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Influencer is the New Recommender: Insights for Theorising Social Recommender Systems

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Abstract

Designing theory-driven social recommender systems (SRSs) has been a significant research challenge for over a decade. This study aims to identify behavioural factors that could improve the persuasiveness and quality of recommendations made by SRSs. Given both research streams' striking similarity, it uses the recent yet rich research on social media influencers (SMI) to inform SRS research. Drawing on 72 publications, we classified 52 independent variables into 12 categories regrouped into three broad categories that characterise the relationships between the consumer and the (i) recommender system, (ii) product or brand, and (iii) and advert. The metanalysis results determined the relative importance of each category in predicting purchase intentions, placing recommender credibility and attitude towards the recommended product or brand at the top of the charts. Our findings are expected to facilitate more refined theory-building efforts and theory-driven designs in SRS research and practice.

Keywords: Social recommender system, social media influencer, e-commerce, social commerce, metanalysis, review

1 Introduction

Social recommender systems (SRSs) can generate personalised product recommendations based on social connections between individuals (Li Y. M. et al., 2013). These systems have become an integral part of e-commerce platforms (Li Y. M. et al., 2013; Patro et al., 2020) and essential decision support systems for consumers who use such media (Chen J. & Shen, 2015; Tsai & Brusilovsky, 2021). The reason for SRSs' growing importance in the e-commerce ecosystem is their ability to reduce consumers' decision time and effort by filtering out excess information online to recommend just what the consumer needs (Arazy et al., 2009; Sun et al., 2020; Tsai & Brusilovsky, 2021). It captures researchers' attention because people are increasingly willing to delegate their decisions to algorithms due to information overload (Goldbach et al., 2019; Guy, 2015; Schneider & Leyer, 2019). Thus, improving the quality of recommendations made by SRSs can significantly positively affect e-commerce traders as it would facilitate decision-making for consumers.

The extant research shows that enhancing the quality of recommendations made by SRSs remains a significant challenge (Guy, 2015; Shokeen & Rana, 2020). In general, SRS literature assumes that the quality of recommendations can be enhanced by accurately identifying consumer preferences in individual social networks and making predictions on how relevant an item could be for the consumer targeted by the recommendation (Arazy et al., 2009; Nagulendra & Vassileva, 2016; Shokeen & Rana, 2020). Therefore, researchers are constantly investigating innovative ways to make recommendations from SRSs more accurate, relevant, and persuasive (Ahmadian et al., 2020; Weng et al., 2021). Big data and advances in artificial intelligence (AI) provide researchers with a unique opportunity to improve the overall performance of SRSs. Given the proliferation of available social big data on consumers, researchers can access massive amounts of data on all kinds of social relationships and interactions between individuals (Jyoti & Chhavi, 2020; Sun et al., 2020). Meanwhile, AI algorithms like machine learning and deep learning now make it possible to analyse complex relationships in such massive datasets to arrive at more efficient recommendations (Guo et al., 2018; Gupta et al., 2021; Shokeen & Rana, 2020).

However, very few studies investigate behavioural factors to be considered when designing SRSs (Arazy et al., 2009, 2010). Most studies focus on the technical aspects of the recommendation algorithm without understanding the nature of the social information that improves the recommendation performance (Shokeen & Rana, 2020; Sun et al., 2020). This focus has led to profound challenges related to the identification and relative weight of attributes to be considered when designing SRS algorithms (Arazy et al., 2010; Jyoti & Chhavi, 2020). This gap in the literature has led to several debates on whether consumers would adhere more to product recommendations from other consumers (human recommenders) than from AI-powered SRSs (Longoni & Cian, 2020; Wien & Peluso, 2021). Faced with such debates, the need for a behavioural theory-driven approach to SRS design is as critical today as it was ten years ago, with an even better chance of achieving such designs thanks to big data and AI. This study aims to identify behavioural factors that could improve the persuasiveness and quality of recommendations made by SRSs used in e-commerce platforms to address this knowledge gap. It attempts to answer the following research question: *what behavioural factors influence consumers' intention to purchase products or brands recommended by SRSs?*

The research question was assessed through the lens of social media influencer (SMI) literature. This body of knowledge helped us understand the parallel relationship between how SMIs influence consumers' purchase

intentions and how SRSs could do the same. To this end, we use a metanalytic approach to theorise individual (consumer) level behaviour under the primary assumption that behavioural factors can be computed and integrated into SRS design. Our main empirical finding is that relationship with the SMI, product or brand, and advert are three broad categories of behavioural factors that affect followers' intention to purchase products recommended by SMIs. These findings reveal how these categories could lead to theory-driven SRS designs that generate more persuasive recommendations. Thus, this paper mainly contributes to the extant research by (i) synthesising empirical findings on the factors that make SMIs influence the purchase intentions of their followers; (ii) recommending behavioural factors to be considered when designing SRSs; and (iii) ranking attributes to be considered when designing SRS algorithms.

The following section presents relevant prior studies to highlight the research gap on behavioural factors that affect SRSs' persuasiveness and explains how SMI literature can help fill this gap. It is followed by Section 3, where we describe the metanalytic approach used in this study. Section 4 presents the results discussed in Section 5, alongside the study's implications and limitations. The paper ends with a conclusion in Section 6.

2 Background literature

SRSs are mainly designed following the basic assumption that if two individuals have a social relationship, they are likely to share similar preferences (Mukamakuza et al., 2019; Tsai & Brusilovsky, 2021; Wu et al., 2021). Thus, most researchers focus on users' ratings on items and explicit social connections to boost recommendation accuracy (Hsu et al., 2018; Xiwang Yang et al., 2014). SRS researchers mostly investigate technical aspects regarding algorithms that can improve the identification of social relationships and their strengths. Some multidisciplinary studies have investigated technical ways to build accurate social trust networks and preserve SRS users' privacy. They have proposed composite trust-based probabilistic matrix factorisation models and methods of concealing consumers' data to ensure user privacy is respected (Chen C. et al., 2016; Elmisery, 2014). In information systems (IS) research, technically-oriented studies have used social correlation theory (Wu et al., 2021), exponential random graph model (Yang D. et al., 2017), and complexity theory (Yan et al., 2017) to understand SRSs. Using advanced computational techniques (Guo et al., 2018; Wu et al., 2021; Yan et al., 2017; Yang D. et al., 2017), they have used user communication patterns on social media to understand user influence across heterogeneous social networks (Arbelaitz et al., 2016). Others have analysed trust relationships within social networks, incorporated social context, activities, and preferences, and combined context-aware, social network, and sentiment-based information into SRS design (Colombo-Mendoza et al., 2018; Li W. et al., 2017; Yang D. et al., 2017).

