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Functional, hedonic, and social motivated consumer innovativeness as a driver of word-of-mouth in smart object early adoptions: an empirical examination in two product categories

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Abstract: This research aims to consider, in the context of smart objects, the interplay of motivated consumer innovativeness (MCI), satisfaction and word-of-mouth (WOM). Following earlier behavioural research through three phases of attitudes (cognition, affection and conation), the study proposes that functional, hedonic, and social MCI (cognition) are positively related to satisfaction (affection), thus positively influencing WOM engagement (conation). In addition, it is shown that functional and hedonic MCI moderate the relationship between social MCI and satisfaction. Two quantitative studies across two smart object categories (1,129 users of wearables and 511 users of smart home objects) highlight that both functional and hedonic MCI positively relate to satisfaction and WOM. Though the effect of social MCI on satisfaction is non-significant for smart home objects and very low for wearables, our findings confirmed that social MCI has an indirect impact on satisfaction through functional and hedonic MCI in both product categories.

Keywords: consumer innovativeness; early adoption; internet of things; IoT; motivated consumer innovativeness; MCI; product adoption; satisfaction; smart home; smart objects; smart watch; wearable; word-of-mouth; WOM.

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1 Introduction

The internet of things (IoT), encompassing day-to-day objects and devices (Korte et al., 2021), is identified as one of the four 'new-age technologies' (Kumar et al., 2021) and the central part of the Fourth Industrial Revolution (Agarwal and Brem, 2015; Sima et al., 2020). The IoT and more specifically smart objects open opportunities for human-computer interaction that can fundamentally change consumers' service experience (Hoffman and Novak, 2018) as well as firms' business ecosystem (Chen and Lu, 2019; Yang et al., 2020). Since innovative technologies in emerging markets do not always achieve high acceptance (Calantone et al., 2006), it is insightful for practitioners who attempt to grow by launching innovative products, to obtain an understanding of how the adoption process of innovative products is structured (Brem and Viardot, 2015).

Although a significant body of literature exists regarding the adoption of smart objects, the current literature is scant in at least three aspects. First, smart objects have certain specificities compared to other innovative products such as connectivity and interactivity (Benamar et al., 2020; Ives et al., 2016). These evolutions not only offer a new context to revolutionise consumer experiences (Hoffman and Novak, 2018) but also new approaches to adopt such innovation. However, few studies have taken these characteristics into account when considering smart object adoptions.

Second, most quantitative studies on smart object adoption concentrate either on consumers' attitudes and intentions to use, or their purchase intentions (Choi and Kim, 2016; Wu et al., 2016). These studies are frequently based on theories that identify factors to adopt a new smart object, such as the technology acceptance model (Davis, 1989), the unified theory of acceptance and use of technology (Venkatesh et al., 2003), and the extensions of these models (Venkatesh and Bala, 2008; Venkatesh and Davis, 2000; Venkatesh et al., 2012). These studies pay little attention to other theories or identify other diffusion approaches.

Third, the majority of existing research on smart object adoption focuses on a single product or one product category such as wearables devices (Rauschnabel et al., 2015), smart homes (Baudier et al., 2020) or smart toys (Zhang et al., 2020). However, some dimensions of smart objects such as the physical distance between the user and products are considered essential for understating consumers' adoption process (Greenberg et al., 2011). It is therefore necessary to undertake product categories regarding these specificities when examining the adoption process of smart objects.

Being motivated to fill these theoretical gaps, this research aims to provide a unique angle of smart object adoption by considering the above-mentioned characteristics. The first key characteristic of smart objects is connectivity (Ives et al., 2016). They are designed not only for object-to-object interaction but also for human-to-human interaction (Benamar et al., 2020). In this context, when considering the adoption of smart objects with higher accessibility to peers, interpersonal communications and recommendations from early adopters are essential. The literature has stated that the adoption of disruptive technologies is directly linked to interpersonal communication (Peres et al., 2010; Prins and Verhoef, 2007). Word-of-mouth (WOM) can serve here as a decisive factor for the acceptance of innovations (Zhao et al., 2021). Very successful concepts like Nespresso show that WOM can play a key role to gain market success (Brem et al., 2016), specifically in the early adoption phase (Narayanan et al., 2005). Hence, considering this specificity, our paper attempts to investigate smart object early adoptions by understanding factors that impact WOM communication.

The behavioural perspective of emphasising early adoption had led academics to focus on recognising individual characteristics that may predict innovation adoption (Im et al., 2007). Without properly segmenting and targeting potential early adopters, practitioners may hinder or even eliminate product diffusion attempts. Recent research shows that consumer innovativeness is an essential concept to understand the acceptance of new technologies (Li et al., 2015). To analyse this concept, the motivated consumer innovativeness (MCI) theory (Vandecasteele and Geuens, 2010), incorporating different motivations to enhance product-consumer interactions, was selected.

Therefore, the objective of this research is to answer the following question: *how a combination of individual motivations and individual characteristics of innovation could fit into the process of WOM diffusion in the context of smart objects?* To answer this question, the present research draws from the behavioural literature by Rosenberg and Hovland (1960) to model the link between MCI, satisfaction, and WOM and empirically tests it through two quantitative studies across two product categories that include users of 1,129 wearables and 511 smart home objects. It makes a unique contribution to addressing the limitations and extending the innovation adoption literature in four major ways. First, this research considers the specificity of smart object characteristics and identifies those interpersonal communications from early adopters are essential to investigate smart object adoption. Second, this study investigates how individual characteristics could drive WOM diffusion by using MCI theory. The examination of such a link is essential because individuals' influenced desires for new and different experiences play vital roles in their satisfaction and diffusions of products. Indeed, if many scholars study individual characteristics explaining the acceptance of innovative products, few focused on the communication processes (Im et al., 2007). Third, up to now, three different dimensions of MCI (functional, hedonic and social) are used at the same level or order to explain attitudes and behaviours, neither the theoretical framework nor empirical evidence has shown the relationships among these dimensions. This study examines the relationships among three dimensions to explain WOM. Finally, this research analyses the model in two categories of smart objects, by considering the physical distance between the user and products as an essential factor for understanding smart object adoption.

