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REVIEW PAPER

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# Device-mediated customer behaviour on the internet: A systematic literature review

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## Abstract

The proliferation of smartphones, tablets and other digital devices in addition to traditional computers has transformed the Internet into a device-mediated environment. While these devices provide immediate access to similar Internet sources, they differ significantly in their characteristics, such as screen size, operation mode and context of use. As a consequence, behaviours on the Internet along the customer journey vary substantially depending on the device used. To summarize the fast-growing body of research on device-mediated customer behaviour, a systematic, framework-based literature review of 59 articles from the last decade was conducted. Through an examination of the antecedents, decisions and outcomes investigated in the publications, the review presents a conceptual framework that highlights the relation between device characteristics, decision processes and behavioural outcomes. The review further summarizes the theories, contexts and methods employed in the studies and sets an extensive future research agenda. We found that the extant literature lacks comprehensive theories and clear definitions of digital devices in the omnichannel environment. Furthermore, existing findings should be generalized for other contexts (e.g. industries and countries) and validated via the introduction of other research designs and methods. The understanding of device-mediated behaviour and the consequently arising marketing measures remains scarce. Thus, this review advances the comprehension of customer behaviour on the Internet and provides researchers and practitioners with information on the implications for customer experience and omnichannel management.

**KEYWORDS**
customer behaviour, customer experience management, digital devices, omnichannel management, systematic literature review, TCM-ADO framework

## 1 | INTRODUCTION

The diffusion of the Internet and the proliferation of digital devices have substantially changed customer behaviour, making online shopping more versatile and complex (Herhausen et al., 2019; Lemon & Verhoef, 2016). According to a recent study by GlobalWebIndex (GWI), 90.7% of Internet users worldwide utilize smartphones to access Internet sources, while 66.8% employ laptops or desktop devices, 28.2% tablet devices and 31.8% Internet-connected televisions (GWI, 2022). Thus, today's customers frequently use a multitude of devices alongside or instead of the traditional desktop computer. While these digital devices provide immediate access to similar online

content, they differ vastly in terms of their characteristics such as screen size, operation mode (e.g. touchscreen or keyboard and mouse), or technical features (e.g. availability of wireless connections). The obvious differences in their physical properties further entail divergent contexts of use (e.g. stationary or mobile) and customer evaluations (e.g. perceived usability or perceived enjoyment). It is evidently the case that customer behaviours likewise vary throughout the customer journey depending on the device employed (Lemon & Verhoef, 2016).

The Internet has evolved from a computer-mediated environment (Yadav & Pavlou, 2014) into a device-mediated one. This shift has laid the foundation for a rich body of research on the influence of the digital device used on customer behaviour (e.g. Brasel & Gips, 2014; Ghose et al., 2013; Wang et al., 2015). The constantly increasing variety of devices and ongoing development of online technologies has furthermore led to a move from a multi- to an omnichannel environment. Omnichannel refers to the synergistic management of a variety of available channels to enable seamless interactions and easy switching between channels for customers. In comparison to multichannel management, the omnichannel type involves a more differentiated view of the "online channel" and an increased importance of the customer experience along the entire customer journey (Beck & Rygl, 2015; Lemon & Verhoef, 2016; Verhoef et al., 2015).

To optimize customer experience and provide a seamless experience across channels and devices—the main goals of omnichannel management—companies need to understand customers' decision-making and behavioural patterns when utilizing different devices (Kaatz et al., 2019; Wagner et al., 2020). The plethora of studies in customer behaviour research driven by this exigency have so far failed to yield a comprehensive and integrated synthesis of the influential role that Internet-enabled devices play along the customer journey. This paper therefore seeks to advance the comprehension of omnichannel and customer experience management by synthesizing the existing body of knowledge on the influence of digital devices on customer behaviour on the Internet using a systematic literature review (SLR). Specifically, the review aims to answer the following questions: (RQ1) what do we know about device-mediated customer behaviour on the Internet? (RQ2) How do we know about it? (RQ3) Where should research on the influence of digital devices on customer behaviour be heading? (RQ4) How should future research answer open questions?

The present review combines two established SLR frameworks to answer the research questions and generate structured insights. The antecedents, decisions and outcomes (ADO) framework (Paul & Benito, 2018) identifies what is known about those aspects of device-mediated customer behaviour and which research gaps persist (i.e. RQ1 and RQ3). Meanwhile, the theories, contexts and methods (TCM) framework (Paul et al., 2017) reveals which are applied and examined in the extant literature, and which could help to advance the research area (i.e. RQ2 and RQ4). By combining these two frameworks into one TCM-ADO framework, this SLR seeks to achieve a holistic and well-structured review of the current literature and a comprehensive research agenda related to theories, contexts, methods, as well as antecedents (i.e. different devices types and associated device characteristics that might influence customer behaviour on the Internet), decisions (i.e. decision processes) and outcomes (i.e. customer behaviour on the Internet; Bhatia et al., 2021a; Lim et al., 2021). The move toward omnichannel management and the ongoing proliferation of smartphones and tablets besides stationary devices led to a substantial body of heterogeneous research on the influential role of digital devices along the digital customer journey (e.g. Ghose et al., 2013; Wang et al., 2015). The maturity of studies makes the research topic well suited for the conduct of a SLR (Palmatier et al., 2018; Paul, Lim, et al., 2021). This notwithstanding, the investigation presented here is the first literature review that systematically synthesizes and summarizes research in this specific area.

Previous literature reviews in the field of customer behaviour on the Internet and digital devices (see Table A1) focused on a variety of subjects including customer attitudes and intentions regarding mobile advertising (Jebarajakirthy et al., 2021; Maseeh et al., 2021), as well as the perceived value and adoption of mobile commerce (Dastane et al., 2020; Luceri et al., 2022), interactive, personalized and behavioural online advertising (Krishen et al., 2021; Tong et al., 2020; Varnali, 2021), customer decision-making in omnichannel environments (Mishra et al., 2021; Wolf & Steul-Fischer, 2022), in-store mobile device usage (Cavalinhos et al., 2021) and online or digital customer behaviour in general (Cummins et al., 2014; Güngör & Çadırcı, 2022; Singh & Basu, 2023; Vanhala et al., 2020). The numerous recent literature reviews acknowledge the widespread adoption of digital and mobile technologies by summarizing and synthesizing findings on digital and mobile marketing and general online or omnichannel customer behaviour. However, none of the SLRs to date has compared different digital devices or considered their mediating role in customer behaviour on the Internet. Thus, the review presented here differs from previous SLRs both in terms of purpose as well as literature selection (see Table A1).

In so doing, the review contributes to the literature on customer behaviour on the Internet in multiple ways: first, by descriptively analysing the relevant published work, we elaborate the status quo of research in this field with regard to the theories employed, contexts investigated (i.e. industry sector, countries, customer journey stage) and methods used. Second, the qualitative approach taken by the thematic content analysis yields a comprehensive conceptual framework describing the relationship between the device characteristics, decision processes and behavioural outcomes found in the selected literature. This conceptual framework advances the understanding of customer behaviour on the Internet for both researchers and practitioners. Drawing on the descriptive and thematic analysis based on the TCM-ADO framework, we identify promising research directions and establish an extensive research agenda (Bhatia et al., 2021b; Lim et al., 2021). Finally, the review outlines important implications for customer experience and omnichannel management, particularly with regard to device-related marketing efforts. Paul, Lim, et al. (2021) argued that SLRs can support future researchers by providing an overview of research domains and highlighting future ones, when (1) a sufficient body of heterogeneous studies in the domain exists (at least 40 articles) and (2) no (comprehensive) SLRs in the domain have been

published within recent years or in high-quality journals. These criteria apply to the current marketing research regarding the influence of the digital device utilized on customer behaviour on the Internet, which means the research domain is eminently suitable for a thorough SLR.

The remainder of the paper is organized as follows. The next section presents the methodological approach of the study, including a discussion of the literature selection process. Section 3 then presents the descriptive profile of the selected literature based on the TCM framework (i.e. how do we know about device-mediated customer behaviour?) and Section 4 proposes a conceptual framework based on the thematic analysis of the ADO framework (i.e. what do we know?). Section 5 discusses a broad research agenda for the future, in terms of antecedents, decisions and outcomes (i.e. where should we be heading?) as well as theories, contexts and methods (i.e. how should we get there?). Finally, Section 6 identifies the implications for management and concludes the paper with an overview.

## 2 | METHODOLOGY

The present systematic literature review is a domain-based one (Paul & Criado, 2020; Paul, Lim, et al., 2021); more specifically, it adopts a framework-based content analysis approach with the aim of comprehensively synthesizing studies within the research domain and offering a well-structured, holistic agenda for future investigation. Framework-based reviews tend to be more impactful and informative than other types due to their robust and clear structure (Paul, Lim, et al., 2021; Paul, Merchant, et al., 2021). Accordingly, this work uses the TCM framework developed by Paul et al. (2017) to provide an overview of theories, contexts and methods applied in the existing literature. To delve deeper into current knowledge about digital devices and customer behaviour, and to further organize the findings of existing research (i.e. antecedents, decisions and outcomes), we extend the TCM framework to include Paul and Benito's (2018) ADO framework. By combining these two well-established structures into a TCM-ADO framework, this review reveals what we know about device-mediated customer behaviour on the Internet (existing ADO) and how (existing TCM). Moreover, the SLR sheds light on directions for additional exploration by highlighting where we should be heading (new ADO) and how (new TCM; Bhatia et al., 2021b; Khatri & Duggal, 2022; Lim et al., 2021).

SLRs, as a methodology, must follow a transparent and conclusively justified process of literature selection and analysis, to which aim the development of a detailed systematic review protocol that entails clarification on the selection of the search string and the relevant databases, as well as inclusion criteria, data extraction tactics and analysis, is highly recommended (Palmatier et al., 2018; Paul, Lim, et al., 2021; Snyder, 2019). Therefore, we grounded our review in the *Scientific Procedures and Rationales for Systematic Literature Reviews* (*SPAR-4-SLR*) protocol (Paul, Lim, et al., 2021) to ensure a rigorous, replicable and relevant literature selection (Basu et al., 2022; Hassan et al., 2021; Sharma et al., 2022; Singh & Basu, 2023). The SPAR-4-SLR protocol, as illustrated in Figure 1, comprises three stages: assembling, arranging and assessing existing literature.