The main shortcoming in SRS research is the limited number of behavioural studies (Arazy et al., 2009, 2010). Very few IS studies have adopted a behavioural approach to understanding SRSs and improving their recommendation accuracy. Multidisciplinary studies have explored behavioural factors related to SRSs using theoretical frameworks like the elaboration likelihood model (Xue Yang, 2020), social presence theory (Virdi et al., 2020), and social exchange theory (Chang & Hsiao, 2013). Some have investigated factors that affect consumer intention to use SRSs and how to improve their interactions with such systems (Chang & Hsiao, 2013; Tsai & Brusilovsky, 2021). Meanwhile, others have focused on understanding consumers' motives to accept SRS in e-commerce websites and informational factors that affect purchase intentions based on recommendations from SRS (Virdi et al., 2020; Xue Yang, 2020). These studies show that consumers are very

likely to interact with SRSs that they can control and provide explanations for recommendations made (Tsai & Brusilovsky, 2021). Trust, shared values, perceived value, and persuasiveness directly affect intention to use SRSs and follow its recommendations (Chang & Hsiao, 2013; Viridi et al., 2020; Xue Yang, 2020).

Using Walls et al.'s (1992) IS design theory and social network theory, IS research shows that cognitive homophily, tie strength, preference similarity, and social relations are behavioural factors that affect willingness to accept recommendations from SRSs (Arazy et al., 2010; Li Y. M. et al., 2013). A few studies have delved more into the characteristics of social information to better understand the quality of the information and how "noise" in it can be filtered (Mukamakuza et al., 2019; Sun et al., 2020; Yan et al., 2017). Despite these contributions to behavioural research on SRS, there is still a gap in understanding the nature of the information contained in the recommendation that affects consumers' behaviour. Without this knowledge, no amount of algorithmic optimisation would make SRS's recommendations as accurate as humans because of our limited understanding of human behaviour on the issue. One way of addressing the issue is by improving our understanding of what makes consumers accept recommendations made by other consumers and model this behaviour to enhance SRS design.

SMIs are people with sizeable followers on social media platforms who regard them as trusted tastemakers in one or several niches (Torres et al., 2019). They are among the most popular product recommenders nowadays, and their recommendations are increasingly being accepted by consumers (Breves et al., 2019). Thus, SMIs have become an exciting channel for product/service recommendations by several brands (Farivar et al., 2019). A key component of influencers' success is their ability to drive consumers to consume a product or brand (Weismueller et al., 2020). This component makes SMIs and SRSs very similar in *modus operandi*. Firms pay SMIs or SRS service providers to recommend their brands because they believe they can shape consumers' attitudes and actions in their favour (Pick, 2021). Therefore, the stakes are the same for both recommender systems regarding recommendation quality, given that unsatisfied consumers would stop taking recommendations from them. Like SRSs, SMIs make product recommendations to their followers and serve as human decision support systems. Their recommendations can reduce consumers' decision time and effort by recommending specific products to their followers.

Given the strong similarities in capabilities and *modus operandi* between SMIs and SRS, understanding how SMIs influence consumer behaviour would greatly interest SRS research and practice. It would help SRS researchers understand what drives consumers to accept recommendations from a recommender and enable them to theorise how to improve SRSs. It is essential to highlight that influencers do not collect information on their followers' preferences and do not know most of them personally (Denecli & Denecli, 2019). Unlike SRSs, SMIs cannot provide highly personalised recommendations to individual followers. Despite this drawback, brands are increasingly abandoning traditional advertising techniques to adopt influencer-based advertising (De Veirman et al., 2017). Does this imply that SRSs are less effective? How can SMI literature inform SRS research? This research paper proposes to analyse SMI literature to identify behavioural factors that make consumers intend to purchase products recommended by SMIs. These factors would inform SRS researchers and practitioners on how SRS design can be improved and pave the way for future research on behavioural factors affecting SRS design.

3 Methodology

This study adopted a metanalytic research approach. It is an aggregative literature review that uses quantitative methods to test specific research hypotheses based on prior empirical findings (Templier & Paré, 2015). This technique is instrumental in summarising evidence in research accurately and reliably (Dwivedi et al., 2021; Hong et al., 2017; Ismagilova et al., 2020; Tamilmani et al., 2021). Lipsey and Wilson (2001) proposed the approach used in this paper. It involves three main steps: (i) literature search, (ii) article coding, and (iii) article analysis. This paper also followed recommendations made by Jeyaraj & Dwivedi (2020) regarding publication bias, selection of studies, effect sizes, coding, modelling, and sensitivity analysis.

3.1 Literature search

We searched the Web of Science (WoS), Scopus, and Business Source Ultimate databases for relevant publications. The databases were selected due to their frequent use in the academic literature as appropriate sources of data for metaanalysis (Dwivedi et al., 2021; Tamilmani et al., 2021). The search was performed in September 2021 using the terms: (“Influencer” OR “blog*” OR “vlog*” OR “microcelebrity” OR “microinfluencer” OR “wanghong” OR “cewebrity” OR “instafamous” OR “social media celebrity” OR “social media star” OR “social media personality” OR “online celebrity” OR “online star” OR “Internet celebrity” OR “internet star” OR “opinion leader” OR “YouTuber” OR “YouTube celebrity” OR “YouTube star” OR “Instagram celebrity” OR “Instagram star” OR “Facebook celebrity” OR “Facebook star” OR “Twitter celebrity” OR “Twitter star” OR “TikTok celebrity” OR “TikTok star” OR “unboxing” OR “digital influencer” OR “online influencer” OR “online opinion leader” OR “instafamous” OR “influencer endorsement”) AND (“Purchase intention” OR “purchase intent” OR “willingness to pay” OR “willingness to buy” OR “buying intention” OR “purchase behaviour” OR “purchase behavior” OR “price acceptance” OR “WTP”). There was no restriction placed on the publication outlet or timeline. A total of 225 unique publications were identified through the search.