The next section outlines our conceptual background and presents the model. We then show the results of the study. Finally, we specify our contribution to the literature, and offer practical recommendations and suggestions for future research.

2 Literature background

2.1 Smart objects characteristics and our approach in the adoption context

Human perception and sensation of products play a central role in product design and are in many cases part of the companies` value proposition (Kampfer et al., 2017). Smart objects have certain specificities compared to other innovative products. As identified by Benamar et al. (2020), smart objects have four dimensions: first, the *physical dimension* refers to the connected device itself, which often resembles everyday things; second, the *intangible dimension* refers to the services provided through software capabilities; third, *object-to-object connectivity* refers to the exchange between devices; and finally, *human-to-human connectivity* refers to the social exchange to connect people. Ives et al. (2016) also point out that connectivity is a key component of the design of smart objects.

As connectivity and interactions are prominent characteristics of smart objects, when considering the adoption of such innovation with higher human contacts, we believe interpersonal communications and recommendations from early adopters play an essential role to gain market success. Indeed, the literature provides evidence that WOM is crucial for the adoption of innovative products (Easingwood et al., 1983; Mahajan et al., 1990), specifically at an early stage (Narayanan et al., 2005).

As early adopters are valuable resources for companies introducing new products (Ruvio and Shoham, 2007), scholars emphasise on recognising individual characteristics to identify early adopters (e.g., Im et al., 2007). Indeed, consumer innovativeness is a key concept in understanding individual characteristics of innovation (Li et al., 2015), which is presented in the next section.

2.2 Motivated consumer innovativeness

Consumer innovativeness addresses the need for consumers to seek novelty or purchase innovative products (Roehrich, 2004). This concept has evolved, and scholars conceptualise and measure it in various ways. The existing literature presents two main different conceptualisations: innate innovativeness and domain-specific innovativeness. Innate innovativeness is characterised as a persistent personality trait in the late 1970s and has been redefined as the desire for novelty seeking that is socially influenced and may vary during an individual's life (Hirschman, 1980). Domain-specific innovativeness relates to innovativeness within an interest in a specific product domain (Foxall et al., 1998; Hoffmann and Soyez, 2010). However, it is criticised as very product-specific (Goldsmith and Hofacker, 1991). In our theoretical framework, we seek to understand the multitude of motivation sources for adopting innovation in the cognition stage, and we adopt the MCI scale that incorporates different motivations and extends the evaluation of product-consumer interactions (Vandecasteele and Geuens, 2010). This MCI scale, widely applied to different contexts of disruptive and sustaining innovations (Hwang et al., 2021a, 2021b, 2020; Kim et al., 2021; Reinhardt and Gurtner, 2015), includes functional, hedonic, social and cognitive dimensions. *Functionally motivated innovative consumers* expect that the products will fulfil a utilitarian purpose, such as improving performance and increasing their productivity (Voss et al., 2003). *Hedonically motivated innovative consumers* need to be in a state of excitement and joy (Venkatraman and Price, 1990; Voss et al., 2003) and to meet their needs of fun, pleasure, enjoyment and distraction (Olshavsky and Granbois, 1979). *Socially motivated innovative consumers* want to highlight their uniqueness by using a product that others do not have, to feel special, smart, attractive and socially superior (Roehrich, 2004; Shavitt, 1990). *Cognitively motivated innovative consumers* purchase innovative products to enlarge their understanding, stimulate intellectual creativity, and expand their cognitive limits.

Current literature on MCI and innovation adoption context presents some common and contradictory results. Functional and hedonic MCI are mostly reported positively related to attitude and behaviour to use smart objects (Hwang et al., 2019, 2020), nevertheless, the impacts of social and cognitive MCI are ambivalent in different studies. Regarding social MCI, Hwang et al. (2020) underline that social MCI has no impact on the perception of a robotic restaurant. One possible reason is that people do not consider robot-related service special. Esfahani and Reynolds (2021) show a negative relationship between social MCI and individuals' attitude toward really new product (RNP) adoptions. As an RNP is not yet available on the market, consumers may feel less capable of imaging it in the future. These findings imply that the nature of the product is fundamental in explaining how the influence of social MCI.

Regarding the impact of cognitive MCI, Hwang et al. (2019) indicate that the influence of cognitive MCI on attitude and the intention to utilise drone food delivery is not significant. The authors explain that one reason is that consumers encounter time and performance risks because they need time to learn and may worry about how well this service performs, thus it is not evident to rationally evaluate them. When adopting new technology-based services, consumers are likely to be anxious about unexpected results, and this uncertainty impacts the relationship between cognitive MCI and consumers' attitudes. However, in RNP adoptions, the various information presentation of promoting RNPs (e.g., 3D models) can help consumers to reduce their concern about the product, thus the cognitive MCI presents a positive influence on consumers' attitude towards RNP.

Due to the unpredictability of cognitive MCI in new technology-based services, this study only focuses on the functional, hedonic, and social MCI dimensions.

Our research model draws on the behavioural literature by Rosenberg and Hovland (1960) who classify three phases of attitudes, namely *cognition*, *affection* and *conation*. These three components reflect that attitudes are an important explanation for how individuals think, feel and behave. The cognitive stage refers to the consumer's perception and needs regarding an object (Holbrook, 1978). The affective state is an emotional reaction (positive/negative feelings) based on the evaluation of the object (as favourable/unfavourable) (Wilkie, 1994). The conative stage is an expression of the individual's intention by showing the likelihood that he/she will execute an action. It is a tendency to act (Wilkie, 1994). Based on this theory, an individual's cognitive appraisal of an object (cognition) leads to an emotional reaction (affection) and results in behavioural responses (conation).

Several significant theoretical models, as highlighted in Table 1, have been proposed using these components across different research domains, including marketing, innovation, psychology and information systems.