### 2.1 | Assembling

The assembling stage involves identifying and acquiring literature, including defining the research domain and specific research questions, determining relevant sources and search strings, and establishing inclusion criteria such as language and search period (Paul, Lim, et al., 2021). This review seeks to advance the understanding of the influence of different devices on customer behaviour on the Internet. While acknowledging the interdisciplinary nature of this topic, our literature review specifically focuses on articles from academic journals in business and marketing, in alignment with previous SLRs on customer behaviour (e.g. Cavalinhos et al., 2021; Cummins et al., 2014; Güngör & Çadırcı, 2022; Singh & Basu, 2023; Wolf & Steul-Fischer, 2022). With the aim of comprehensively covering the customer behaviour literature and simultaneously limiting the results to a manageable amount, we searched the top quartile of marketing journals within the Scopus database with regard to Scopus CiteScore 2021 (i.e. 48 journals) as well as those in the business or management category in the Web of Science database. Scopus and Web of Science are considered the most popular databases for SLRs within the management and marketing field due to their large pool of articles and high-quality journals (Paul & Criado, 2020; Paul, Lim, et al., 2021). The databases are consequently frequently used for SLRs within the management and marketing field (e.g. Basu et al., 2022; Cavalinhos et al., 2021; Harju, 2022; Hassan et al., 2021; Singh & Basu, 2023; Wang et al., 2022).

To align with the research objective, the search string (i.e. words and phrases directly related to the research question) is two-fold and includes alternative terms, synonyms and abbreviations of "digital device" and "customer behaviour." The final search string, chosen through brainstorming, testing in different databases and the consideration of major studies within the research domain (e.g. Brasel & Gips, 2014; Ghose et al., 2013; Wang et al., 2015), includes the terms (*"mobile device*" OR *phone* OR tablet* OR "personal computer*" OR laptop* OR desktop* OR PC*) *AND* (*consum* OR customer* OR shop* OR buy**).

The data collection process began with searching for articles in Scopus and Web of Science that contained the abovementioned terms in the title, abstract, or keywords. The database search was conducted in October 2022. Further inclusion criteria besides the subject category related to language (English) and year of publication (2012–2022). The year 2012 was chosen as the first of the time frame for three reasons. First, 2012 marks the starting point of omnichannel-related studies and papers on Scopus and Web of Science. With the rise of omnichannel research, customer experience and its optimization across all touchpoints and along the customer journey gained importance (Lemon & Verhoef, 2016; Verhoef et al., 2015). This move, in combination with the continuous proliferation of mobile devices (i.e. smartphones and tablets), propelled investigation into customer behaviour on the Internet and the influential role of digital devices used. Accordingly, in their comprehensive bibliometric review of 5505 publications regarding the digital customer in the last 21 years, Güngör and Çadırcı (2022) highlighted that mobile technology adaption

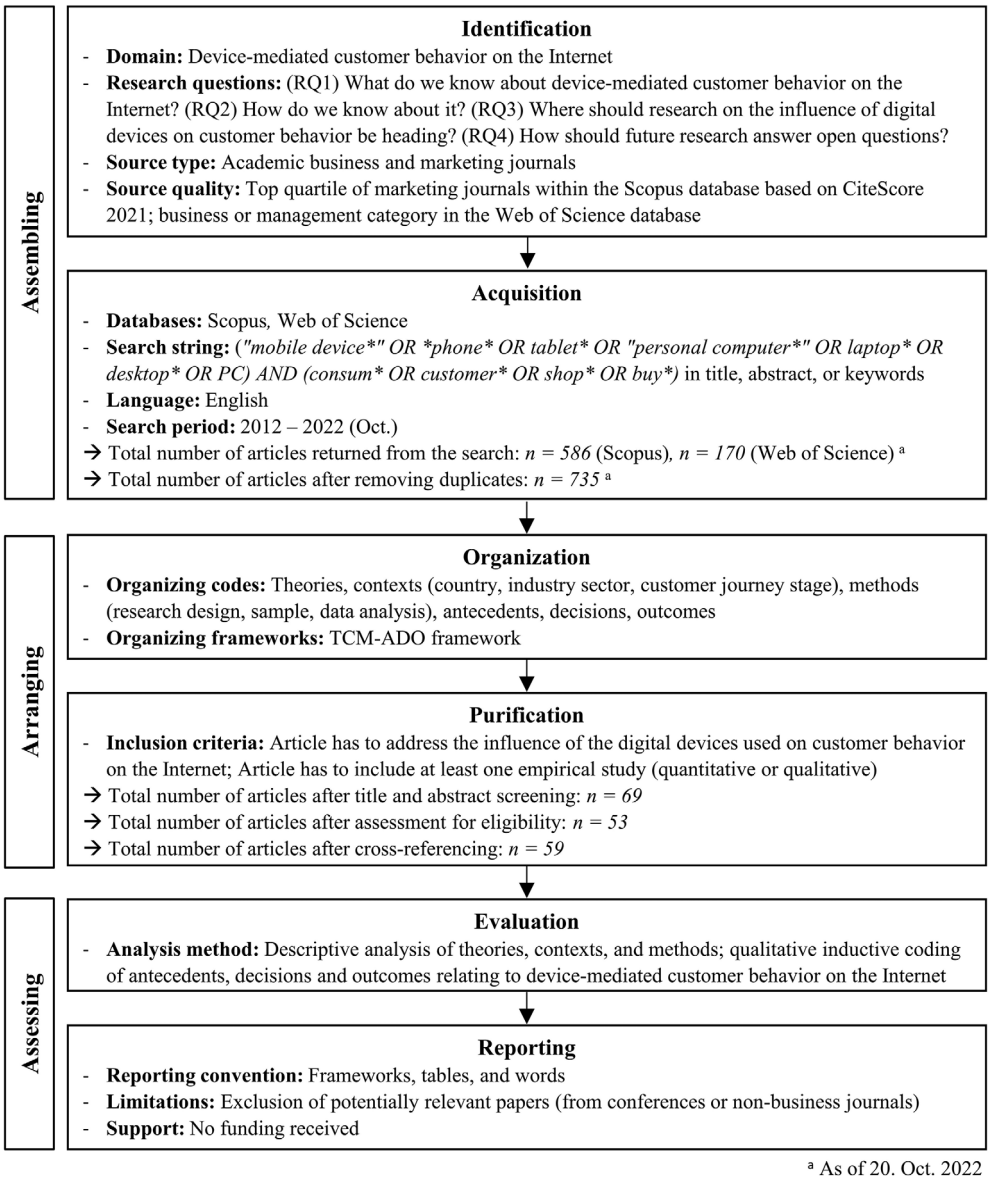


**FIGURE 1** The systematic literature review procedure using the SPAR-4-SLR protocol.

and mobile usage behaviour remained relatively unexplored before the 2010s, but work in this field grew significantly after 2015. Second, technological developments and innovations within the 2010s, such as the introduction of the iPad by Apple and the Samsung Galaxy Tab in 2010, changed the perceptions of customers regarding digital devices substantially (Dastane et al., 2020). Third, a time period of 10 years is perfectly fitted for the conduct of an SLR within established and mature domains, according to Paul, Lim, et al. (2021).

## 2.2 | Arranging

The second step of the SPAR-4-SLR protocol, arranging, involves organizing and purifying the literature (Paul, Lim, et al., 2021). A total of 756 articles were retrieved in the initial data collection, 21 of which were duplicates and therefore removed. After the identification and acquisition, the titles and abstracts of all the works ($n = 735$) were extracted to an Excel spreadsheet and assessed in terms of their content. The manual screening was performed based on the following inclusion criteria:

- To be included in the final literature selection, the article had to address the influence of the digital devices used on customer behaviour on the Internet.
- To be included in the final literature selection, the article had to include at least one empirical study (quantitative or qualitative); other literature reviews and conceptual works were excluded.

Two researchers independently screened the titles and abstracts in the same manner to ensure validity and reliability. The high agreement of 98.23% (Cohen's kappa $\kappa = 0.90$) between the researchers on suitability or non-suitability in this regard highlights the reproducibility of the selection. The full texts of all those approved by at least one member of the review panel ($n = 69$)[1] were downloaded, read in

detail and assessed for eligibility in the next stage of the selection process. This resulted in the exclusion of 16 further papers due to inapposite content (reasons for exclusion are listed in Table A2). Cross-referencing yielded six examples from periodicals that are not included in the top quartile of marketing journals or in the business or management category on Web of Science (e.g. Ghose et al., 2013; Mariani et al., 2019). These publications were cited by at least one of the initially selected works and were considered eligible for inclusion (Webster & Watson, 2002; see Table A2). The final selection that constitutes the database for the analysis of the present review comprised 59 papers. Table A2 lists the articles included in the review.

### 2.3 | Assessing

The final step of the SPAR-4-SLR protocol, assessing, encompasses the evaluation of the selected literature and the reporting of findings (Paul, Lim, et al., 2021). We analysed the selected literature descriptively and thematically based on the TCM-ADO framework (Paul et al., 2017; Paul & Benito, 2018; Paul, Lim, et al., 2021). To this end, we extracted the descriptive information from the studies within the articles into a concept matrix (Webster & Watson, 2002). Specifically, we listed the theories employed, in addition to the country, industry sector and phases of the customer journey stages studied (i.e. contexts), as well as the methods applied (Snyder, 2019). Additionally, a thematic analysis guided by the ADO framework was conducted to synthesize the content of the 59 selected papers using the inductive coding process presented by Braun and Clarke (2006). This qualitative process entails five steps: (1) familiarization with the content, (2) the generation of initial codes regarding interesting features, (3) the search for themes across these codes, (4) the review and refinement of these themes and (5) the naming, definition, and report of the themes. Accordingly, we reread the selected works in detail and inductively extracted antecedents, decisions and outcomes relating to device-mediated customer behaviour on the Internet from the selected publications (Lim et al., 2021; Paul, Lim, et al., 2021). Figure A1 outlines a state-of-the-art overview of the antecedents, decisions and outcomes of device-mediated customer behaviour on the Internet and its supporting theories, contexts and methods in the selected literature.