Every publication included in this metaanalysis had to respect four criteria. First, it had to be an empirical study at the individual (consumer) unit of analysis. Conceptual papers, qualitative papers, and literature reviews of any kind were excluded. Second, the study investigated at least one behavioural factor (independent variable) that affected consumers' purchase intention (dependent variable). All publications that investigated technical aspects such as new methods or algorithms to improve the accuracy of recommendations were excluded. Third, the publication had to report sufficient data to compute effect size statistics (sample size and correlation coefficient). All articles that did not report any of these factors were excluded. Fourth, publications must be published in English (or have an English version). Based on these criteria, 72 publications were retained for metaanalysis. Seventy were journal articles, and two were conference papers. [Figure 1](#) summarises the protocol for this literature search.

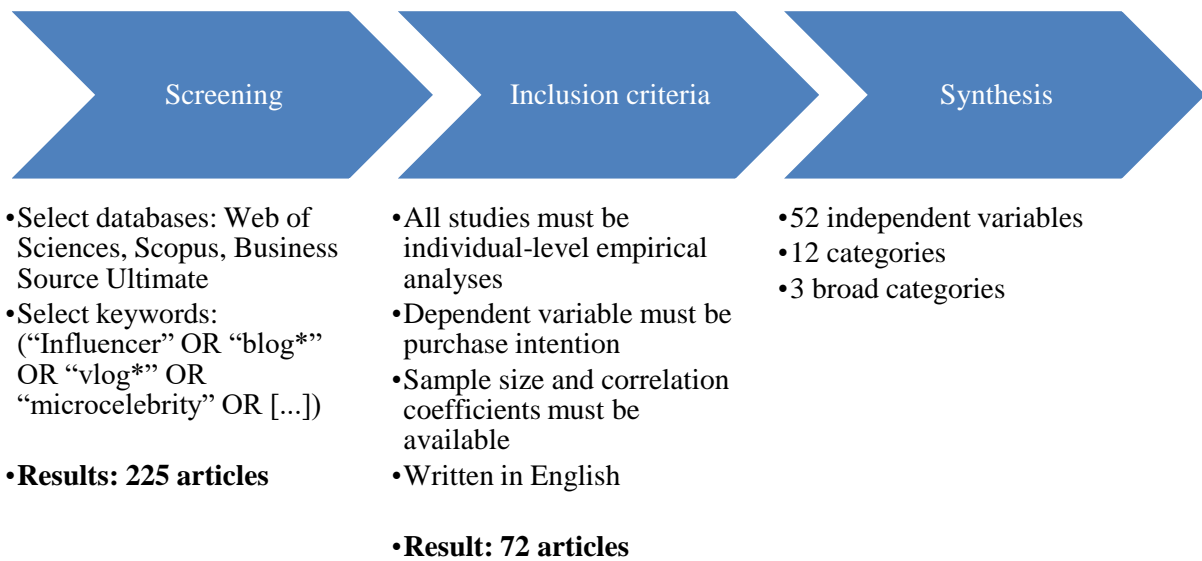


Fig. 1 Protocol for the literature search

3.2 Article coding

We identified 52 independent variables within the corpus of articles considered for this analysis. The variables result from the broad range of theoretical foundations employed in SMI literature to explain behavioural factors that affect purchase intention. We were able to identify relevant categories by analysing commonalities in theoretical foundations and measurement scales. We began placing each independent variable into a category iteratively based on commonality in meaning or measurement, and this process was relatively straightforward for factors like trustworthiness and credibility.

Meanwhile, it was less evident for factors like desire to mimic and arousal. Where uncertainty existed, the authors re-reviewed the definitions and measurement instruments of the variable to determine if a new category was required or an existing category would suffice. In total, 52 independent variables were organised into 12 categories. Each category was based on 2 to 12 publications, and [Table 1](#) contains a definition for each category.

Table 1 Independent variable categories and definitions

Category	Operational definition	Independent variables	Sample Sources
Relationship between consumer and recommender (SMI)			
Credibility	The degree to which the consumer perceives an influencer as believable and reliable.	Influencer's credibility; Perceived influence; Credibility	(Argyris et al., 2021; Jiménez-Castillo & Sánchez-Fernández, 2019; Mueller et al., 2018; Müller et al., 2018; Rosara & Luthfia, 2020; Saima & Khan, 2021)
Trustworthiness	The degree to which the consumer perceives an influencer as honest, sincere, truthful, genuine, or factual.	Perceived trustworthiness; Influencer's integrity; Benevolence; Trust in influencer's posts; Honesty; Authenticity; Confidence in blogger	(Al-Harbi & Badawi, 2021; Kim & Choo, 2019; Lee et al., 2021; C Lou & Yuan, 2019; Chen Lou & Kim, 2019; Naderer et al., 2021; Yuchung & Hanqing, 2017; Zogaj et al., 2021)
Expertise	The degree to which the consumer perceives that an influencer can make valid assertions and provide correct solutions or accurate judgments on a particular subject.	Perceived competence; Expertise of influencer; Expert influencers	(Kim & Choo, 2019; C Lou & Yuan, 2019; Chen Lou & Kim, 2019; J. P. Trivedi, 2018; J. Trivedi & Sama, 2020; Zogaj et al., 2021)
Attractiveness	The degree to which the consumer perceives an influencer as physically appealing, desirable, beautiful, classy, or elegant.	Influencer's attractiveness; Likability; Attractiveness of celebrity influencer; Attractiveness	(C Lou & Yuan, 2019; Chen Lou & Kim, 2019; Taillon et al., 2020; Torres et al., 2019; J. P. Trivedi, 2018; J. Trivedi & Sama, 2020)
Electronic word of mouth (eWOM)	The extent to which a consumer is willing to negatively or positively endorse, propagate, and recommend information shared by influencers.	eWOM	(C Lou et al., 2020; Rosara & Luthfia, 2020; Taillon et al., 2020)
Parasocial relationship-edited	The degree to which the consumer perceives a resemblance, attachment, and friendly relationship with an influencer.	Attachment to influencer; Similarity; Influencer's extroversion; Parasocial relationship; Follower's fandom; Psychological closeness; LOV interpersonal influence	(Argyris et al., 2021; Hahna & Lee, 2014; Kim & Choo, 2019; Kwak & Yoh, 2021; Chen Lou & Kim, 2019; Taillon et al., 2020)
Desire to mimic	The degree to which a consumer desires to imitate an influencer's lifestyle.	Envy; Desire to mimic; Fashion leadership	(Hahna & Lee, 2014; Ki & Kim, 2019; Lee et al., 2021)
Decision support	The degree to which a consumer seeks information, opinions or inspiration from an influencer to use as the basis for decision making regarding a topic of interest.	Opinion seeking; Consumerism; Creative inspiration	(Al-Harbi & Badawi, 2021; Lee et al., 2021)
Relationship between consumer and brand/product			
Brand congruence	The degree to which the consumer perceives a "fit" or "match" between the influencer and a brand.	Brand congruence; Collaboration of the influencer with renowned/non-renowned brand	(Ibáñez-Sánchez et al., 2021; Torres et al., 2019)
Attitude towards product/brand	The degree to which the consumer has positive or negative feelings about a brand.	Follower's attitude towards product or brand; product curiosity; Perceived quality of product/brand; Confidence in the product; Utility of the product; Attitude towards the brand; Consumer's brand admiration	(Magrizos et al., 2021; Mueller et al., 2018; Rosara & Luthfia, 2020; Shin & Lee, 2021; Torres et al., 2019; J. P. Trivedi, 2018; J. Trivedi & Sama, 2020; Yuchung & Hanqing, 2017)
Relationship between consumer and advert			
Advertising recognition	The extent to which a consumer perceives to be confronted with an advert and pays attention to its content.	Advertising recognition; Advertising disclosure; Message process involvement	(Mueller et al., 2018; Naderer et al., 2021; J. P. Trivedi, 2018)
Attitude towards the ad	The degree to which the consumer has positive or negative feelings about an advert.	Attitude towards the ad; Informative value; Content flow; Entertainment value; Arousal; Emotional assessment; Rational assessment	(Kwak & Yoh, 2021; C Lou & Yuan, 2019; Mueller et al., 2018; Szymkowiak et al., 2021)