Table 1 Summary of research using cognition, affection and conation components

Research domain	*Theory/model*	*Authors*
Marketing	Commitment-trust theory	Morgan and Hunt (1994)
Innovation	Innovation diffusion model	Rogers (1962)
Psychology	Theory of reasoned action	Fishbein and Ajzen (1977)
	Theory of planned behaviour	Ajzen (1991)
	Emotion-adaption theory	Lazarus (1991)
	Self-regulation model	Bagozzi (1992)
Information system	Technology acceptance model (TAM)	Davis (1989)
	Expectation-confirmation theory	McKinney et al. (2002)
	TAM2 model	Venkatesh and Davis (2000)
	TAM3 model	Venkatesh and Bala (2008)
	Unified theory of acceptance and use of technology (UTAUT) model	Venkatesh et al. (2003)
	UTAUT2 model	Venkatesh et al. (2012)

We have mapped our research framework within these three components: MCI dimensions (functional, hedonic and social) positively relate to satisfaction which positively relates to WOM. In this study, we posit that WOM (conation) is directly influenced by the user's overall satisfaction (affection), and indirectly determined through individual-level motivations (cognition). As WOM can be positive or negative, our research focuses on positive WOM. In the following section, we explain the expected relationships among the variables integrated into our research framework through six hypotheses.

3 Hypotheses development

3.1 Social MCI as an antecedent of functional and hedonic MCI

The literature indicates that consumers build a social identity-related self-image by owning innovative products (Tian et al., 2001), and the acquisition of such products is a social means to make a unique impression (Persaud and Schillo, 2017; Simonson and Nowlis, 2000). Particularly, individuals with social MCI tendencies wish to enhance their feeling of differentiation through the possession of unique and innovative products (Vandecasteele and Geuens, 2010).

In this study, we go a step further and propose that social MCI is an antecedent of functional and hedonic MCI in the context of smart objects. We posit that consumers' desires for functional and hedonic feelings obtained from innovative products are influenced by their desire of being socially unique. This can be supported by the integration of smart objects in the consumers' extended self (Belk, 2014), showing that the social value builds the uniqueness of the individual's identity and improves the perception of functional and hedonic product quality.

More specifically, the literature indicated for the relationship between social MCI and functional MCI, that the self-assertive nature underlying social differentiation reflects the ability to examine more functional products in a consumer's decision-making process (Engelland et al., 2001). Consumers do not only gain utility from a product but also behavioural expectations of their social identity (Andorfer and Liebe, 2013). The literature further found that individuals with a high expectation of uniqueness tend to have concerns about peer evaluation regarding the products they use. Thus, they pay more attention to product utility when purchasing (Schumpe et al., 2016). Therefore, we postulate that consumers with higher social MCI tendencies may have a more accurate estimate of product utility and they are inclined to positively evaluate products' functional qualities to justify their possessions of these products.

Regarding the link between social MCI and hedonic MCI, the literature demonstrates that the need for uniqueness is strongly correlated to consumers' sensation-seeking and recreational activities, which lead to hedonic-based consumption (Baird, 1981). The literature further indicated that both uniqueness-seeking and sensation-seeking motives can explain individuals' innovative behaviours (Burns and Krampf, 1992; Burns, 2007) and the end goal of pleasure-seeking is self and social fulfilment (Whitley et al., 2018). Therefore, socially motivated innovative consumers that manifest themselves through the need for uniqueness may tend to feel that the benefits and expectations regarding the product are more exciting and fun.

The above analysis justifies the assumption that the more consumers want to gain social differentiation by owning innovative products, the more they perceive utilitarian and hedonic values through the possession of smart objects. This is formalised in our first two hypotheses below:

H1 Social MCI positively relates to functional MCI.

H2 Social MCI positively relates to hedonic MCI.

3.2 MCI and satisfaction

Satisfaction is commonly identified as an affective psychological state when the consumer feels pleasure from the consumption of a product (Sanchez-Franco, 2009), over time (Anderson et al., 1994; Anderson and Srinivasan, 2003; Bagozzi et al., 1999). Previous literature has demonstrated an indirect link between consumer innovativeness and satisfaction by using the self-congruence theory (Cowart et al., 2008). Self-congruence theory (Sirgy, 1985) outlines that individual behaviour is partly driven by the congruence associated with a cognitive comparison between the individual self-concept and the product-user image (Sirgy, 1985). The literature on consumer innovativeness reveals that innovators are more open to change in their self-concept (Manning et al., 1995) and as a result, novelty seekers are expected to have greater perceived self-congruence (Cowart et al., 2008). Literature finds a strong positive impact of self-congruence on satisfaction (Sirgy et al., 1997), indeed consumers are more satisfied when their self-congruence goals are met.

This research enhances the existing body of literature by proposing a direct link between consumer innovativeness and satisfaction. Regarding the link between functional MCI and satisfaction, consider the example of an individual who wants to appear as a knowledgeable, intelligent and technically adept person (self-image). This individual may experience a high self-congruence by purchasing a smartwatch. The fact that wearing a functionally sophisticated smartwatch (product-user image) is consistent with how this individual wants to see himself, and as a result, the consumer is satisfied by a high self-congruence, as satisfaction is the result of the comparison between the expectations and perceived performance (Oliver, 1980). Similarly, the sensation-seeking hedonic innovator is driven by the need of purchasing products, aligned with an image of fun and enjoyment. Therefore, the hedonic novelty seeker may purchase products to appear fun, which would cause him to be satisfied with the purchase decision. A socially motivated innovative consumer aims to see him or herself as special, different, and socially superior, thus the possession of products that can activate strong self-esteem corresponds to the consumer's self-image and triggers a higher level of satisfaction.

Therefore, we assume that functional, hedonic, and social MCI would positively relate to a consumer's satisfaction"

H3 (a) Functional, (b) hedonic and (c) social MCI positively relate to satisfaction in the context of smart objects.