## 3 | HOW DO WE KNOW ABOUT DEVICE-MEDIATED CUSTOMER BEHAVIOUR ON THE INTERNET?—A PROFILE OF THE LITERATURE

We identified 29 journals that published relevant papers in the last decade (see Table 1). Of these, all but two have a CiteScore >5.0, placing them in the top 15% of journals in the subject area of Business, Management and Accounting on Scopus.[2] This shows that most publications come from premier journals (Paul, Lim, et al., 2021; Singh & Basu, 2023). The highest number were published by the *Journal of Retailing and Consumer Services* ($n = 11$), followed by the *Journal of Business Research* ($n = 10$). The distribution of the articles selected by year of publication (see Figure 2) demonstrates that the customer behaviour literature with regard to digital devices is on the rise. As expected, the recent move from a multi- to an omnichannel environment has given notable impetus to the research field. Three fourths of the works ($n = 44$) that met our selection criteria were published in the last 5 years. None of the studies were published before 2013, further supporting the chosen time frame.

### 3.1 | Theories (T)

Of the 59 articles retrieved, 33 (56%) are grounded in one or more established theories, such as the construal level (Kaatz, 2020; Kim et al., 2020; Lurie et al., 2014; Park et al., 2022; Ransbotham et al., 2019), uses and gratification (Kim et al., 2022; Kukar-Kinney et al., 2022; Luo et al., 2022; Sreejesh et al., 2021; Wagner et al., 2020), media richness (Ghosh et al., 2021; März et al., 2017; Sreejesh et al., 2021; Tseng & Wei, 2020), information (Han, Han, et al., 2022; Zhang et al., 2021), or social exchange theories (Kim et al., 2020; Park et al., 2022; see Table 2).

The *construal level theory* states that customers behave and decide differently depending on the construal level, which is determined by psychological distance (Trope & Liberman, 2010). Studies on device-mediated behaviour argue that psychological distance differs along temporal, spatial, social, or hypothetical dimensions due to differences in accessibility and mobility between devices, which consequently leads to variations in customer behaviour (e.g. the creation of online reviews; Park et al., 2022). According to the *uses and gratification theory*, customers are goal-directed and actively seek out media to gratify specific needs (Blumler, 1979). This theory is employed in the publications to explain differences in customer needs by device and the resulting variations in customer behaviour (e.g. reactions to advertising, Kim et al., 2022; Sreejesh et al., 2021). The *media richness theory* posits that the representational richness of media, as determined by sensory breadth and depth, leads to a higher perceived vividness and quality of information (Daft & Lengel, 1986; Steuer, 1992). Several works argue that perceived media richness, and hence information processing, varies across devices due to differences in screen size (e.g. Ghosh et al., 2021; Sreejesh et al., 2021). Other theories used in the selected articles include the *information theory* (Shannon, 1948) and *social exchange theory* (Homans, 1958; for a comprehensive overview, see Figure A1). Twenty-six articles (44%) do not indicate the application of specific theories to explain the influence of digital devices on customer behaviours (e.g. Jain & Tan, 2022; Maslowska et al., 2021; Stewart et al., 2019).

### 3.2 | Contexts (C)

Context refers to the environment in which the study was conducted (Paul et al., 2017). Table 3 illustrates the distribution of the articles across research contexts (i.e. country, industry sector and customer

**TABLE 1** List of journals disseminating research on device-mediated customer behaviour on the Internet

| Journals | No. of articles | CiteScore 2021 | References |
|---|---|---|---|
| Journal of Retailing and Consumer Services | 11 | 11.4 | Boden et al. (2020), Canova and Nicolini (2019), Fuentes and Svingstedt (2017), Kaatz et al. (2019), Kaatz (2020), Liu and Dewitte (2021), Nakano and Kondo (2018), Qin, Osatuyi, and Xu (2021), Singh and Swait (2017), Zhu et al. (2020), Zhu and Meyer (2017) |
| Journal of Business Research | 10 | 11.2 | Banerjee et al. (2021), Bhatnagar and Papatla (2019), Han, Han, et al. (2022), Kim et al. (2021), Li et al. (2021), McLean et al. (2018), McLean et al. (2020), Meißner et al. (2020), Sreejesh et al. (2021), Wagner et al. (2020) |
| Journal of Consumer Research | 3 | 12.2 | Hadi and Valenzuela (2020), Hovy et al. (2021), Melumad and Pham (2020) |
| Journal of Interactive Marketing | 3 | 12.8 | Ghosh et al. (2021), Okazaki and Mendez (2013), Pagani et al. (2019) |
| Journal of Retailing | 3 | 8.2 | Herhausen et al. (2019), Wang et al. (2015), Zhang et al. (2021) |
| Electronic Commerce Research and Applications | 2 | 10.0 | Goldstein and Hajaj (2022), Raphaeli et al. (2017) |
| Information Systems Research | 2 | 9.1 | Ghose et al. (2013), Lee et al. (2020) |
| Journal of Interactive Advertising | 2 | 7.1 | Joa et al. (2018), Maslowska et al. (2021) |
| Journal of Marketing | 2 | 15.7 | Haan et al. (2018), Melumad and Meyer (2020) |
| Journal of Marketing Research | 2 | 8.1 | Melumad et al. (2019), Shen et al. (2016) |
| Asia Pacific Journal of Marketing and Logistics | 1 | 6.1 | Park et al. (2022) |
| European Journal of Information Systems | 1 | 11.1 | Piccoli (2016) |
| European Journal of Marketing | 1 | 6.6 | Stewart et al. (2019) |
| International Journal of Advertising | 1 | 7.6 | Kim et al. (2022) |
| International Journal of Electronic Commerce | 1 | 7.2 | Kim et al. (2020) |
| International Journal of Information Management | 1 | 28.8 | Tseng and Wei (2020) |
| International Journal of Retail and Distribution Management | 1 | 6.1 | Holmes et al. (2013) |
| Internet Research | 1 | 10.1 | Luo et al. (2022) |
| Journal of Advertising | 1 | 8.5 | Orimoloye et al. (2022) |
| Journal of Consumer Psychology | 1 | 5.8 | Brasel and Gips (2014) |
| Journal of the Academy of Marketing Science | 1 | 15.2 | Kukar-Kinney et al. (2022) |
| Journal of Travel and Tourism Marketing | 1 | 12.0 | Flavián et al. (2019) |
| Management Science | 1 | 7.7 | Xu et al. (2017) |
| Manufacturing and Service Operations Management | 1 | 9.5 | Jain and Tan (2022) |
| Marketing Science | 1 | 6.5 | Ransbotham et al. (2019) |
| Marketing Science Institute Working Paper Series | 1 | n/a | Lurie et al. (2014) |
| MIS Quarterly Executive | 1 | 10.2 | Piccoli and Ott (2014) |
| Psychology and Marketing | 1 | 4.9 | März et al. (2017) |
| Tourism Management | 1 | 19.8 | Mariani et al. (2019) |

*Note*: Marketing Science Institute Working Paper Series is not listed on Scopus. The CiteScore is therefore not available for this journal (i.e. "n/a").

journey stage). Nine of those retrieved do not explicitly mention the country in which the investigation was conducted. The major portion of the remaining examples are from the US ($n = 15$), Western Europe (UK: $n = 8$; Germany: $n = 7$; Italy: $n = 2$) and Asia (China: $n = 5$; India: $n = 4$; South Korea: $n = 4$; Japan: $n = 2$). None have been conducted in South America, Africa, or Australia. Forty-eight focus on specific product types or industries. Among these, the most frequently studied industrial context is travel and tourism ($n = 15$). The high number of works within this sector can be explained by the abundance of papers that analyse the influence of the submission device on online reviews on online travel agencies websites such as TripAdvisor or Booking.com (e.g. Hovy et al., 2021; Kim et al., 2020; Kim et al., 2021; Mariani

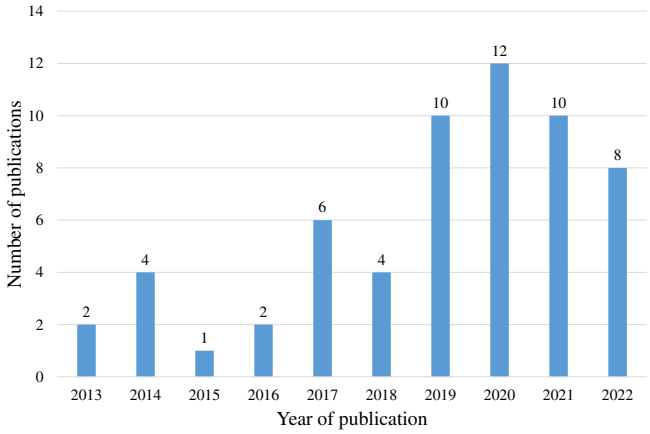


**FIGURE 2** Distribution of articles by year of publication.

**TABLE 2** The most frequently occurring theories (T) within the articles retrieved for the review

| Theories | No. of articles | References |
|---|---|---|
| Construal level theory (Trope & Liberman, 2010) | 5 | Kaatz (2020), Kim et al. (2020), Lurie et al. (2014), Park et al. (2022), Ransbotham et al. (2019) |
| Uses and gratifications theory (Blumler, 1979) | 5 | Kim et al. (2022), Kukar-Kinney et al. (2022), Luo et al. (2022), Sreejesh et al. (2021), Wagner et al. (2020) |
| Media richness theory (Daft & Lengel, 1986) | 4 | Ghosh et al. (2021), März et al. (2017), Sreejesh et al. (2021), Tseng and Wei (2020) |
| Information theory (Shannon, 1948) | 2 | Han, Han, et al. (2022), Zhang et al. (2021) |
| Social exchange theory (Homans, 1958) | 2 | Kim et al. (2020), Park et al. (2022) |

*Note*: Articles that are grounded in more than one theory (e.g. Kim et al., 2020) are listed multiple times.

et al., 2019; Melumad et al., 2019; Park et al., 2022). Fashion and beauty, including apparel and cosmetics, follow in second place ($n = 14$) and groceries in third ($n = 9$). To analyse the distribution of publications across the customer journey, we used the three-stage process model presented by Lemon and Verhoef (2016). Accordingly, we assigned the customer behaviours examined in the analyses to either the pre-purchase (need recognition, consideration, search), purchase (choice, ordering, payment), or post-purchase stage (consumption, usage, engagement, service requests), or several of these. Most works ($n = 16$) consider a combination of typical pre-purchase and purchase tasks. Thirteen focus separately on the post-purchase stage, again mainly in terms of examining the creation of online reviews. Seven of the papers retrieved could not be clearly assigned to any of the stages.