3.3 Article analysis

A separate meta-analysis was conducted for each independent variable category following the random effects method proposed by Schmidt & Hunter (2015). The reported correlation of each study in every category was used to calculate the weighted mean effect size of the category (hereafter simply called effect size). Specifically, we used Fisher's r-to-Z transformation to standardise the reported correlations. We then calculated the weighted average of these new metrics, including both between- and within-study variance into the weights. Details of the calculations of effect size and other metrics are provided by Field & Gillett (2010).

The resulting effect sizes were ranked in order of magnitude such that effect sizes $\leq .30$ are small, between $.30$ and $.50$ are medium, between $.50$ and $.67$ are large, and $\geq .67$ are very large (Lipsey & Wilson, 2001). 95% confidence intervals and their significance (z-test) were calculated for each antecedent category to assess the validity and reliability of the meta-analytic results. Using Fisher's (1992) failsafe number (Failsafe-N), we also estimated the number of additional studies that would turn the effect size insignificant.

4 Metanalysis results

Table 2 Metanalysis results

Broad category	Category	Number of studies	Total sample size	Effect size (ES)	ES magnitude	95% CI ^a	Z-value	Failsafe-N test (Fisher)
Relationship between consumer and influencer (recommender)	Credibility	6	961	0.521	Large	0.41; 0.63 ***	12.340	15
	Decision support	3	1056	0.456	Medium	0.17; 0.74 ***	6.963	7
	Desire to mimic	3	961	0.433	Medium	0.07; 0.79 ***	5.189	7
	eWOM	3	843	0.391	Medium	0.10; 0.68 ***	5.791	7
	Attractiveness	7	2554	0.389	Medium	0.28; 0.50 ***	8.752	15
	Trustworthiness	12	4029	0.379	Medium	0.30; 0.45 ***	11.283	26
	Expertise	7	2530	0.375	Medium	0.29; 0.46 ***	10.790	15
	Para social relationship	8	2404	0.330	Medium	0.21; 0.45 ***	6.627	16
Relationship between consumer and brand/product	Attitude towards product/brand	9	2481	0.560	Large	0.41; 0.71 ***	9.331	18
	Brand congruence	2	709	0.403	Medium	-2.00; 2.81 *	2.124	5
Relationship between consumer and advert	Attitude towards the ad	7	2010	0.386	Medium	0.29; 0.46 ***	11.333	15
	Advertising recognition	3	880	0.125	Small	-1.09; 1.34	0.441	7

^adenotes z-test values that are significant at $p < .05$ * $p < .01$ **, $p < .001$ ***.

Table 2 summarises the meta-analysis results. The 52 independent variables identified in this study were grouped into 12 categories. The 12 categories were regrouped into three broad categories that characterise the relationship between the consumer and (i) the influencer (recommender), (ii) product/brand, and (iii) advert. The broad category that characterises the relationship between the consumer and influencer contains eight categories: credibility, decision support, desire to mimic, electronic word of mouth (eWOM), attractiveness, trustworthiness, expertise, and parasocial relationship. Credibility has a large effect on purchase intention, while all other categories in this broad category have medium effects. All confidence intervals are statistically significant. The

broad category characterising the relationship between the consumer and the product/brand contains two categories: attitude towards product/brand and brand congruence. Attitude towards product/brand has a large effect size, while brand congruence has a medium effect size. Both results are statistically significant. Finally, the broad category that characterises the relationship between the consumer and the advert contains two categories: attitude towards the ad and advertising recognition. Attitude towards the ad has a significant medium effect, while advertising recognition has a small and insignificant effect on purchase intention. Figure 2 presents a theoretical model on the behavioural factors that affect consumers' intentions to purchase products recommended by SMIs.