3.3 Mediating role of functional and hedonic MCI

According to Vandecasteele and Geuens (2010), consumer innovativeness includes functional and hedonic dimensions that directly refer to the domains of intrinsic motivation of self-determination theory (Deci and Ryan, 2000). The self-determination theory includes three dimensions determining the degree of intrinsic motivation: the needs for autonomy, competence and relatedness. The need for relatedness refers to the need to feel connected to others but also to feel valued by others. Social MCI is related to social power and public image (Vandecasteele and Geuens, 2010). From this perspective, we postulate that a consumer with a high level of social MCI will be intrinsically motivated because the need for relatedness is satisfied. More precisely, we argue that social MCI will influence satisfaction, directly and indirectly through the level of functional and hedonic MCI. We postulate that a mediating role of functional and hedonic MCI exists regarding the link between social MCI and satisfaction in the context of smart objects:

H4 The relationship between social MCI and satisfaction is mediated by functional MCI.

H5 The relationship between social MCI and satisfaction is mediated by hedonic MCI.

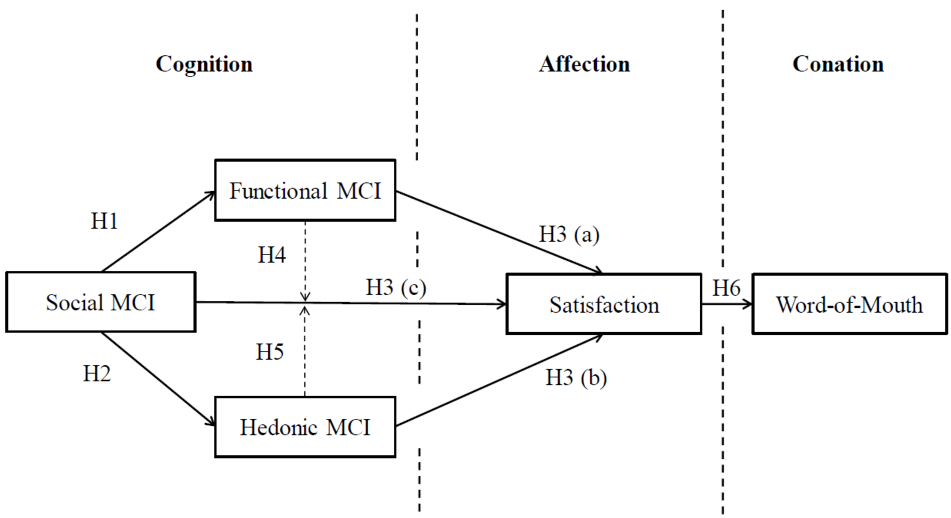
3.4 Satisfaction and WOM

Satisfaction is identified in the literature as a key driver of the behavioural intentions of customers (Anderson et al., 1994; Garbarino and Johnson, 1999; Taylor and Baker, 1994; Zeithaml et al., 1996; Zeng et al., 2009). The relation between satisfaction and WOM, developed by Oliver (1980), was mobilised in research on both traditional business contexts (Anderson, 1998; Zeithaml et al., 1996) and virtual business environments (An and Han, 2020; Duarte et al., 2018). Most of them found a positive connection between satisfaction and WOM. Indeed, satisfied consumers tend to be more confident in the products' abilities to effectively meet their needs, therefore they are comfortable spreading positive reviews and recommending the products to others. We expect that the same relationship is valid in the context of smart objects. Hence, we propose:

H6 Satisfaction positively relates to WOM.

The research model with six hypotheses is illustrated in Figure 1.

Figure 1 Research framework



4 Methodology

The purpose of this research was to quantify the effect of MCI on WOM. Thus, a quantitative approach was selected to gather insights from early adopters to test the theoretical framework using existing scales. Two studies across two product categories were conducted to gather data, and the results were analysed by mobilising structural equation modelling (partial-least-square method).

4.1 Context: choice of two product categories

Two product categories of smart objects were selected as samples: wearables (Study 1) and smart home objects (Study 2). According to Greenberg et al. (2011), the physical distance between the user and products is a fundamental dimension of smart objects and can be considered essential for understanding consumers' adoption process. Two product categories of smart devices are identified by the interaction modes based on physical distance: *ambient interaction* refers to an interaction at the furthest distance from a device, and *direct interaction* refers to an interaction at the closest distance (Greenberg et al., 2011). Wearables, for example, measure human activities through direct interactions. They are close to the human body and act as a self-extension (Belk, 2014). On the other hand, smart homes (or connected environments) go beyond the classic framework of the consumption of an object to a “collection of dynamic, nonlinear experiences that emerge from consumers’ interactions with devices that also interact with each other” [Hoffman and Novak, (2015), p.21]. Owners of smart home objects create personalised and adaptable consumer experiences through direct and ambient interactions with their smart home assemblage (Hoffman and Novak, 2015). For this reason, we choose wearables and smart home objects as two product categories.

4.2 Measures

The model was built using existing measurement scales issued from the literature, adapted, using five points Likert scale as recommended by Revilla et al. (2014), and to be consistent with other measurements used in this study. Functional, hedonic, and social MCI were measured using the three-item scale adapted from Vandecasteele and Geuens (2010). Satisfaction was measured by selecting the three items developed by Maxham and Netemeyer (2002), and WOM using the three-item scale, adapted from Zeithaml et al. (1996). The constructs are presented in Appendix.

4.3 Sample

Studies 1 and 2 were conducted using a survey in collaboration with a crowdsourcing platform created by innovation-focused international telecommunication. The community is made up of technophiles from all over Europe who are mainly early adopters. A computer-assisted web interviewing (CAWI) link was sent by e-mail to participants who have an interest in smart objects. The participants were asked if they own wearables (e.g., smartwatches or smart bracelets) or smart home objects. Depending on their responses, participants were thus invited to complete questions about functional, hedonic, and social MCI. They were also invited to complete questions about their satisfaction and their engagement in recommending them.