### 3.3 | Methods (M)

In terms of research design and methods, the majority of the studies are quantitative ($n = 55$), with field data analyses and experiments the most commonly used methods ($n = 32$ and $n = 21$, respectively, of the articles retrieved). Field data include online review website datasets (e.g. Ransbotham et al., 2019), as well as clickstream (e.g. Goldstein & Hajaj, 2022) and transactional data (e.g. Li et al., 2021). Several articles use more than one quantitative method. For example, Kim et al. (2020) used both experiments and field data from an online review website in their paper. Mixed-method approaches involve combining quantitative and qualitative research. In the selected articles, they occur in the form of combining focus groups with experiments (Ghosh et al., 2021; Sreejesh et al., 2021) and combining focus groups with surveys (Okazaki & Mendez, 2013). There is only one purely qualitative paper (Fuentes & Svingstedt, 2017). Most works are based on either non-student samples ($n = 41$) or non-student and student ones ($n = 8$) combined in multiple analyses. For data analysis, researchers mostly used regression models (e.g. negative binomial regression models [Lurie et al., 2014] and logistic regression models [Haan et al., 2018], *t*-tests [Zhu et al., 2020] and ANOVA [Melumad et al., 2019]). Other approaches to analyse the data involve structural equation modelling (SEM), including partial least squares structural equation modelling (Qin, Osatuyi, & Xu, 2021), multivariate analysis of variance (MANOVA; Brasel & Gips, 2014), chi-square tests (Piccoli, 2016), difference-in-difference approaches (Jain & Tan, 2022) and general linear models (Maslowska et al., 2021; see Table 4).

## 4 | WHAT DO WE KNOW ABOUT DEVICE-MEDIATED CUSTOMER BEHAVIOUR ON THE INTERNET?—A THEMATIC ANALYSIS OF ANTECEDENTS, DECISIONS AND OUTCOMES

In the following subsections, we provide structured insights into the understanding of device-mediated customer behaviour on the Internet using a qualitative thematic analysis. The evaluation is based on the ADO framework by Paul and Benito (2018). Antecedents (A) thereby encompass reasons behind behaviour, decisions (D) serve as direct responses to antecedents and as precursors to outcomes, and outcomes (O) relate to the variables of interest (Khatri & Duggal, 2022; Lim et al., 2021; Paul & Benito, 2018; Södergren, 2021). Thus, in this SLR, outcomes refer to differences in behaviour along the customer journey depending on the device utilized, while antecedents and decisions refer to reasons behind these behavioural differences (Lim et al., 2021; Paul & Benito, 2018).

The selected literature attributes behavioural differences to various device types and associated device characteristics such as screen sizes. Therefore, we define device characteristics as antecedents. Based on our review, we have been able to classify device

**TABLE 3** The most frequently occurring contexts (C) within the articles retrieved for the review

| Contexts | No. of articles | References |
|---|---|---|
| *Country* | | |
| US | 15 | Bhatnagar and Papatla (2019), Boden et al. (2020), Brasel and Gips (2014), Hadi and Valenzuela (2020), Hovy et al. (2021), Joa et al. (2018), Kim et al. (2020), Liu and Dewitte (2021), Melumad and Pham (2020), Piccoli (2016), Piccoli and Ott (2014), Qin, Osatuyi, and Xu (2021), Singh and Swait (2017), Stewart et al. (2019), Wang et al. (2015) |
| UK | 8 | Holmes et al. (2013), Kim et al. (2020), Kim et al. (2021), Mariani et al. (2019), McLean et al. (2018), McLean et al. (2020), Orimoloye et al. (2022), Park et al. (2022) |
| Germany | 7 | Boden et al. (2020), Herhausen et al. (2019), Kaatz et al. (2019), Kaatz (2020), März et al. (2017), Meißner et al. (2020), Wagner et al. (2020) |
| China | 5 | Luo et al. (2022), Shen et al. (2016), Tseng and Wei (2020), Xu et al. (2017), Zhu et al. (2020) |
| *Industry sector* | | |
| Travel and tourism | 15 | Brasel and Gips (2014), Flavián et al. (2019), Goldstein and Hajaj (2022), Hovy et al. (2021), Kim et al. (2020), Kim et al. (2021), Lurie et al. (2014), Mariani et al. (2019), Melumad et al. (2019), Okazaki and Mendez (2013), Park et al. (2022), Piccoli (2016), Piccoli and Ott (2014), Ransbotham et al. (2019), Zhu and Meyer (2017) |
| Fashion and beauty | 14 | Brasel and Gips (2014), Holmes et al. (2013), Jain and Tan (2022), Kaatz et al. (2019), Kaatz (2020), Kukar-Kinney et al. (2022), Lee et al. (2020), McLean et al. (2018), McLean et al. (2020), Nakano and Kondo (2018), Orimoloye et al. (2022), Pagani et al. (2019), Tseng and Wei (2020), Zhang et al. (2021) |
| Groceries | 9 | Holmes et al. (2013), Meißner et al. (2020), Nakano and Kondo (2018), Pagani et al. (2019), Shen et al. (2016), Sreejesh et al. (2021), Stewart et al. (2019), Wang et al. (2015), Zhu and Meyer (2017) |
| Customer electronics | 5 | Han, Han, et al. (2022), Holmes et al. (2013), Shen et al. (2016), Stewart et al. (2019), Tseng and Wei (2020) |
| *Stage of customer journey* | | |
| Pre-purchase and purchase | 16 | Banerjee et al. (2021), Goldstein and Hajaj (2022), Haan et al. (2018), Han, Han, et al. (2022), Herhausen et al. (2019), Holmes et al. (2013), Kaatz et al. (2019), Kukar-Kinney et al. (2022), Lee et al. (2020), Luo et al. (2022), McLean et al. (2020), Nakano and Kondo (2018), Orimoloye et al. (2022), Raphaeli et al. (2017), Singh and Swait (2017), Xu et al. (2017) |
| Post-purchase | 13 | Hovy et al. (2021), Kim et al. (2020), Kim et al. (2021), Li et al. (2021), Lurie et al. (2014), Mariani et al. (2019), März et al. (2017), Melumad et al. (2019), Melumad and Meyer (2020), Park et al. (2022), Piccoli (2016), Piccoli and Ott (2014), Zhu et al. (2020) |
| Pre-purchase | 10 | Bhatnagar and Papatla (2019), Canova and Nicolini (2019), Flavián et al. (2019), Ghose et al. (2013), Ghosh et al. (2021), Joa et al. (2018), Kim et al. (2022), Maslowska et al. (2021), Sreejesh et al. (2021), Stewart et al. (2019) |
| Purchase | 9 | Boden et al. (2020), Brasel and Gips (2014), Jain and Tan (2022), Kaatz (2020), Liu and Dewitte (2021), Meißner et al. (2020), Qin, Osatuyi, and Xu (2021), Wang et al. (2015), Zhu and Meyer (2017) |

*Note*: Articles that conduct studies in more than one country (e.g. Boden et al., 2020) or more than one industry sector (e.g. Tseng & Wei, 2020) are listed multiple times. Articles that cover more than three industry sectors or product categories (e.g. Banerjee et al., 2021, Liu & Dewitte, 2021, Haan et al., 2018) are omitted for the industry sector column to avoid biases.

characteristics into three categories, including differences in (i) hardware and software, (ii) application and usage and (iii) data and services. Consistent with the chosen ADO framework, we find that device characteristics do not directly influence behavioural outcomes, but that this influence appears to be mediated by decision processes that revolve around psychological factors such as cognitive costs. This review reveals five categories of decision processes that help explain device-mediated behaviour: (i) customer evaluations, (ii) psychological barriers, (iii) information processing, (iv) perceived media richness and (v) relationship to device. Finally, three categories of outcomes are distinguished that relate to device-mediated customer behaviour on the Internet along the customer journey: (i) pre-purchase, (ii) purchase and (iii) post-purchase behaviours.

### 4.1 | Antecedents: Device characteristics

Today's customers use a variety of devices alongside or instead of the traditional stationary desktop computer. Most of the 59 studies in this review investigate and compare desktop devices such as personal computers (PCs) or laptops (studied in 80% of the articles) and mobile devices (examined in 59%). Some papers delve deeper into mobile devices, distinguishing between smartphones and tablets (researched in 37% and 15%, respectively, of those retrieved; for the breakdown by publication, see Table A2). Research into online customer behaviour on other devices such as Internet-enabled televisions, smartwatches and virtual reality devices is becoming increasingly important (e.g. Meißner et al., 2020; Wagner et al., 2020).

**TABLE 4** Research designs, samples and data analysis (M) within the articles retrieved for the review

| Methods | No. of articles |
|---|---|
| *Research design* | |
| Quantitative | 55 |
| Field data | 24 |
| Experiment | 11 |
| Survey | 9 |
| Field data and experiment | 4 |
| Experiment and survey | 3 |
| Field data and survey | 3 |
| Experiment, field data and survey | 1 |
| Mixed-methods | 3 |
| Focus group and experiment | 2 |
| Focus group and survey | 1 |
| Qualitative | 1 |
| Focus group | 1 |
| *Sample* | |
| Non-student sample | 41 |
| Student sample | 9 |
| Both | 8 |
| Not specified | 1 |
| *Data analysis* | |
| Various regression models | 28 |
| T-Tests | 12 |
| Analysis of variance (ANOVA) | 9 |
| Structural equation modelling (SEM) | 6 |
| Multivariate analysis of variance (MANOVA) | 4 |
| Chi-square-tests | 3 |
| Difference-in-difference approach | 3 |
| General linear models | 3 |

*Note*: Since some articles use more than one approach for data analysis (e.g. März et al., 2017 use both *t*-tests and negative binomial regression models to test their hypotheses), the total numbers for data analysis exceed the number of articles retrieved.

Although similar in functionality and enabling access to identical content, digital devices differ in several ways that may be meaningful with respect to customer behaviour. As a consequence, all 59 studies selected discuss differences in device characteristics to explain why customer behaviour on the Internet varies depending on the device used. Table 5 lists the device characteristics mentioned in the articles of our systematic review. These include differences in hardware and software, application and usage and data and services (see Table 5).