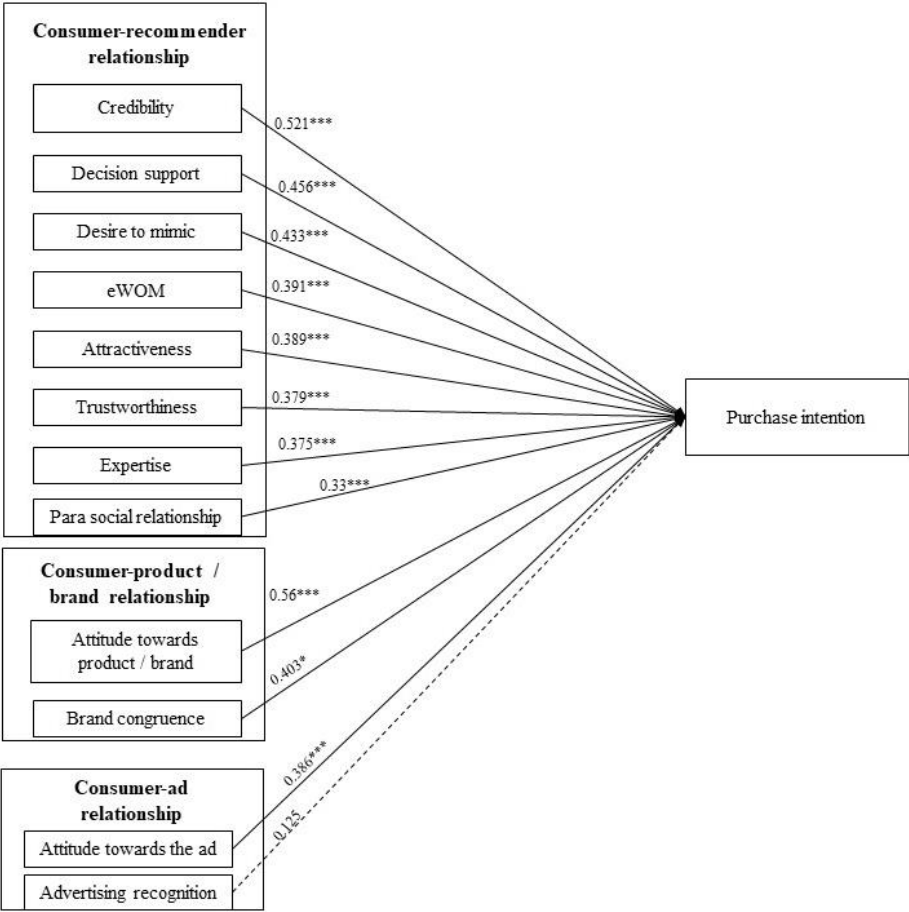


Fig. 2 Theoretical model on behavioural factors that affect consumers' intention to buy products recommended by recommenders (drawing from the case of SMIs as human recommenders)

5 Discussion

This study's objective was to identify behavioural factors that could increase the ability of SRSs to influence consumers' purchase intentions. It was motivated by the proliferation of SRSs in e-commerce platforms, the growing reliance of consumers on product recommendations due to information overload on the internet, and the potential of AI and analytics to enhance SRSs. Nevertheless, very few studies have investigated behavioural factors that affect consumers' intention to purchase products recommended by SRSs. People tend to rely on recommendations made by SMIs increasingly. This reliance has led to tensions regarding whether consumers would listen more to product recommendations from other consumers (human recommenders) than from AI-

powered SRSs. This study proposed to ease this tension by identifying the relative importance of antecedents to purchase intentions when SMIs recommend products to promote theoretical advancements in SRSs, given the similarity between both research spaces. It identified three broad categories of antecedents to purchase intention that characterise the relationship between the consumer and (i) the recommender, (ii) the product or brand, and (iii) the advert. This section discusses each category in these broad categories keeping in mind their relevance in SRS contexts.

Relationship between consumer and recommender

In order of effect size magnitude, credibility, decision support, desire to mimic, eWOM, attractiveness, trustworthiness, expertise, and parasocial relationship were the categories of independent variables in this broad category that affect consumers' purchase intentions. Credibility was explained using self-congruence theory, similarity–attraction theory, construal level theory, source credibility theory, and social learning theory (Argyris et al., 2021; Rosara & Luthfia, 2020; Saima & Khan, 2021; Zogaj et al., 2021). Researchers use self-congruence theory (Sirgy, 1986) to show that SMIs trigger credibility in consumers by matching their personality and self-concept (Zogaj et al., 2021). Such studies have considered perceived trustworthiness and perceived competence as dimensions of perceived credibility (Argyris et al., 2021; Zogaj et al., 2021). They show that ideal (whom a person would like to be) and actual (whom a person is) self-congruence affect each dimension of perceived credibility differently. Nevertheless, perceived credibility mediates the relationship between self-congruence and purchase intention (Zogaj et al., 2021). Based on similarity-attraction theory (Byrne, 1997), individuals are more likely to take recommendations from SMIs similar to them, especially in terms of attitudes, values, preferences, and attractiveness. This theory explains why self-congruence is essential for influencing purchase intentions, given that it positively affects individuals' perceived trustworthiness towards people they perceive as similar to them (Zogaj et al., 2021). It also explains how the personality match between the SMI and the consumer affects the relationship between perceived credibility and purchase intentions (Argyris et al., 2021; Nguyen et al., 2018).

Construal level theory (Trope & Liberman, 2010) describes the relationship between psychological distance and thought abstractions. This theory helps show that the effect of actual self-congruence on purchase intentions via perceived trustworthiness is stronger than ideal self-congruence on purchase intentions via perceived trustworthiness. Thus, a smaller psychological distance is related to more reliable and trustworthy information (Zogaj et al., 2021). The source credibility theory highlights that people are more likely to be persuaded by a source they perceive as credible (Hovland et al., 1953; Ohanian, 1990). The theory indicates that the three key determinants of source credibility are perceived expertise, trustworthiness, and attractiveness (unlike some researchers who identify expertise and trustworthiness as dimensions of source credibility, as mentioned above). This theory provides empirical support for the positive effect of SMI credibility on purchase intention. Researchers have used this theory to show that the perceived expertise, trustworthiness, and attractiveness of SMIs influence consumers' perception of credibility, which in turn affects purchase intention (Argyris et al., 2021; Saima & Khan, 2021). Social learning theory (Bandura, 1977; Hammer, 2011) and media dependency theory (Ball-Rokeach, 1985) were used to examine the process through which SMIs influence purchase intentions. They revealed that consumers' interactions with SMIs create a conducive social and cultural environment where consumers learn new norms, attitudes, expectations, and beliefs (Rosara & Luthfia, 2020). Such interactions create a dependency relationship wherein the consumer increasingly depends on the SMI's

perceptions and behaviours, including towards endorsed products or brands (Jiménez-Castillo & Sánchez-Fernández, 2019). The greater the consumer's interaction and dependency on a SMI, the greater their perceived credibility which leads to increased purchase intentions.