In total, 1,129 users for Study 1 on wearables and 511 users of smart home objects were retained after samples with missing or erroneous data were removed. Demographic characteristics are consistent in both studies. Indeed, there were 87% men (Study 1) and 85% men (Study 2) with an average age of 30 years (Study 1) and 29 years (Study 2). 52.1% (Study 1) and 59% (Study 2) were executives, and 25.9% (Study 1) and 28% (Study 2) lived in the Paris region. Samples collected, representing early adopters, are both in line with other studies. Men are often more willing to adopt innovative technologies than women (Hardman et al., 2019; Van Slyke et al., 2002), and based on a study run by INSEE (2019) from 2016 to 2019, the most representative user of internet devices is an executive, aged between 25–39 years.

4.4 Psychometric quality of constructs of two studies

Cronbach’s alpha for each construct was above the recommended reliability level at 0.7, except for functional MCI (Study 1: 0.67 and Study 2: 0.64). However, Cronbach’s alpha of the functional MCI, measured with three items, can be considered as acceptable when using less than ten items (Loewenthal, 1996) and significant when above 0.6 (Peter, 1979). The composite reliability values, all above 0.8 respecting the minimum threshold defined at 0.7 (Fornell and Larcker, 1981), also confirmed the reliability. Finally, the reliability was controlled by examining the factor loadings for each item in the measurement model (FMCI2 has been removed as it is lower than the recommended threshold of 0.7 for Study 1 on wearables). The convergent validity was validated by analysing the average variance extracted (AVE) for each construct, all above the recommended threshold defined at 0.5. For the discriminant validity, the square root of the AVE for each construct was greater than the correlation values between any two constructs (Table 2 and Table 3).

Table 2 Reliability and convergent validity

	Cronbach's alpha	*Composite reliability*	*AVE*
		Study 1	
FMCI	0.67	0.86	0.75
HMCI	0.68	0.82	0.60
SAT	0.81	0.89	0.73
SMCI	0.70	0.84	0.63
WOM	0.94	0.96	0.90
		Study 2	
FMCI	0.64	0.85	0.73
HMCI	0.73	0.85	0.64
SAT	0.78	0.87	0.70
SMCI	0.72	0.84	0.64
WOM	0.95	0.96	0.90

Table 3 Discriminant validity

	FMCI	*HMCI*	*SAT*	*SMCI*	*W*
			Study 1		
FMCI	*0.87*				
HMCI	0.60	*0.78*			
SAT	0.46	0.39	*0.86*		
SMCI	0.58	0.65	0.34	*0.79*	
WOM	0.49	0.47	0.72	0.43	*0.95*
			Study 2		
FMCI	*0.86*				
HMCI	0.55	*0.80*			
SAT	0.40	0.34	*0.83*		
SMCI	0.56	0.66	0.30	*0.80*	
WOM	0.45	0.43	0.70	0.38	*0.95*

Cross-loading results of each indicator for Study 1 on wearables (Table 4) and Study 2 on smart home objects (Table 5) show that three dimensions of MCI are distinct from one another, by controlling that they load higher on their respective construct (Sarstedt et al., 2012) and cannot be considered as a single construct as presented in certain literature (e.g., Goldsmith and Hofacker, 1991).

Table 4 Cross-loadings (Study 1)

	FMCI	*HMCI*	*SAT*	*SMCI*	*WOM*
FMCI1	*0.881*	0.511	0.482	0.476	0.469
FMCI3	*0.854*	0.512	0.303	0.538	0.380
HMCI1	0.316	*0.744*	0.289	0.401	0.332
HMCI2	0.330	*0.783*	0.224	0.470	0.311
HMCI3	0.650	*0.799*	0.380	0.607	0.435
SAT1	0.386	0.320	*0.905*	0.320	0.674
SAT2	0.401	0.344	*0.910*	0.275	0.677
SAT3	0.391	0.356	*0.740*	0.288	0.479
SMCI1	0.457	0.505	0.326	*0.735*	0.441
SMCI2	0.432	0.463	0.166	*0.776*	0.235
SMCI3	0.491	0.572	0.306	*0.862*	0.344
WOM1	0.438	0.425	0.687	0.390	*0.953*
WOM2	0.485	0.441	0.689	0.414	*0.947*
WOM3	0.474	0.480	0.671	0.432	*0.943*

Table 5 Cross-loadings (Study 2)

	FMCI	*HMCI*	*SAT*	*SMCI*	*WOM*
FMCI1	*0.871*	0.478	0.436	0.441	0.476
FMCI3	*0.840*	0.461	0.234	0.514	0.286
HMCI1	0.318	*0.778*	0.261	0.445	0.304
HMCI2	0.370	*0.809*	0.216	0.510	0.326
HMCI3	0.589	*0.821*	0.329	0.616	0.393
SAT1	0.316	0.243	*0.899*	0.234	0.644
SAT2	0.339	0.290	*0.899*	0.228	0.661
SAT3	0.350	0.335	*0.686*	0.305	0.421
SMCI1	0.443	0.506	0.291	*0.753*	0.375
SMCI2	0.407	0.491	0.147	*0.788*	0.204
SMCI3	0.477	0.584	0.267	*0.855*	0.314
WOM1	0.403	0.383	0.665	0.334	*0.954*
WOM2	0.438	0.405	0.675	0.361	*0.949*
WOM3	0.441	0.437	0.655	0.377	*0.945*

5 Test of the research model

A structural equation modelling analysis was conducted using SmartPLS3 Software to test the hypotheses of our research model. The partial least square (PLS) method provides researchers with a better understanding of the cause/effect relationship between the observed variables of the model (Wold, 1975). PLS-SEM is used to develop more advanced models attempting to measure both indirect and direct effects. It is also well-adapted when evaluating the impact of a latent variable on another latent variable in a model. Latent variables are composed of several variables (Rigdon et al., 2010). Finally, PLS-SEM performs well regarding the estimation of nonlinear relations between variables because contrarily to multiple regression that uses unit weighted measures of variables (sum of several variables to create one latent variable), there is less overestimation or underestimation of the error (Basco et al., 2022; Hair et al., 2017).

