For example, Mosaly et al. (2010) divided anthropomorphism into *physical appearance*, *expressiveness*, *task handling*, *user subjective experience*, which confused affect-oriented proxy with task-oriented feature. Bartneck et al. (2009) invested standardized measurement tools for human robot interaction, and analyzed anthropomorphism from *natural*, *humanlike*, *conscious*, *lifelike*, *moving elegantly*. Nowak et al.(2009) used *human image*, *human feature*, and *human-like expression*, Chen et al. (2018) put *personality* and *emotion* into consideration, whose role is empirically proved by Tay et al. (2014) when studied robot acceptance. For the sake of the research purpose of this paper, we decided to focus on image *look-like, expression and personality.*

Besides the emotional fulfillment of psychological demand, another important aspect of smart product usage is to meet the essential needs, for example, accessing to information, asking questions, listening to music, controlling home devices etc., as what was shown previously. It is closely related to elementary needs which is task-oriented mode. When talking about the feature path of DPT, information quality and system quality were conformed to be key antecedents of a technology acceptance (Wixom and Todd 2005). While the information quality contains information accessibility, information presentation, completeness, timeliness, accuracy, reliability and updatedness (Nicolaou and McKnight 2006), the main system quality concerns such as response time, system reliability, system functionality, system flexibility and friendliness, and integration with other systems are

comprehensively considered (Barki and Hartwick 2001), which covered what we need to take into account when triggering type II.

In a word, the unconscious, heuristic anthropomorphism is closely related to emotion, which is perfect suitable for type I. Another path need more cognitive effort and a high level of cognitive ability, which is accord with type II.

Trust of the dual processing path

Trust is a key variable to interpret consumers' behavior and can influence (re)purchase intention (Ou et al. 2014), use (Gefen et al. 2003), adoption (Chwelos 2001). When coming to trust of smart product, smart speaker for example, Touré-Tillery and McGill (2015) confirmed that people of different trust level showed distinct Persuasion effects to each anthropomorphized agents. Pieters (2011) pointed out that AI providers may adopt two kinds of strategies when consumers concern information security, one is explanation-for-confidence, which offers consumer reasons for action, and another one is explanation-for-trust, which provides transparency instruction on how AI is worked and protected.
Consumers' beliefs about smart products' ability and reliability to carry out the task is the trust in the product of type II and researchers named it cognition-based trust (CBT) (Kanawattanachai and Yoo 2007; Schaubroeck et al. 2011). Accordingly, consumers' perception of emotional bonds with smart products are grounded upon expressions of genuine care and emotional communication, which trusts in the bonds of type I and is called affect-based trust (ABT) (Schaubroeck et al. 2011). ABT, which comes from the heart (Chua et al. 2008), is grounded in mutual care and concern between each other (Holste and Fields 2010), and the feelings or emotions toward that object (Tay et al. 2014). By the contrast, CBT, which comes from "the head", is the judgment based on evidence of another's competence and reliability (Chua et al. 2008), beliefs, thoughts, or rational arguments (Tay et al. 2014). And in the human-automation interaction, trust was a primary factors to be considered, and can influence the acceptance of a new technology (Tay et al. 2014). However, under this AI circumstance, the effects of ABT and CBT are still unclear and lack empirical evidence. The relationship of these paths and related trust is shown in table 1.

Table 1. Dual processing path and trust related

DPT path	Consumer behavior mode	Type of trust	Theoretical explanation
Type I Spontaneous, paralleled, emotional, associative	*Affect-oriented mode* Emotional support: communication with or confiding in the smart product, which gives us a way to reveal shameful feelings without feeling shame (Shulevitz 2018).	*Affect-based trust* Trust in smart products' relationship (a servant, friend (Shulevitz 2018), or partner (Gao et al. 2018))	*Social actors:* Consumers perception of emotional bonds with smart product
Type II Serial, cognitive effort needed, high level of cognitive ability	*Task-oriented mode* Essential needs: Information access, system features use, such as shopping, asking a question, listening to music, checking the weather, etc. (Voicebot.ai 2018)	*Cognition-based trust* Trust in smart products' ability and reliability	*Instrumental role:* Consumers will explore smart products' features, based on their cognition to it.

Research model and hypotheses

Based on the literature review above, we developed our research model (see **figure 1**). As mentioned previously, the two type of cognition are paths of emotional cues (Type I) and functional cues (Type II). These two types of cognitive mode could be mapped onto two manipulations where the smart products are treated as social actors and instrumental role. Accordingly, these manipulations reflect how the smart products are recognized and the cognition are perceived along with interaction. In other

words, the two manipulations embody different types of trust, CBT and ABT. These two kinds of trust jointly result in customers' behavior outcome: smart product usage.