The decision support category was backed by opinion leadership theory (Katz, 1957; Schäfer & Taddicken, 2015) and uses & gratifications theory – UGT (Katz et al., 1973). The opinion leadership theory states that information from mass media reaches target audiences through influential people (opinion leaders) who digest the information, interpret it, and spread it to media users. Opinion leaders can be very influential to media users who hold them in high esteem because the users rely on them for advice in a social environment. It makes them very influential in media users' decision-making processes as the information they share can help others achieve their goals. In the same light, UGT states that media users actively seek a media source that best fulfils their specific needs. These theories have been used to show that SMIs who position themselves as opinion leaders can influence consumers' purchase intentions through their ability to improve the perceived image and value of the brand they are recommending (Jiménez-Castillo & Sánchez-Fernández, 2019). Due to information overload on the internet, followers actively seek opinions of SMIs they identify as opinion leaders on a specific topic to make decisions. The more satisfied they are with the recommendations made by the SMI, the more they rely on that SMI for decision support (Al-Harbi & Badawi, 2021).

Desire to mimic was explained using consumers doppelgänger effect theory (Ruvio et al., 2013). This theory argues that some consumers have a strong inclination to intentionally mimic the consumption behaviours of other individuals they perceive as role models. It involves determining who to mimic, the behaviour to mimic, the extent to which the role model should be mimicked, and for how long the mimicking should go on. Since opinion leaders often act as models for opinion seekers, the latter tend to mimic them (Bertrandias & Goldsmith, 2006). In the same way, followers tend to mimic SMIs they perceive as fashion leaders, making mimicry a form of learning (Hahna & Lee, 2014; Ruvio et al., 2013). Followers also tend to mimic the lifestyles of followers they envy (Lee et al., 2021). Mimicking the lifestyles of SMIs strongly affects consumers' purchase intentions, given that they would want to consume the same brands recommended by the SMI, especially if the SMI claims to consume the same brand.

The strong positive effect of the eWOM category on purchase intention has been explained using the meaning transfer model (McCracken, 1989). The model argues that celebrities have some integrated meaning developed from their behaviours and achievements, eventually transferred to brands or products they endorse. This meaning is transferred to consumers who purchase or consume the same brand or product. Simply put, if a celebrity is associated with positive vibes, a product they endorse would be associated with positive vibes as well. The meaning transfer model has been used to show that SMIs influence purchase intentions by associating SMIs' behaviours and achievements that are eventually transferred to brands or products they endorse (Roy, 2018; Taillon et al., 2020).

The attractiveness category was created because some authors did not consider it a dimension of credibility but rather a separate independent variable that affects purchase intention. Researchers who adopted this view explained the relationship between attractiveness and purchase intention using the theory of reasoned action (Ajzen & Fishbein, 1972), parasocial relationship theory (Horton & Richard Wohl, 1956), and meaning transfer

model (McCracken, 1989). The theory of reasoned action explains how beliefs and attitudes towards a given behaviour affect intention (Fishbein, 1980). The theory is used to show that the attractiveness of SMIs positively affects followers' attitudes towards brands, which eventually affects brand admiration, which eventually positively affects purchase intention (J. Trivedi & Sama, 2020). Parasocial relationship theory explains a one-sided relationship experienced by an audience in a mediated encounter with performers on the other side of a media. The theory demonstrates that consumers usually know SMIs well, whereas the reverse is hardly true. Nevertheless, the stronger the consumer's illusionary relationship with the SMI during social encounters, the greater the intention to purchase brands recommended by the SMI (Chen Lou & Kim, 2019). Consumers also learn by association. The associative learning theory establishes that ideas and experiences are mentally linked by association (Shanks, 1995). Using the meaning transfer model as an application of the associative learning theory, researchers show that consumers associate attractive SMIs with product attractiveness, which eventually affects their purchase intentions (Taillon et al., 2020; Torres et al., 2019).

Trustworthiness was also created as a separate category because some researchers used the concept as an independent variable rather than a dimension of credibility. Such researchers leveraged opinion leadership theory, UGT, and the persuasion knowledge model to explain the effect of perceived trustworthiness on purchase intention. Opinion leadership theory helps clarify that the more consumers perceive SMIs as opinion leaders, the greater their trust in the SMIs, which eventually positively affects their intention to follow their purchase recommendations (Al-Harbi & Badawi, 2021; Lee et al., 2021). Consumers perceive the SMI as benevolent, authentic, and honest (Al-Harbi & Badawi, 2021; Kim & Choo, 2019; Lee et al., 2021). They believe that the SMIs they trust are committed to a set of principles based on honesty, and the information they share is without prejudice and in the interest of the consumer (Al-Harbi & Badawi, 2021; Kim & Choo, 2019; Yuchung & Hanqing, 2017). The persuasion knowledge model (Friestad & Wright, 1994) attempts to explain how people cognitively deal with information when they realise that it is an advertising attempt. This model is used to explain that if consumers perceive that the information presented by an SMI is purely advertising, it will reduce the trustworthiness of the influencer, which in turn reduces their purchase intention (Naderer et al., 2021). Expertise is another category created due to research that used this concept as an independent variable rather than a dimension of credibility. The category is used to show that followers are more likely to follow purchase recommendations from SMIs they perceive as experts on the topic of interest. Perceived expertise affects followers' attitudes towards the endorsed brands, which eventually affects brand admiration, which in turn positively affects purchase intention (J. Trivedi & Sama, 2020).

The parasocial relationship category was explained using parasocial relationship theory, the similarity-attraction model and the meaning transfer model discussed in the previous paragraphs. This category grouped independent variables that explained how parasocial relationships are formed between the SMI and followers and how the relationship affects purchase intention. This category highlights that followers develop enduring (one-sided) relationships with SMIs, cultivated more like friendship. The relationship is built due to the followers' perceived resemblance with the SMI on demographic or ideological aspects, which creates an attachment to the SMI (Argyris et al., 2021; Kwak & Yoh, 2021; Chen Lou & Kim, 2019). It makes followers develop a strong passion for a specific SMI, which is cognitively, behaviourally, and emotionally related to loyalty (Kim & Choo, 2019).

Thus, the greater the parasocial relationship between a follower and SMI, the more likely the follower will purchase products recommended by the SMI.