To test the inner model, the relationships between variables were controlled by analysing if the R^2 values are considered as substantial (> 0.67), moderated (0.33), or weak (< 0.19). The cross-validated redundancy indicators (Q^2) were verified by controlling that Q^2 values were all above zero, using the blindfolding procedure (Tenenhaus et al., 2005). Finally, we controlled that the path coefficients (β) were above the recommended threshold of 0.2, the t-values were above 1.96, and the p-values below 0.05. The size effect of the relationships between variables was measured by analysing the f^2 values. Based on Cohen (1988), an f^2 at 0.02 is considered as low, at 0.15 as moderated, and 0.35 as high. All the variance inflation factor (VIF) values are below the recommended threshold 3.3 confirming that the model is free of common method bias (Kock, 2015).

Finally, to analyse the mediation effect, for both studies, we examined whether functional and hedonic MCI mediated the impact of social MCI on satisfaction (following earlier research by Zhang et al., 2020). Analyses conducted using Preacher and Hayes's (2008) macro with bootstrapped samples (5,000) indicates indirect mediation (Zhao et al., 2010).

5.1 Results of Study 1: wearables

5.1.1 Direct effects

Our results reveal that R^2 of functional (0.34) and hedonic MCI (0.43) are both related to social MCI, highlighting that social MCI positively relates to functional MCI (β = 0.58, t = 17.86, p = 0.00) with a high size effect (f^2 = 0.51), and hedonic MCI (β = 0.65, t = 25.40, p = 0.00) with also a very high size effect (f^2 = 0.74). Thus, *H1 and H2 are supported*. Functional MCI (β = 0.33, t = 5.74, p = 0.00, f^2 = 0.09), hedonic MCI (β = 0.18, t = 2.77, p = 0.00, f^2 = 0.02) and social MCI (β = 0.01, t = 7.80, p = 0.00, f^2 = 0.01) explain 23% of the variance of satisfaction (R^2 = 0.23). Although the influence of social MCI on satisfaction is significant, the path coefficient close to zero indicates a very low impact (β = 0.01), confirmed by the size effect (f^2 = 0.001). Therefore, *H3a, H3b, and H3c are supported*. Finally, the level of satisfaction (β = 0.72, t = 23.92, p = 0.00) explains 52% of the variance of WOM. Thus, *H6 is supported*. All Q^2 values, above 0, confirm the good predictivity of the model with a better result for WOM (0.43), followed by functional MCI (0.24), hedonic MCI (0.23) and satisfaction (0.16). Finally, the goodness of fit with a value close to 0.5 confirms the good quality of our model considered as high when above 0.36 (Latan and Ghozali, 2012). The results are summarised in Table 6.

Table 6 Structural equation models (Study 1)

		Study 1						
		R^2	f^2	*β*	*t*	*p*	Q^2	*H*
FMCI		0.34					0.24	
	SMCI		0.51	0.58	17.86	***		x
HMCI		0.43					0.23	
	SMCI		0.74	0.65	25.40	***		x
SAT		0.23					0.16	
	FMCI		0.09	0.33	5.74	***		x
	SMCI		0.00	0.01	7.80	***		x
	HMCI		0.02	0.18	2.77	**		x
WOM		0.52					0.43	
	SAT		1.07	0.72	23.92	***		x

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

5.1.2 Indirect effects

The analysis reveals that the indirect impact between social MCI and satisfaction is significant if we consider the 95% confidence interval which did not include zero. In addition, the Sobel test confirms bootstrapping results and shows that functional and hedonic MCI mediate the relationship between social MCI and users' satisfaction (Table 7). Thus, *H4 and H5 are supported*.

Table 7 Mediating analysis (Study 1)

	Study 1			
	Bootstrap procedures			
	β	*p*	*LLCI*	*ULCI*
Direct effect	0.01	n.s.	–0.06	0.09
Indirect effect	0.23	***	0.16	0.31
Total effect	0.25	***	0.19	0.32
	Sobel test			
	β	*Z*	*p*	
FMCI	0.14	5.78	***	
HMCI	0.09	3.62	***	

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

5.2 Results of Study 2: smart home objects

5.2.1 Direct effect

The results indicate that social MCI positively relates to functional MCI (β = 0.56, t = 23.47, p = 0.00) and explains 30% of the variance with an important size effect (f^2 = 0.51). Social MCI positively relates to hedonic MCI (β = 0.66, t = 38.81 p = 0.00) and explains 43% of the variance of MCI with a very high effect of size (f^2 = 0.78). *H1 and H2 are supported*. Both functional MCI (β = 0.29, t = 7.99, p = 0.00, f^2 = 0.07) and hedonic MCI (β = 0.16, t = 3.93, p = 0.00, f^2 = 0.01) positively relate to satisfaction (R^2 = 0.18). We observe that the relationship between social MCI and satisfaction is not significant (β = 0.03, t = 0.76, p = 0.44, f^2 = 0.01). *H3a and H3b are supported and H3c is not supported*. Finally, satisfaction strongly relates to WOM (β = 0.70, t = 34.20, p = 0.00) and explains 49% of the variance. Thus, *H6 is supported*. All Q^2 values, above 0, confirm the good predictivity of the model with a better result for WOM (0.42), followed by functional MCI (0.22), hedonic MCI (0.27) and satisfaction (0.12). The quality of the model for Study 2 is validated by a goodness of fit at 0.51. Table 8 reports the results from Study 2.