The most obvious difference between smartphones, tablets and PCs is the size and format of screens (mentioned by 43 articles).[3] Whereas the screen sizes of most smartphones are between 4 and 7 inches, tablet screens range from 7 to 11 inches, and most laptop screens from 13 to 15 inches. The screens of stationary computers can be much larger and more than one might be employed. Most mobile devices are designed to be held vertically and used in the portrait mode with a 9:16 aspect ratio (screen width to screen height), while desktop devices are usually horizontal in format and utilized in the landscape mode with a 16:9 aspect ratio (Mulier et al., 2021). Another frequently noted variation between devices (discussed in 24 articles) is the operating mode (e.g. Brasel & Gips, 2014; Shen et al., 2016; Zhu & Meyer, 2017). Smartphones and tablets are typically handheld technologies and are controlled by human touch directly on the screen (i.e. touchscreen). Laptops and stationary computers, by contrast, are normally controlled by external hardware (i.e. keyboard and mouse). Additional operating modes such as voice control (Pagani et al., 2019) or motion-sensing technology (Flavián et al., 2019; Meißner et al., 2020) are emerging.

Furthermore, the devices differ in technical features (mentioned by 16 articles), design and equipment (noted by eight), and capabilities and functionalities (reported by eight). Most stationary devices are superior to mobile devices in regard to battery power or power supply, bandwidth, storage space, speed and available connections (e.g. universal serial bus—USB, Bluetooth, local area network—LAN). However, the advantage of stationary devices in these respects is continuously decreasing due to technical developments. In addition, most mobile devices enable both wireless and wired connection to the Internet, while laptops and computers are often bound to wired connections (Wang et al., 2015). Differences in design and equipment include the position and size of physical buttons, the weight of devices, and the availability of cameras, sensors and global positioning system (GPS) receivers. Due to the different technical features and equipment, the functionalities and capabilities of the individual devices vary considerably. Mobile devices, for example, permit location-based applications because of built-in GPS receivers (Banerjee et al., 2021). Other functionalities that are emerging for mobile devices include augmented and virtual reality technologies that are possible due to embedded cameras, touchscreens and sensors (Qin, Osatuyi, & Xu, 2021). Moreover, most mobile devices offer a vast array of communication features, social media and entertainment applications, and alternative payment methods such as mobile payments are becoming more relevant (Boden et al., 2020; Liu & Dewitte, 2021). Another less investigated device property is the mode of feedback. Smartphones and wearables, in particular, are equipped with haptic feedback technologies that enable vibrational alerts, for instance, to accompany messages or notifications. Such device-delivered haptic feedback may have direct effects on customer responses, as Hadi and Valenzuela (2020) pointed out in their study.

The differences in hardware and software determine the application and usage of devices. Mobile devices are by definition portable and mobile, while devices such as laptops or PCs are usually stationary. Thus, mobile devices and smartphones, in particular, can be used almost anytime and anywhere to access information and content in a timely manner. This lack of spatial and temporal constraints results in novel challenges for retailers, such as in-store mobile device utilization (Bhatnagar & Papatla, 2019; Cavalinhos et al., 2021; Grewal

**TABLE 5** Differences between digital devices (Antecedents)

| Device characteristics mentioned | Exemplary study | Description |
|---|---|---|
| *Differences in hard- and software* | | |
| Screen size and format (43) | Ghose et al. (2013) | Devices differ in size and format (horizontal or vertical) of their screens. |
| Operating modes (24) | Brasel and Gips (2014) | Devices differ in the ways they can be controlled, operated and interacted with (e.g. touch screen, mouse, keyboard, voice control, motion sensors). |
| Technical features (16) | Zhang et al. (2021) | Devices differ in their technical features (e.g. battery power, storage space, resolution, bandwidth, available connections). |
| Equipment and design (8) | Qin, Osatuyi, and Xu (2021) | Devices differ in their embedded equipment and their design (e.g. built-in cameras, sensors or GPS receivers). |
| Capabilities and functionalities (8) | Boden et al. (2020) | Devices differ in their capabilities and functionalities (e.g. location-based applications, augmented or virtual reality applications). |
| Feedback modes (1) | Hadi and Valenzuela (2020) | Devices differ in possible modes of response and feedback they can provide (e.g. haptic feedback through vibrations). |
| *Differences in application and usage* | | |
| Mobility and accessibility (44) | Ransbotham et al. (2019) | Devices differ in their mobility (i.e. portability) and accessibility (i.e. ways of accessing and obtaining information and content). |
| Usage context and situation (24) | Singh and Swait (2017) | Devices differ in terms of the context of use and situation (i.e. physical, social or temporal factors). |
| Personal use (13) | Luo et al. (2022) | Devices differ in terms of personal/shared use and the sense of privacy (i.e. personal nature of devices). |
| Social use (6) | Fuentes and Svingstedt (2017) | Devices differ in terms of social use and interactivity (i.e. social nature of devices). |
| Multitasking (5) | Park et al. (2022) | Devices differ in their ability to enable multiple tasks simultaneously or to switch quickly between different tasks (i.e. multitasking). |
| *Differences in data and services* | | |
| Customer data and services (5) | Kaatz (2020) | Devices differ in terms of the type and variety of data that can be collected for analytics and personalized services. |

*Note*: The numbers in parentheses indicate the number of studies that mentioned the device characteristics in their theoretical background or hypotheses development.

et al., 2018) and real-time electronic word-of-mouth (Lurie et al., 2014; Ransbotham et al., 2019). At the same time, the ubiquity of mobile devices enables opportunities such as location-based advertising (Banerjee et al., 2021). Differences in mobility and accessibility between devices are mentioned by 44 articles. As mobile devices can be utilized anytime and anywhere, the usage context and situation (i.e. physical, social, or temporal factors) and its interference is gaining importance (noted by 24 studies). Desktop computers are mostly located either at home or at the office, while mobile devices can be employed "on the go" (Wagner et al., 2020; Wang et al., 2015). Thus, the times and places of use as well as the social contexts differ between devices and situational factors therefore distinguish digital devices.[4] When customers are waiting for a bus or in a waiting room at a medical office, they might take advantage of their smartphones to simultaneously perform several tasks at the same time and quickly switch from one task to another (i.e. multi-tasking). For instance, they might read product reviews, search for information or set an alarm (Park et al., 2022). At the same time, mobile devices are restricted in their abilities to allow for such multi-tasking due to the small screen and non-existent multi-tab functionality (Jain & Tan, 2022; Raphaeli et al., 2017). Thus, the opportunities for multi-tasking vary depending on the device involved (reported by five works).

The ubiquitous nature of smartphones further enables the immediate exchange of information and thus the collection of others' opinions and interaction with family and friends in real-time, for instance, through social media applications (Melumad & Pham, 2020; Zhang et al., 2021). As a consequence, mobile shopping can be a social activity and mobile phones might be regarded as social devices (Fuentes & Svingstedt, 2017). At the same time, smartphones are considered very personal devices (Melumad & Meyer, 2020; Melumad & Pham, 2020). Smartphones are often highly customized (e.g. personalized case, unique set of applications, etc.) and are rarely shared with anyone else, whereas tablets and desktop computers are frequently used by several persons (e.g. family members; Melumad & Pham, 2020). The social and personal use of devices are mentioned by six and 13 articles, respectively.

Finally, devices differ with regard to the available data and services (noted by five studies). The distinctive nature of mobile devices such as smartphones allows users to store rich data in a unique manner and enables retailers to track customers across time and space.

This facilitates personalized, time- and location-sensitive marketing measures and services, which would not be possible or useful in this form for stationary devices (Tong et al., 2020). The software and hardware features of mobile devices (e.g. embedded cameras or GPS functionalities) are being leveraged, particularly by mobile apps, to provide a more personalized and customized experience (McLean et al., 2018).

## 4.2 | Decisions: Decision processes

Several of the selected works explored potential factors that bridge the relationship between device characteristics and behavioural outcomes along the customer journey. The unique characteristics of digital devices (i.e. the antecedents of device-mediated behaviour) discussed in the preceding section accordingly generate different decision processes depending on which device the customer is using. The portability of mobile devices, for example, provides customers with easy and convenient access to online sources. However, this accessibility comes with limitations in terms of screen sizes and operating modes. Thus, customers evaluate devices differently with regard to usefulness, ease of use, or convenience and enjoyment. Other decision processes mentioned in the articles on device-mediated customer behaviour include psychological barriers, aspects of information processing, perceptions of media richness and relationships to devices (see Table 6 for an overview).

**TABLE 6** Influence of digital devices on decision processes (Decisions)

| Differences in decision processes | Exemplary study | Main findings |
|---|---|---|
| *Customer evaluations* | | |
| Perceived convenience and enjoyment (23) | Singh and Swait (2017) | Convenience and enjoyment are often evaluated higher for mobile devices due to their personal and social nature, and different contexts of use. |
| Perceived ease of use (12) | Kaatz (2020) | Perceived ease of use is often evaluated higher for devices with larger screens. In some cases, however, processes may be perceived as easier on mobile devices (e.g. easy payment with mobile apps). |
| Perceived usefulness (11) | Wagner et al. (2020) | Perceived usefulness is often evaluated higher for devices with larger screens. However, some studies argue that the accessibility counters the negative effect of limited screen sizes and that the usefulness of mobile devices can therefore still be rated highly. |
| *Psychological barriers* | | |
| Privacy and security _concerns (13) | Goldstein and Hajaj (2022) | Privacy and security risks are often perceived to be greater with mobile devices, and smartphones in particular, mainly due to the rich data (time- and location-related information) and wireless transmission. |
| Psychological distance (5) | Lurie et al. (2014) | The psychological distance to a task or an experience tends to be lower on mobile devices due to their ubiquitous nature. |
| *Information processing* | | |
| Cognitive effort (20) | Zhu et al. (2020) | Cognitive effort tends to be higher on devices with smaller screens, more difficult operation modes (e.g. small touch keyboards) and greater interferences by context and situation. |
| Search costs (9) | Ghose et al. (2013) | Closely related to cognitive efforts are search costs, which also tend to be higher on devices with smaller screens. |
| Attentional focus (3) | Melumad and Meyer (2020) | Customers' attentional focus (i.e. attention to present task) tends to be higher on devices with smaller screens. |
| Psychological ownership (2) | Brasel and Gips (2014) | Psychological ownership of selected products might be higher on touch devices and high-immersive virtual reality devices (e.g. head-mounted displays and controllers). |
| Thinking style (1) | Zhu and Meyer (2017) | Customers' thinking styles tend to be more experiential for touch devices and more rational for non-touch devices |
| *Media richness* | | |
| Perceived media richness and information vividness (6) | Sreejesh et al. (2021) | Perceived media richness and information vividness is higher on devices with larger screens. |
| Perceived telepresence (3) | Meißner et al. (2020) | Perceived telepresence (i.e. perception of being present in an unreal environment) is especially high for high-immersive virtual reality devices. |
| *Relationship to device* | | |
| Role and relationship (11) | Melumad and Pham (2020) | The role assigned to devices and the relationship between user and device differs based on accessibility, personal and social use of the devices. |
| Perceived social presence (1) | Hadi and Valenzuela (2020) | Social presence (i.e. perception of the devices as real person) might be higher for smartphones and wearables due to the devices´ vibrational feedback. |

*Note*: The numbers in parentheses indicate the number of studies that discussed the influence of digital devices on that specific decisional factor, including studies in which no significant effect was found.