Relationship between consumer and product or brand

Attitude towards the product/brand and brand congruence are this broad category's independent variable categories. Attitude towards product/brand was explained using the theory of planned behaviour (Ajzen, 1991) and social learning theory. The theory of planned behaviour postulates that behavioural intention depends on attitude towards the behaviour, subjective norm, and perceived behavioural control. The theory explains how each of the above factors affects consumers' intention to purchase products recommended by SMIs (Magrizos et al., 2021). These attitudes include understanding consumers' evaluations of the product quality and utility expressed through curiosity, confidence, and admiration for the brand endorsed by SMIs. Based on social learning theory, the more consumers learn about the overall advantage of a product recommended by SMIs, the greater their purchase intention (Rosara & Luthfia, 2020). The self-congruence theory also explains that the stronger the congruence between the SMI and the endorsed brand, the greater the consumer's purchase intention (Torres et al., 2019).

Relationship between consumer and advert

This broad category contains attitude towards advertising and advertising recognition. Attitude towards the ad describes independent variables that focus on how people feel or think about an ad. Based on the persuasive knowledge model, consumers are less likely to have a positive attitude towards ads from SMIs, which reduces purchase intention because it reduces consumers' trust in the objectivity of the SMI (Naderer et al., 2021). Also, consumers' message process involvement moderates the relationship between attitude towards ads from SMIs and brand attitude (Naderer et al., 2021; J. Trivedi & Sama, 2020). The more consumers are willing to process information in ads from SMIs, the greater their purchase intentions. Nevertheless, the advertising recognition category did not significantly affect purchase intention. It implies that the extent to which a person recognises the persuasive intent of an advert does not affect consumers' purchase intentions. Instead, it is a combination of SMI credibility, attitude towards the ad, advertising disclosure, and rational and emotional assessment of the ad that generates purchase intention (Lou C. & Yuan, 2019; Müller et al., 2018; Szymkowiak et al., 2021).

5.1 Implications for research

This study builds on the cumulative body of knowledge on SMIs to identify behavioural factors that could affect SRS design, thereby adding to the limited body of knowledge on behavioural theory-driven SRS (Arazy et al., 2009, 2010). It reveals similarities and differences between human (SMIs) and technology (SRS) recommender systems. This comparison revealed that SMI research could inform behavioural research on SRS in the IS discipline, which remains limited. It implies that IS researchers can leverage theories and models proposed in SMI's body of knowledge to explain phenomena in the SRS context. This study reveals theoretical foundations that could advance behavioural research on SRSs. It shows that theories and theoretical models on uses and gratifications, associative learning, media dependency, opinion leadership, parasocial relationship persuasion knowledge, self-congruence theory, social learning theory, planned behaviour, and reasoned action have helped understand why consumers accept recommendations from human recommenders. These theories can serve as solid theoretical foundations for SRS research.

In the same light, this study informs debates on whether consumers would adhere more to product recommendations from other consumers (human recommenders) than from AI-powered SRSs (Longoni & Cian, 2020; Wien & Peluso, 2021). It also reveals several behavioural factors explaining why consumers accept product recommendations from other consumers. Given the growing development of AI-powered SRS (Longoni & Cian, 2020; Wien & Peluso, 2021), this study informs researchers on behavioural factors which they can use to compare human recommenders and AI-powered SRS. Furthermore, the behavioural factors identified and categorised in this study could help researchers investigate their relevance in enhancing the persuasiveness of SRSs. Given that human and technology recommender systems are not precisely the same, this study provides the theoretical foundations required to justify future research on the role of each factor identified on consumer behaviour in SRS contexts.

Furthermore, this study synthesises empirical findings on the factors that make SMIs influence the purchase intentions of their followers. The SMI phenomenon has grown exponentially in the last few years, resulting in several research works and divergent results. Several researchers have proposed different reviews to summarise this extant body of knowledge from different perspectives (Guruge, 2018; Vrontis et al., 2021). This study uses a metanalytic approach to synthesise SMI literature on how SMIs affect the purchase intentions of their followers. It identifies three broad categories of antecedents of purchase intentions, making it easy for researchers to identify areas for relevant future research contributions. This study also reveals several divergent views. For example, it highlights studies that measure source credibility as a unidimensional factor, while others measure it as a multidimensional factor. It also highlights studies that discuss the concept of attractiveness and likeability as synonyms while others address them as different concepts. Thus, the study provides a basis for SMI researchers to make meaningful contributions to understanding and clarifying these concepts essential for assimilating this body of knowledge.

5.2 Implications for practice

This research presents a collection of research-based behavioural factors that influence consumers' purchase intentions in SMI contexts to practitioners. It highlights behavioural factors and consumers' preferences in individual social networks when making predictions on the relevance and persuasiveness of a recommendation for consumers. Thus, it presents practitioners with additional behavioural factors to consider when designing SRSs to improve the quality of recommendations made by SRS (Guy, 2015; Parra et al., 2021; Shokeen & Rana, 2020). The effect size magnitudes identified should guide SRS designers on the essential attributes to code in algorithms. It implies that credibility is a fundamental behavioural factor to consider when designing SRSs based on the factors identified in this study.

Meanwhile, parasocial relationship and advertising recognition are the least important factors. Given the proliferation of AI and big data, this study could help SRS developers to develop algorithms and leverage available social data to integrate the identified behavioural factors in their algorithms to improve the quality of their recommendations (Guo et al., 2018; Nisha & Mohan, 2019; Shokeen & Rana, 2020). For instance, they could try to make SRSs more credible (since credibility is the behavioural factor that has the largest effect size) by reinforcing the learning process of the device. SRSs would provide more accurate (and “credible”) recommendations, thus enhancing users' purchase intention. Therefore, reinforcing the learning process would also be crucial for SRS designers to benefit from users' positive attitudes towards the recommended brand or

product. Meanwhile, SRS users may have to be willing to share more personal data with the system to help improve the credibility and trustworthiness of its recommendations and understand their attitudes towards brands.

5.3 Limitations and future research

Despite our attempt to follow a rigorous metanalytic process, this study has two main limitations, which also offer opportunities for future research. First, this study is limited by the possibility that some relevant studies may have been omitted during the metanalysis (publication bias). Although we selected all relevant publications from the widely accepted academic databases, we did not necessarily identify papers that were not yet referenced in these databases or we may have missed them. Second, we may have missed relevant categories within the publications analysed in this metanalysis. It brings us back to the fact that some pertinent publications that contain other relevant independent variables that form different categories may be absent from our metanalysis. To minimise the effect of such a possibility on our results, we calculated the Failsafe number, which showed that many more papers would be needed to render our findings insignificant. Future research could extend the metanalysis to other databases and institutional repositories that are not part of the WoS, Scopus, and Business Source Complete collections. Based on the revelations made in this study, several research questions on how SMI literature could help advance theory-building efforts and theory-driven designs in SRS research and practice. [Table 3](#) highlights some of the main questions and relevant theories that could help answer them.