Table 8 Structural equation models (Study 2)

				Study 2				
		R²	*f²*	*β*	*t*	*p*	*Q²*	*H*
FMCI		0.30					0.22	
	SMCI		0.51	0.56	23.47	***		x
HMCI		0.43					0.27	
	SMCI		0.78	0.66	38.81	***		x
SAT		0.18					0.12	
	FMCI		0.07	0.29	7.99	***		x
	SMCI		0.00	0.03	0.76	n.s.		o
	HMCI		0.01	0.16	3.93	***		x
WOM		0.49					0.42	
	SAT		0.93	0.70	34.20	***		x

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

Table 9 Mediating analysis (Study 2)

		Study 2		
		Bootstrap procedures		
	β	*p*	*LLCI*	*ULCI*
Direct effect	0.03	n.s.	–0.02	0.08
Indirect effect	0.18	***	0.14	0.23
Total effect	0.22	***	0.18	0.25
		Sobel test		
	β	*Z*	*p*	
FMCI	0.10	7.63	***	
HMCI	0.08	4.67	***	

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

5.2.2 Indirect effect

The analysis reveals that the indirect influence between social MCI and satisfaction is significant if we consider the 95% confidence interval which did not include zero. In addition, the Sobel test confirms bootstrapping results (Table 9). Thus, *H4 and H5 are supported*.

5.3 Summarisation of results of two studies

This research investigates how individual characteristics drive individuals to spread WOM in the context of smart objects by using MCI theory, our analysis shows that social MCI positively relates to both functional and hedonic MCI in the two studies. *H1 and H2 are supported*. Both functional and hedonic MCI positively relate to satisfaction. *H3a and H3b are supported* for wearables and smart home objects. We find that the impact of social MCI on satisfaction is non-significant for smart home objects and very low for wearables, therefore *H3c is partially supported*. Our findings confirm that social MCI has an indirect impact on satisfaction through functional and hedonic MCI in both studies. Thus, *H4 and H5 are supported*. Finally, our results demonstrate that satisfaction positively relates to WOM in both product categories. *H6 is supported*.

6 Discussion

6.1 Theoretical implications

The primary goal of this article is to deepen the awareness of innovation adoption by considering how individual characteristics of innovation drive consumers to spread WOM in the context of smart objects. The research framework seeks to clarify the relationships between the different dimensions of MCI, satisfaction and WOM. The main result of the empirical study suggests that there is a positive relationship between MCI and WOM through satisfaction, allowing us to draw theoretical implications for both WOM literature and consumer innovativeness theory.

The existing body of literature on WOM has shown that the most common WOM antecedents are strongly associated with brand-related experiences, such as satisfaction, loyalty, commitment, sharing behaviours or perceived value (De Matos and Rossi, 2008; Dick and Basu, 1994; Eelen et al., 2017; Harrison-Walker, 2001; Karjaluoto et al., 2016; Lovett et al., 2013; Haikel-Elsabeh et al., 2019). Regarding the non-brand motives of WOM, the literature has highlighted:

1 Product-related factors: product characteristics (Berger and Schwartz, 2011) and product innovativeness (Nguyen and Chaudhuri, 2019).

2 Contextual factors: emotion (Berger and Milkman, 2012) and interpersonal closeness (Dubois et al., 2016).

Little research has addressed variables on the individual level to explain WOM regarding innovation adoption. In this research, all hypotheses and mediation effects are supported except H3c which is only partially supported. This demonstrates the complex decision-making process of WOM that integrates both direct and indirect factors.

Our research contributes to the literature by highlighting that social MCI has an amplifier influence on the positive perception of the products functionalities and hedonism. This finding, explained by the integration of smart objects in the consumers' extended self (Belk, 2014), shows that the social value builds the uniqueness of the individuals' identity and improves his/her perception of the quality of the products (functionally and hedonically). More specifically, innovative products play a significant role in building one's self-image and can be mobilised to characterise an individual. For instance, functionally and hedonically motivated innovative consumers are satisfied and ready to spread positive WOM with the product images of being experts and fun, and these satisfied feelings originate from the social need for uniqueness. The results are consistent with those of Alexandrov et al. (2013), who open a broader perspective by considering WOM as a social process based on social exchange theory (Emerson, 1976; Homans, 1961; Thibaut and Kelley, 1959). The authors posit that the ultimate gain from engaging in WOM is the satisfaction of needs such as self-enhancement and self-affirmation. The desire for recognition is one of the deepest human needs because it creates a positive feeling that lasts for a long time. Berger (2014) illustrates one reason why consumers engage in WOM: to shape the impressions that others have of them. The literature also highlights that early adopters who are socially motivated tend to communicate about their innovative products to differentiate themselves from the group (Reinhardt and Gurtner, 2015). To satisfy these needs through WOM, a person must engage in social interaction to satisfy social needs, such as the need for social comparison (Festinger, 1954).

This finding also draws some substantial conclusions for consumer innovativeness theory. Even though the direct relationship between social MCI and satisfaction is not supported for smart home objects and is low for wearables, the complete mediation demonstrates a positive relationship between social MCI and satisfaction through functional and hedonic MCI. This point is important because scholars still consider these three concepts, i.e., functional, hedonic and social dimensions of consumer innovativeness at the same order and level to influence attitudes and behavioural intentions. The idea that social MCI is an antecedent and a driver of functional and hedonic MCI stresses that consumer innovativeness should no longer be considered a persistent personality trait but rather a socially influenced desire to seek out new and different experiences.

We noticed the major difference in our results between wearables and smart home objects is that there is a direct impact of social MCI on satisfaction regarding wearables, but not for smart home objects. Although for both categories a strong impact of functional and hedonic MCI on satisfaction is found, a difference in the impact of social MCI on satisfaction is evident. This may be explained by the interaction mode (Greenberg et al., 2011) and the social benefits attached to the products. Wearables are close to the human body and perceived as self-extension (Belk, 2014), therefore, they are more visible compared to smart home objects. As innovative products play an important role in building one's self-image, in this sense, the social and symbolic benefits expected from the wearables are stronger because they can construct a desirable social situation (Tamminen and Holmgren, 2016).

Finally, this research offers also interesting insights for research on new product launches and innovation success factors in general. As mentioned in the introduction, scholars have stated for almost three decades that most product innovations fail. Hence, emphasising the social dimension of consumer innovativeness might help to analyse and ideally predict future innovation success in more detail.