The trade-off between the high accessibility and ubiquity of smartphones and portable devices on the one hand, and their limited usability due to small screen size, limited functionality, or lower technical capabilities on the other, is discussed in several studies (e.g. Goldstein & Hajaj, 2022; Haan et al., 2018; Jain & Tan, 2022; Kaatz, 2020; Kim et al., 2020; Kim et al., 2021; Lee et al., 2020; Okazaki & Mendez, 2013; Singh & Swait, 2017; Tseng & Wei, 2020; Xu et al., 2017). Kim et al. (2021) called this the accessibility and the usability argument. Accessibility tends to be high in relation to mobile devices, whereas usability tends to be perceived as lower, and vice versa for stationary ones.

In line with the usability argument, perceived ease of use and usability are generally evaluated as lower for devices with smaller screens (Raphaeli et al., 2017; Wagner et al., 2020). Psychological barriers such as privacy and security concerns are also often perceived to be greater for mobile devices, and smartphones in particular, as the devices contain extensive data (time- and location-based information) and wireless transmission appears to be more easily intercepted and abused (Kaatz, 2020; Singh & Swait, 2017). The small screens and low usability of smartphones increase the burdens of information gathering (i.e. search costs) and motivate customers to reduce such cognitive efforts (Ghose et al., 2013; Goldstein & Hajaj, 2022; Han, Han, et al., 2022; Zhu et al., 2020). The influence of usage contexts and situations when mobile devices are used on the go or in stores further adds to the high cognitive load (Grewal et al., 2018). Besides cognitive efforts, the physical constraints of smaller screens are associated with lower perceptions of media richness and vividness of information (Ghosh et al., 2021; Sreejesh et al., 2021). According to the media richness theory (Daft & Lengel, 1986), desktop devices enable rich media due to their larger screens and superior operating modes (mouse and keyboard instead of a touchscreen), whereas smartphones permit only lean media (Sreejesh et al., 2021).

In contrast to this, and based on the accessibility argument, mobile devices are often associated with convenience and enjoyment (Haan et al., 2018; Singh & Swait, 2017; Wang et al., 2015). Moreover, several authors have argued that the psychological distance of mobile device users to a task or an experience is lower compared with customers using stationary devices (Kaatz, 2020; Kim et al., 2020; Lurie et al., 2014; Ransbotham et al., 2019). In line with the construal level theory (Trope & Liberman, 2010), scholars have claimed that the lack of temporal and spatial dimension induced by mobile devices leads to a more concrete (vs. abstract) mental construal, as customers employ their smartphones on the go, throughout the day and in a timely manner. In addition, several studies have highlighted that customers may have different relationships with their digital devices as they play different roles in their lives (Lurie et al., 2014; Melumad & Meyer, 2020; Melumad & Pham, 2020). Melumad and Pham (2020), for instance, showed that smartphones are more likely to be utilized in situations where customers feel stressed, because these devices act as a source of enjoyment and escapism (Fuentes & Svingstedt, 2017). Other devices (e.g. PCs or laptops), by contrast, do not provide the same stress relief. It appears that the smartphone promotes a sense of psychological comfort due to the combination of specific features (portability, personal nature, sense of privacy, haptic pleasure). For example, whereas stationary devices tend to be adopted for work tasks, mobile devices are frequently employed for "fun tasks" such as watching videos, communicating with family and friends, or engaging in social media activities. As a consequence, customers experience a unique emotional mindset when operating a smartphone (Melumad & Meyer, 2020; Melumad & Pham, 2020). Additionally, mobile phones are viewed as a social tool because they allow immediate exchange with friends and family (Fuentes & Svingstedt, 2017).[5] Interestingly, the special role of mobile phones is not evident when the otherwise similar smartphone belongs to someone else; this underscores the highly personal nature and special relationship that many customers attribute to their smartphones (Melumad & Pham, 2020; Sohn et al., 2022).

Finally, several studies have demonstrated the influence of operating modes (i.e. touchscreen vs. mouse and keyboard) on decision processes (Brasel & Gips, 2014; Shen et al., 2016; Zhu & Meyer, 2017). For example, Zhu and Meyer (2017) noted that touchscreens evoke stronger experiential (more holistic and affective) thinking styles, while traditional operating modes lead to more rational (more analytical and rational) ones. Brasel and Gips (2014) highlighted that touch interfaces elicit an increased psychological ownership of products. Similarly, Shen et al. (2016) showed that the usage of touchscreens generates mental product interaction and stimulation. The decision processes most frequently discussed in the articles are perceived convenience and enjoyment ($n = 23$), cognitive effort ($n = 20$), and privacy and security concerns ($n = 13$).

### 4.3 | Outcomes: Behavioural outcomes along the customer journey

The 59 articles analysed in the systematic review highlight that digital devices affect all kinds of customer behaviours along the entire customer journey (i.e. outcomes), based on variations in device characteristics and the resulting decision processes. Differences in purchase ($n = 21$) and search behaviour ($n = 14$) as well as customer engagement ($n = 14$) were found to be the most frequently studied outcomes in the literature. Table 7 lists the main findings of the studies. Figure 3 illustrates the key impacts of devices along the customer journey.

The *pre-purchase stage* encompasses customers' experiences before a purchase and includes all behaviours from initial need recognition to search and consideration (Lemon & Verhoef, 2016). Customers' focus on reducing cognitive efforts when using mobile devices influences browsing and searching behaviour in several ways. For example, browsing on mobile devices is shown to be more task-oriented and less diverse, while on desktop devices it appears to be more exploration-oriented (Goldstein & Hajaj, 2022; Han, Han, et al., 2022; Raphaeli et al., 2017). This is consistent with findings illustrating that sessions conducted through mobile devices tend to be shorter in both duration and numbers of clicks than those performed on stationary devices (Goldstein & Hajaj, 2022; Kaatz et al., 2019; Luo

**TABLE 7** Influence of digital devices on behavioural outcomes (Outcomes)

| Differences in behaviours | Exemplary studies | Main findings |
|---|---|---|
| *Pre-purchase tasks* | | |
| Search behaviour (14) | Ghose et al. (2013), Goldstein and Hajaj (2022), Raphaeli et al. (2017) | Search behaviour is influenced by the device used through differences in cognitive effort and assigned role:<br>• More task-oriented browsing on mobile devices, more exploration-oriented browsing on desktop devices<br>• Browsing for pleasure or distraction while avoiding effortful information searches on smartphones<br>• Ranking effects and different importance of marketing channels and recommendation systems |
| Consideration (5) | Han, Han, et al. (2022), Kukar-Kinney et al. (2022), Zhang et al. (2021) | Consideration is influenced by the device used through differences in cognitive effort and media richness:<br>• Larger consideration set on mobile devices compared with stationary devices<br>• Higher shopping cart usage if mobile devices are used<br>• Possibly different products considered (see choice behaviour)<br>• More intensive and effortful narrowing down of choice sets on large screen devices |
| Processing of brand-related messages and advertisement (8) | Ghosh et al. (2021), Maslowska et al. (2021), Sreejesh et al. (2021) | Processing of advertising and brand-related messages is influenced by the device used through differences in media richness:<br>• Lower brand memory (long-term, recall, recognition) and brand attitude on devices with smaller screens<br>• Higher likelihood to skip pre-roll video ads for mobile device users compared with users of stationary devices<br>• Some studies find no significant effect of device (e.g. Maslowska et al., 2021, Stewart et al., 2019) |
| *Purchase tasks* | | |
| Choice behaviour (12) | Meißner et al. (2020), Shen et al. (2016), Wang et al. (2015) | Choice behaviour is likely influenced by the device used through differences in cognitive effort, psychological product ownership and perceived telepresence:<br>• More likely choice of well-known brands or habitual products on mobile devices, higher share of top-displayed products in purchases via mobile devices<br>• More likely choice of hedonic products on touchscreen devices<br>• More variety-seeking and less price sensitivity on high-immersive virtual reality devices<br>• Some studies find no significant effect (e.g. Singh & Swait, 2017, Zhang et al., 2021) |
| Purchase behaviour (21) | Haan et al. (2018), Herhausen et al. (2019), Kaatz et al. (2019) | Purchase and transactions differ depending on the device used trough differences in cognitive effort, assigned role and perceived risks<br>• Higher willingness to pay, higher purchase intention and impulse-driven purchase behaviour on mobile devices<br>• Decrease in conversion rates with smaller screens of devices<br>• Different importance of customer experience aspects for purchase |
| Payment (2) | Boden et al. (2020), Liu and Dewitte (2021). | Different payment methods (e.g. mobile payment) may influence payment behaviours<br>• Differing effects with regards to mobile payment are found both within and between different papers |
| *Post-purchase tasks* | | |
| Customer engagement (14) | Li et al. (2021), Kim et al. (2020), Melumad et al. (2019), Ransbotham et al. (2019) | Customer engagement (in terms of word-of-mouth and content creation, as well as loyalty point redemption) is influenced by the device used through differences in cognitive effort, assigned role and psychological distance<br>• Shorter, more emotional and more extreme user-generated content for smartphones as a submission device<br>• Unclear impact of submission device on valence and volume of online reviews<br>• Differential impact of mobile versus non-mobile online reviews on the recipient are found in the literature<br>• More hesitant redemption behaviour of loyalty points on mobile devices compared with stationary devices |

**TABLE 7** (Continued)

| Differences in behaviours | Exemplary studies | Main findings |
|---|---|---|
| Product return behaviour (1) | Zhang et al. (2021) | Product return behaviour is influenced by the device used through differences in information processing and attentional focus<br>• Fewer product returns for purchases made via mobile devices versus stationary devices |

*Note*: The numbers in parentheses indicate the number of studies that discussed the influence of digital devices on that specific behavioural outcome, including studies which did not find a significant effect.