Table 3 Opportunities for future research

Category	Finding in SMI context	Future research questions in SRS context	Relevant theories
Consumer-recommender relationship			
Credibility	SMI's perceived credibility enhances consumers' purchase intention.	<ul style="list-style-type: none"> • What kind of recommendations will render SRSs credible? • Does perceived credibility increase consumers' intention to accept recommendations made by SRSs? 	<ul style="list-style-type: none"> • Self-congruence theory • Similarity–attraction theory • Construal level theory • Source credibility theory • Social learning theory
Decision support	If SMIs are considered opinion leaders by consumers, these consumers rely more on SMIs for decision support, enhancing their purchase intention.	<ul style="list-style-type: none"> • To what extent do consumers rely on SRSs for decision support? • What kind of SRS recommendations are consumers most likely to use for decision support compared to similar recommendations coming from a human recommender like SMI? • Would consumers use recommendations more from anthropomorphic SRSs than non-anthropomorphic ones? 	<ul style="list-style-type: none"> • Opinion leadership theory • Uses & gratifications theory
Desire to mimic	Consumers tend to mimic SMIs they regard as models or envy, which increases their intention to purchase the brand/product recommended by the SMI.	<ul style="list-style-type: none"> • What type of SRSs would consumers like to mimic? • Would consumers want to mimic an SRS if it is anthropomorphic? 	<ul style="list-style-type: none"> • Consumers doppelganger effect theory
eWOM	SMIs' behaviours and achievements are associated with and transferred to the product/brand they recommend, which enhances the purchase intention of their followers/consumers.	<ul style="list-style-type: none"> • To what extent do beliefs associated with a specific SRS affect consumers' intention to accept recommendations from it? • Can consumers transfer meaning associated with a particular SRS to the brand the system is recommending? Does this meaning transfer affect purchase intention? 	<ul style="list-style-type: none"> • Meaning transfer model
Attractiveness	The attractiveness of SMIs positively affects followers' attitudes towards brands, which	<ul style="list-style-type: none"> • What does attractiveness mean in the SRS context? How can it be measured? Does the 	<ul style="list-style-type: none"> • Theory of reasoned action

	eventually affects brand admiration, positively affecting purchase intention. Consumers associate attractive SMIs with product attractiveness, which eventually affects their purchase intentions.	attractiveness of an SRS affect the intention to accept recommendations made by the SRS? • Would consumers be willing to accept recommendations more from anthropomorphic SRSs than from non-anthropomorphic ones?	•Parasocial relationship theory •Meaning transfer model •associative learning theory
Trustworthiness	Followers tend to perceive SMIs as trusted opinion leaders, which eventually positively affects their intention to purchase products recommended by SMIs.	• What are the mechanisms through which people build trust in SRSs? How does this affect their intention to follow recommendations made by SRSs?	•Opinion leadership theory •UGT •Persuasion knowledge model
Expertise	Perceived expertise affects followers' attitudes towards the endorsed brands, which eventually affects brand admiration, positively affecting purchase intention.	• Do consumers perceive expertise in SRS? What kind of recommendations will make SRSs be perceived as experts? How does this perception affect their attitude towards the recommended brand and intention to purchase it?	•Theory of reasoned action
Parasocial relationship	The greater the parasocial relationship between a follower and SMI, the more likely the follower will purchase products recommended by the SMI.	• How can consumers develop parasocial relationships with SRS? How does this affect their ability to accept recommendations from the system?	•Similarity-attraction model
Consumer-product/brand relationship			
Attitude towards product or brand	Attitude towards product/brand, subjective norm, and perceived behavioural control affect consumers' intention to purchase products recommended by SMIs. The more consumers learn about the overall advantage of a product recommended by SMIs, the greater their purchase intention.	•Do attitudes towards product/brand, subjective norm, and perceived behavioural control affect consumers' intention to purchase products recommended by SRS? •Does the information content of an SRS's recommendation affect consumers' purchase intention?	•Theory of planned behaviour •Social learning theory
Brand congruence	The stronger the congruence between the SMI and the endorsed brand, the greater the consumer's purchase intention.	•Do consumers perceive a match between a particular SRS and the brand it recommends? Does it affect purchase intention?	•Self-congruence theory
Consumer-ad relationship			
Attitude towards the advert	Consumers are less likely to have a positive attitude towards ads from SMIs, which in turn reduces purchase intention because it reduces consumers' trust in the objectivity of the SMI. Message process involvement moderates the relationship between attitude towards ads from SMIs and brand attitude.	•What is consumers' attitude when they realise that a recommendation they thought was objectively in their interest is an ad? How does this affect purchase intention? •If the consumer decides to pay attention to the recommendation (ad), how does this affect their attitude towards the advertised brand?	•Persuasive knowledge model

6 Conclusions

SRSs have become an integral part of e-commerce platforms and important decision support systems for consumers. Thus, improving the quality of recommendations made by SRSs remains a significant concern for IS researchers and practitioners. Part of the problem is the limited use of behavioural theory-driven SRS design. Most studies tend to focus on technical aspects regarding new algorithmic techniques. However, no technical improvements can compensate for the lack of behavioural understandings underlying why consumers accept recommendations made by SRSs. Thus, this study identified behavioural factors that could help improve the persuasiveness of recommendations made by SRSs, assessed through their ability to influence consumers' purchase intention. Rather than just test a single theory, this study adopted an innovative approach of exploring the rich stream of SMI literature to inform SRS research. This approach revealed three broad categories of behavioural antecedents and several theories that explain how SMIs influence consumers' purchase intentions. The broad categories reveal that relationships between the consumer and the (i) recommender system, (ii) product or brand, and (iii) and advert are key determinants of purchase intention. It is worth noting that credibility and attitude towards the product or brand directly affect purchase intention. Thus, this study contributes new behavioural factors and theories to be explored in SRS research and practice to improve the

quality of SRSs. We hope that our results help advance research on SRSs by highlighting theoretical frameworks that can support future research on behavioural theory-driven SRSs and SMIs.

Conflict of interest

The authors have no relevant financial or non-financial interests to disclose.

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