To sum up, this study contributes to addressing the limitations and extending the smart object adoption literature in three major ways. First, it considers the specificity of smart object characteristics and extends WOM literature by investigating how individual characteristics of innovation drive WOM diffusion in an early adoption phase. Second, this research extends the MCI literature by proposing a theoretical framework and empirically testing the relationships among the three dimensions of MCI (functional, hedonic and social). Finally, the different result regarding wearables and smart home objects demonstrates the necessity of considering the product category when investigating smart object adoption.

6.2 Managerial implications

The adoption of innovation is a key but difficult endeavour to manage in a company. An innovative product does not guarantee market success just by being innovative (Calantone et al., 2006). It may encounter consumer resistance and it is increasingly difficult to be recognised in the market (Brem and Viardot, 2015). Before this background, this study offers unique insights into the dynamics and their impacts on the adoption of innovation.

First, this research confirms the positive effect of functional and hedonic MCI on satisfaction (H3a and H3b) and WOM (H6) in both product categories. Thus, wearables and smart home firms need to emphasise not only the functional but also the hedonic aspects of these products. If the pragmatic and sensation-seeking advantages of the wearables/smart home objects are fulfilled and highlighted to potential consumers, they tend to be satisfied with the products and engage in spreading positive WOM. This is key for all kinds of companies, including small- and medium-sized firms.

Second, the study revealed that social MCI positively relates to both functional and hedonic MCI in both studies (H1 and H2). This finding indicates that functional and hedonic motivations are strongly linked with social motivation in wearables and smart home objects. Therefore, if the social advantage of being unique in these products is highlighted, the consumers will likely consider these products useful and fun. Also here, companies of all sizes can use this result to foster their product development activities.

Third, it was found that social MCI is non-significant on satisfaction for smart home objects and very low for wearables (H3c), but social MCI has an indirect impact on satisfaction through functional and hedonic MCI in both product categories (H4 and H5). By analysing the mediation effects of functional/hedonic MCI on the relation between social MCI and satisfaction, we show that the social factors strengthen this relationship in both smart object categories. We also show that the social MCI is a clear antecedent of WOM communication through satisfaction. Companies need to consider that WOM does not come by itself but can be triggered by conveying an appropriate product image that can help users socially distinguish themselves, as shown by the example of the success of Nespresso (Brem et al., 2016). An image construction process for innovative products could go beyond the novelty of such products to trigger an affective reaction and cognitive reflection. If they fulfil users' images of being unique, this leads to a higher probability that the users will perceive a higher functional and hedonic value. In the best case, this will also lead to satisfaction and a higher recommendation probability through WOM.

Hence, hedonic, functional, and social MCI should much more often be a part of the agenda of corporate top management. This is not only important for analysing past innovation problems but also to foster a higher probability of future new product introductions into the market. A common issue might be the case that especially big companies have many different departments dealing with new product introductions, namely research and development, production, marketing and sales. This is another important point worth mentioning: only if communication and understanding between those departments are fostered, the probability of innovation success rises in general.

6.3 Limitations and future research

Although this research contributes to our understanding of the impacts of MCI on WOM, its limitations should also be acknowledged. The primary concern is that only smart object categories were chosen, i.e., wearables and smart homes, other dimensions of the innovation products should be investigated (e.g., the disruptive innovations or RNPs), to discuss the generalisability of the research model.

Future research is needed to better understand the unrelated or low direct relations between social MCI and satisfaction. Size effects highlight in both studies that social MCI relates to hedonic MCI more than to functional MCI; however, functional MCI relates to satisfaction more than to hedonic MCI. Potential explanations for this phenomenon need to be explored further.

We also recommend that future research should include other potential constructs, for example, self-concept, to increase the robustness of the research framework. Besides, as artificial intelligence (AI) is increasingly implemented in smart objects (Xiong et al., 2020; Yang et al., 2020), it is interesting to apply the research framework to a new category of smart objects with AI assistance.

7 Conclusions

The evolutions and specificities of IoT open not only a new context to revolutionise consumer experiences, but also a window of new opportunities to adopt such innovation. Although a substantial body of literature exists on the adoption of smart objects, the current research provides a unique contribution by investigating how individual characteristics of innovation drive WOM diffusion in two product categories of smart objects. Following the behavioural literature of Rosenberg and Hovland (1960), our research framework is proven to be largely supported. The obtained results extend both WOM literature and consumer innovativeness theory and contribute to a better understanding of how firms can trigger WOM through consumers' MCI tendencies.

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Appendix

Constructs and measures

Constructs		*Measurement items*
Functional MCI (FMCI)	FMCI1	If an innovation like wearables (smart home objects) is more functional, then I usually use it.
	FMCI2	If a new product like wearables (smart home objects) gives me more comfort than my current product, I would not hesitate to use it.
	FMCI3	If a new product like wearables (smart home objects) makes my work easier, then this new product is a ‘must’ for me.
Hedonic MCI (HMCI)	HMCI1	Using novelties like wearables (smart home objects) gives me a sense of personal enjoyment.
	HMCI2	Innovations like wearables (smart home objects) make my life exciting and stimulating.
	HMCI3	The discovery of novelties like wearables (smart home objects) makes me playful and cheerful.
Social MCI (SMCI)	SMCI1	I like to own a wearable (smart home objects) that distinguishes me from others who do not own this new product.
	SMCI2	I prefer to try new products like wearables (smart home objects), with which I can present myself to my friends and neighbours.
	SMCI3	I like to outdo others, and I prefer to do this by buying new products like wearables (smart home objects) that my friends do not have.
Satisfaction	SAT1	I am satisfied with the choice of my wearables (smart home objects).
	SAT2	I am satisfied with the use of my wearables (smart home objects).
	SAT3	I am satisfied with the services associated with my wearables (smart home objects) (community, sharing of information, …).
Word-of-mouth (WOM)	WOM1	I recommend my wearables (smart home objects) to someone who seeks my advice.
	WOM2	I encourage friends and relatives to use my wearables (smart home objects).
	WOM3	I say positive things about my wearables (smart home objects) to other people.