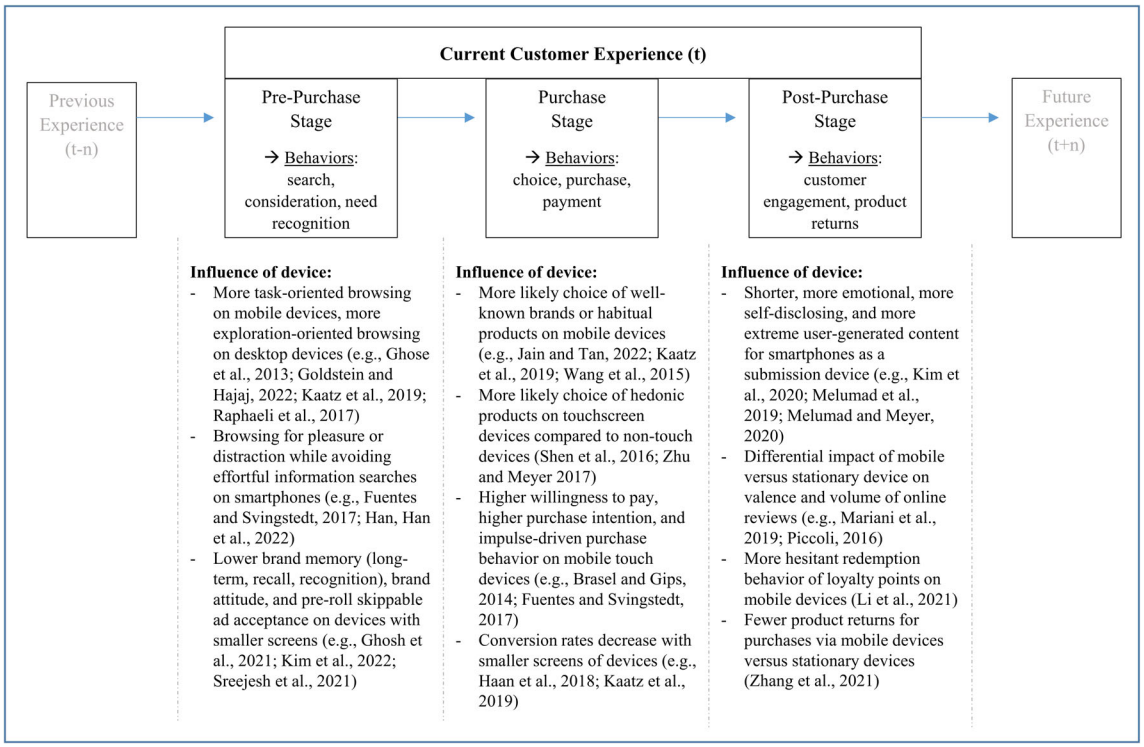


**FIGURE 3** The influence of digital devices along the customer journey (based on Lemon & Verhoef, 2016).

et al., 2022; Raphaeli et al., 2017). Ghose et al. (2013) further demonstrated a higher ranking effect when mobile devices are utilized. As a result of higher search costs, smartphone users (compared with desktop computer users) are more likely to click on links or posts that appear at the top of the screen to avoid extensive information search and cognitive load. The same appears to be true for top-displayed products, whose share of purchases is significantly higher when mobile devices are employed in comparison to stationary ones (Jain & Tan, 2022).

In a similar manner, marketing channels play different roles depending on the devices used. Sponsored search results (search engine advertising—SEA) and direct type-in (i.e. entering the website link directly) are more important on smartphones, while organic search results (search engine optimization—SEO), referrers, newsletters and social media contribute more to conversions if desktop or tablet devices are utilized (Kaatz et al., 2019). Moreover, recommendation systems (i.e. presenting specifically selected items online) are particularly efficient for mobile users, as they reduce search costs and cognitive efforts (Lee et al., 2020). This said, browsing for pleasure or as a distraction to skip otherwise unused time such as when waiting for a bus appears to be an important objective when a mobile phone is employed (Fuentes & Svingstedt, 2017). Thus, mobile devices might be operated more for an initial need recognition and consideration, whereas stationary ones might be adopted for a more effortful narrowing of choice sets through extensive and diverse exploration (Han, Han, et al., 2022; Kukar-Kinney et al., 2022). In line with this argument, Herhausen et al. (2019) highlighted in their study that the usage of mobile phones is associated with a larger number of general touchpoints (retailer, competitor and additional touchpoints) visited in the pre-purchase stage. Furthermore, it has been shown that that the average number of products considered and the number of items added to the virtual shopping cart is significantly greater on mobile devices than on stationary ones (Kukar-Kinney et al., 2022; Zhang et al., 2021).

The accessibility and ubiquity of smartphones, in combination with their unique ability to contact friends and family in real time, enable completely alternative search behaviours such as in-store usage to search for product-related information at the point of sale

(Bhatnagar & Papatla, 2019; Fuentes & Svingstedt, 2017). Bhatnagar and Papatla (2019) showed in their study that 43% of the investigated sample had recently used their mobile device in-store to call family members or friends, 23% to look at online reviews, and 22% to compare prices on-site with other stores. Ghose et al. (2013) illustrated that the ubiquity of smartphones creates a proximity effect; mobile users are significantly more likely to click on posts and links by geographically proximate brands compared with desktop computer users. The same appears to be true with regard to the recency of posts (higher recency of a post leads to a significantly greater likelihood of clicking on that post when mobile phones are utilized; Ghose et al., 2013). Finally, differences in media richness and information vividness between devices are especially important in early stages of the customer journey (Tseng & Wei, 2020). The higher media richness of large screen devices induces deeper cognitive processing of advertising and brand-related messages, ultimately leading to favourable customer reactions (e.g. better brand memory and attitude; Ghosh et al., 2021; Sreejesh et al., 2021).

The small screens and resulting limited cognitive capacity of mobile devices, by contrast, lead customers to focus more on the primary tasks (e.g. information search) and less on advertisements. In line with this argument, studies show that pre-roll video ads are more likely to be skipped on mobile devices (Kim et al., 2022), that exposure to product reviews only positively influences the purchase behaviour of customers using PCs or tablets (Orimoloye et al., 2022), and that the intention to seek more information and the likelihood of opting to receive more product information after exposure to digital video advertisements is higher on stationary devices (Stewart et al., 2019). However, Stewart et al. (2019) also pointed out that attitudinal responses toward video advertising and purchase intention do not appear to be influenced by the digital device. Maslowska et al. (2021) likewise demonstrated that customers pay equal attention to social media advertisements regardless of the device employed. These conflicting findings might be due to the forced ad exposure situation in the latter experiments.

The *purchase stage* of the customer journey involves all interactions between customers and brands or companies during the actual purchase and accordingly includes choice, ordering and payment behaviours (Lemon & Verhoef, 2016). Again, to avoid cognitive load, smartphone users likely prefer products which do not require an extensive information search. Thus, familiar products from popular brands or habitual ones that have been purchased online before are preferably chosen on smartphones (Jain & Tan, 2022; Kaatz et al., 2019; Wang et al., 2015). Furthermore, different thinking styles and mental product interactions elicited by touchscreen interfaces prompt the choice of hedonic over utilitarian products (Shen et al., 2016; Zhu & Meyer, 2017). In addition, the type of device can have an impact on customers' price sensitivity and variety seeking. Meißner et al. (2020) discovered in their study of virtual reality systems that highly immersive head-mounted displays, compared with desktop computer screens, lead to greater variety in product choice and the lower importance of price, as telepresence and psychological product ownership are valued more highly with these devices. Orimoloye et al. (2022) indicated significant differences in the value of virtual shopping carts between devices. In contrast, other works found no significant influence of digital devices on the type of product chosen and purchased (Singh & Swait, 2017; Zhang et al., 2021).

In general, studies show that mobile devices tend to be used as an additional search channel and to a lesser extent for actual purchases (Haan et al., 2018; Herhausen et al., 2019; Holmes et al., 2013; Luo et al., 2022; Singh & Swait, 2017). Kaatz et al. (2019) and Haan et al. (2018), for example, demonstrated that conversion rates tend to decrease with smaller screens. At the same time, willingness to pay and purchase intention, as well as impulse-driven purchase behaviour, tend to be higher on mobile touch devices due to the immediacy, accessibility and ubiquity of these devices and the psychological product ownership elicited by the touch interfaces (Brasel & Gips, 2014; Fuentes & Svingstedt, 2017; Kaatz, 2020). As a consequence, mobile shopping cart abandonment is a common phenomenon (Kukar-Kinney et al., 2022; Wang et al., 2022). Customers tend to switch from small- to large-screen devices for the transaction to reduce cognitive efforts and perceived risks and to take advantage of the greater media richness (Goldstein & Hajaj, 2022; Haan et al., 2018). Building on this, aspects of customer experience appear to play different roles in the purchase process depending on the device employed (Kaatz et al., 2019; McLean et al., 2018); cognitive dimensions of customer experience (e.g. the search for information) gain in importance for devices with larger screens, while affective, behavioural and social components contribute more to conversions for smartphone and tablet users (Kaatz et al., 2019).

Digital devices also diverge with respect to their influence on payment behaviours. The technological advances of smartphones have enabled the proliferation of mobile payment applications such as Samsung Pay or Apple Pay (Boden et al., 2020; Liu & Dewitte, 2021). That said, the literature shows no clear effect of these emerging payment methods on device-related behaviours, variously reporting a tendency for mobile payment to reduce the perceived pain of payment and increase payment convenience, but no influence on spending behaviour (Liu & Dewitte, 2021), while other authors note an increase in willingness to pay, but no reduction in the pain of payment (Boden et al., 2020).