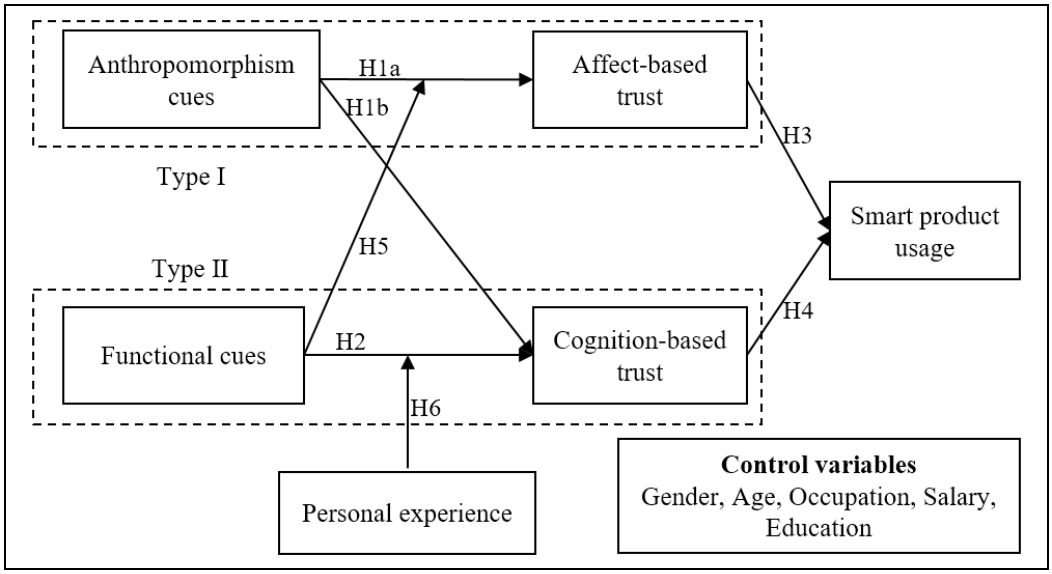

Figure 1. Research Model

Smart products as social actors

Anthropomorphizing nonhuman smart products make them become participants to join into people's life, through which their roles are changed from pure machines to social actors. Consequently, the interaction between people and smart products becomes accessible, convenient and frequency. Evidence from Chua et al. (2008) confirmed that friendship tie significantly influence ABT, compared to CGT. McAllister (1995) pointed out that behavior, interaction frequency are also antecedents of ABT. However, considering the Uncanny Valley effect in which imperfect human-likeness provokes dislike (Mathur and Reichling 2016), the interaction may be quite different from interpersonal relationship. The trust, mainly refer to ABT which goes along with interaction, will become complex. Mathur and Reichling (2016) experimentally proved that people's trust-motivated behavior also follows an "Uncanny Valley" pattern. The social actor role of smart products have other aspect of impact that we should take into consideration. We suppose that cognition on anthropomorphism helps people to better recognize smart products' ability and make the judgment. So, we hypothesize the following:

H1a: The influence of anthropomorphism cues on ABT follows a concave curve.

H1b: Anthropomorphism is positively related to CBT.

Smart products as instrumental role

Contrast to smart products' social role, the instrumental role provides bases for customer to use and explore, depending on their cognitive ability. And this is closely related to behavior mode of task-oriented and meet customers' essential needs such as shopping, questioning and listening to music. Researchers have offered massive evidences that such functional features could affect consumers' perceived CBT. McAllister (1995) confirmed early that peer reliable performance, professional credentials and components of competence positively influenced CBT. Chua et al. (2008, 2009) considered that task advice tie was positivily related to CBT. So we propose the following hypothesis:

H2: Smart products' functional cues is positively related to CBT.

Effects of ABT and CBT

As what is demonstrated previously, trust is proved to be one of the most important interpret variable of behavior. When it comes to ABT, it influenced knowledge sharing and the use of tacit knowledge (Holste and Fields 2010). While CBT shown the similar effect on sharing and using knowledge, it still

influenced task-knowledge coordination (Kanawattanachai and Yoo 2007). In term of smart product, trust can influence new technology (e.g. intelligence robots, smart speakers, learning robots, etc.) acceptance (Tay et al. 2014). Although the specific effects of ABT and CBT on smart products is short in research, the positive effects of them on behavior make us come up with similar assumptions. Accordingly, we propose the following hypothesis:

H3: ABT can positively influence consumers' usage of smart products.

H4: CBT can positively influence consumers' usage of smart products.

Moderating effect

In addition to the main effect, we still want to examine moderating effects. On one hand, because of smart products' functional role, it should be taken into consideration at the outset. Thus, the role as functional machines is the premise of role as social actors. On the other hand, people's cognitive ability is constrained by many aspects of factors, of which personal experience is a prominent one. It refers to experience with human-machine (especially the smart product such as smart speaker, robot) activities. Personal experience describes a consumer's experience related to their human-machine knowledge, ability, skills and reduces uncertainty (Li and Ku 2018). It illustrates positive relationship between experience and gains, which could enhance people's cognition of smart products. Hence, we propose hypothesis as follows:

H5: Functional cues of smart products positively moderates the effect between anthropomorphism cues to ABT of smart products.

H6: Customer's personal experience positively moderates the effect between functional cues and CBT of smart products.

Methodology

To ensure quality of questionnaire, the scales utilized are based on existing maturity scales. Three aspects of anthropomorphism cues are adapted from Mosaly et al. (2010) and Chen et al. (2018). Two dimensions of information quality and system quality are measured by using what Nicolaou and McKnight (2006) and Barki and Hartwick (2001) used. The items of CBT are adapted from Kanawattanachai and Yoo (2007), while ABT's from Schaubroeck et al. (2011). Other measures such as Gender, Age, Occupation, Salary, and Education are used as control variables.

We want to use smart speaker as a representative of smart products to design questionnaire. The survey is intended to conduct on https://www.wjx.cn/ , the biggest survey website in China. The data collected will be analyzed using smart PLS 3.0.

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