The third stage of the customer journey, the *post-purchase phase*, involves all customer experiences with the purchased product, service, or brand and is characterized by behaviours such as consumption, usage, customer engagement and service requests (Lemon & Verhoef, 2016). The most frequently noted post-purchase behaviour in the articles is the creation of user-generated content and, in particular, writing online reviews (investigated by 13 papers). Not surprisingly, content written on smartphones is often found to be shorter compared with desktop computers (Lurie et al., 2014; Mariani et al., 2019; März et al., 2017; Melumad et al., 2019; Melumad & Meyer, 2020; Park et al., 2022; Piccoli, 2016; Piccoli & Ott, 2014; Zhu et al., 2020). Due to the small screens, inconvenient touchscreen keyboards, and potential impairments from the usage situation, using mobile devices for content creation leads to higher cognitive costs, which are typically reduced by writing less (Lurie et al., 2014; Park

et al., 2022; Zhu et al., 2020). The literature further suggests that smartphone-generated word-of-mouth is more affective (Hovy et al., 2021; Lurie et al., 2014; März et al., 2017; Ransbotham et al., 2019). The greater brevity leads to less specific content when utilizing smartphones and, in turn, to more affective and emotional information (Melumad et al., 2019). Besides brevity and emotionality, the devices employed also have an effect on the narrative content of texts and word-of-mouth. Melumad and Meyer (2020), for instance, pointed out that user-generated content tends to be more self-disclosing on smartphones compared with desktop devices, as the former are associated with heightened psychological comfort and greater attentional focus. Zhu et al. (2020) demonstrated that online reviews written on smartphones mention fewer price aspects, product features or content in terms of quality. However, mobile reviews typically contain more images due to the immediate availability of cameras and wireless connections (Zhu et al., 2020).

Several of the articles examine and compare the valence of user-generated content on mobile and non-mobile devices (e.g. Kim et al., 2020; Lurie et al., 2014; Mariani et al., 2019; Zhu et al., 2020). However, the studies do not provide clear evidence. It is assumed that writing negative content requires more cognitive effort (Kim et al., 2020; Piccoli & Ott, 2014; Schwarz, 1990). Consequently, several authors pointed out that online reviews submitted via smartphones have higher star ratings and are thus more positive (Kim et al., 2020; Mariani et al., 2019; Zhu et al., 2020). In contrast, according to Kim et al. (2021), the valence of online reviews is not affected by the introduction of mobile channels in the long term. Moreover, some works have even suggested that online reviews provided via mobile devices have a more negative valence (Lurie et al., 2014; Piccoli, 2016; Piccoli & Ott, 2014). However, in line with the construal level theory (Trope & Liberman, 2010), mobile reviews tend to be more extreme and polarized (Kim et al., 2020; Kim et al., 2021; Mariani et al., 2019; Piccoli, 2016). The high accessibility of mobile devices causes customers to create content immediately after or even during an experience (März et al., 2017; Piccoli & Ott, 2014; Zhu et al., 2020). This temporal proximity leads to a less abstract thinking style and consequently more extreme reviews, as highly satisfied and dissatisfied reviewers are more likely to reach for smartphones (Kim et al., 2020; Kim et al., 2021). In addition, with the higher accessibility of mobile devices, one might expect a higher volume of word-of-mouth on these devices (Lurie et al., 2014; San-Martín et al., 2020). While Mariani et al. (2019) confirmed this argument, Kim et al. (2021) found no long-term effects of different devices on review volume.

As a consequence of the aforementioned differences between mobile and non-mobile word-of-mouth, recipients of such content may respond differently. This point is corroborated by Ransbotham et al. (2019), who found that smartphone-generated content is associated with 40% fewer likes. Several other authors likewise indicated that mobile reviews are perceived as less helpful than non-mobile ones (Lurie et al., 2014; Mariani et al., 2019; März et al., 2017). Melumad and Meyer (2020), by contrast, demonstrated that reviews written on smartphones are rated as more persuasive and interesting by recipients. Grewal and Stephen (2019) further indicated that knowing that online content was created on a mobile device (e.g. by indicating the device type with "written via mobile" labels) leads to greater review credibility and ultimately higher purchase intentions among readers. This seems to be particularly true when recipients are also using a mobile device, as the congruence between the device employed to create the review and the one utilized to read it reinforces its perceived usefulness (März et al., 2017).

Other post-purchase behaviours investigated in the literature include loyalty point redemption (Li et al., 2021) and product return behaviour (Zhang et al., 2021). When customers shop via mobile devices (compared with desktop devices), they are initially less likely to redeem loyalty points due to higher search costs and perceived risks. However, once they decide to apply loyalty points, they use a higher number of points via mobile devices than desktop ones due to the perceived convenience (Li et al., 2021). Higher search costs also play a role in product return behaviour. Based on Melumad and Meyer's (2020) findings that interactions with smartphones increase customers' focus on the present task (i.e. attentional focus), Zhang et al. (2021) argued that mobile users are more focused and therefore more confident in their decision-making when purchasing goods via mobile devices compared with stationary devices. In addition, mobile devices allow for social exchange and extended access to information from various sources due to their ubiquitous nature. This ultimately leads to different return behaviour, with the utilization of mobile channels resulting in fewer product returns compared with traditional online channels. Hence, when customers choose to purchase through smartphones, despite the general trend of employing these devices in a complementary manner, they tend to be more confident in their choice (Zhang et al., 2021).

### 4.4 | The conceptual framework

We propose a three-component conceptual framework to explain the influence of digital devices on customer behaviour (see Figure 4). Based on the ADO framework, which was adapted for the thematic analysis, we found that different device characteristics (antecedents) influence internal customer evaluations and other psychological reactions (decisions), which eventually result in observable differences in customer behaviours along the customer journey (outcomes). This causal path is highlighted directly or indirectly in most of the studies within the selection of articles. Ghose et al. (2013), for instance, illustrated that the smaller screens of mobile devices and associated limitations in usability (i.e. device characteristics) cause a higher cognitive load and greater search costs for smartphone users (i.e. decision processes). This leads to differences in browsing and searching behaviour depending on the device used (i.e. behavioural outcomes). Similarly, Melumad and Meyer (2020) demonstrated that the special characteristics of smartphones (e.g. mobility and accessibility) evoke greater feelings of psychological comfort, thereby influencing the generation and content of electronic word-of-mouth. Many works have identified similar psychological drivers that mediate the influence of device

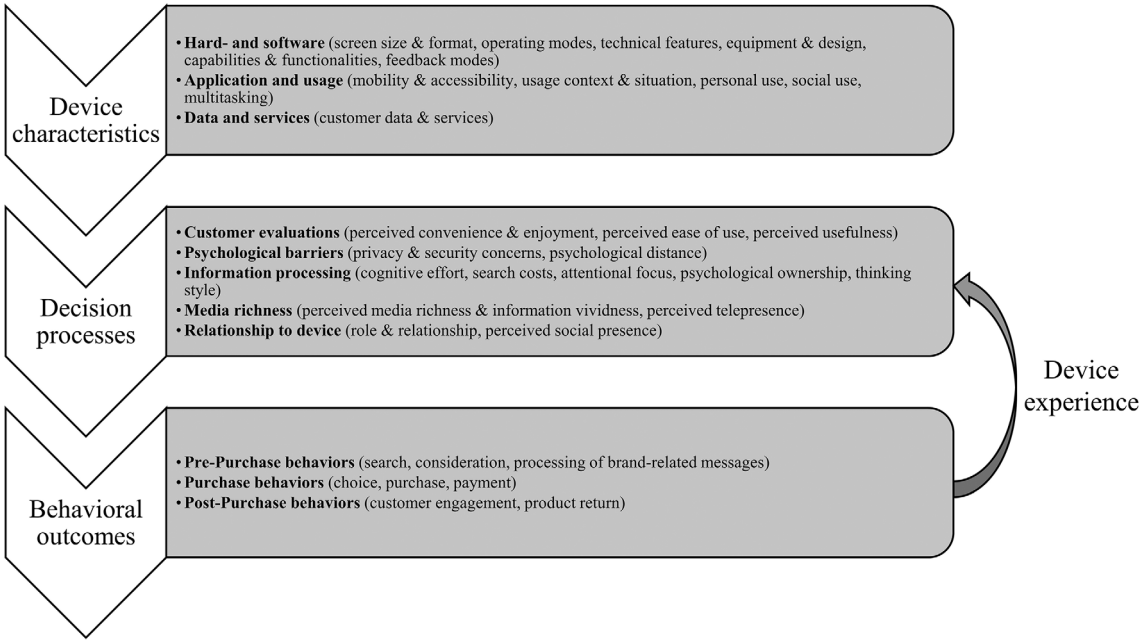


**FIGURE 4** Conceptualization of the influential role of digital devices on customer behaviour on the Internet.

characteristics on behaviour (e.g. touchscreen → thinking style → purchase intention for product types [Zhu & Meyer, 2017]; touchscreen → psychological ownership → willingness to pay [Brasel & Gips, 2014]; screen size → search costs → product choice [Jain & Tan, 2022]; screen size → physical and cognitive costs → creation of online reviews [Lurie et al., 2014]; screen size → attentional focus → product return behaviour [Zhang et al., 2021]).

In addition to the proposed causal path of the framework (device characteristics → decision processes → behavioural outcome), we find evidence in the articles that device experience directly influences psychological factors (see arrow in Figure 4). With the continuous use of devices and thus more experience, customers tend to evaluate them more favourably. McLean et al. (2020) and Boden et al. (2020), for instance, indicated that the earlier adoption and utilization of mobile apps and payment positively influence confidence and convenience in its utilization. A lack of familiarity with devices and technologies, meanwhile, can further increase the cognitive effort required (Haan et al., 2018; Pagani et al., 2019). However, innate differences between device characteristics, such as screen size, are of course not affected by device experience and thus exert a constant influence on customers' decisional and, ultimately, behavioural responses (Jain & Tan, 2022). In line with this argument, Wang et al. (2015) asserted that customers prefer different products when shopping on mobile devices as compared with stationary devices, even after becoming accustomed to mobile technology. Similarly, Meißner et al. (2020) highlighted that substantial behavioural differences between virtual reality devices persist even once customers get more experienced with the technology. McLean et al. (2020) showed that the usage context of mobile phones hardly changes between initial adoption and continued employment and therefore has an impact on decision processes and customer behaviour that is independent of device experience.

## 5 | WHERE SHOULD WE BE HEADING AND HOW?—SUGGESTIONS FOR FUTURE RESEARCH

The proliferation of smartphones, tablets and other devices alongside traditional desktop devices has transformed the Internet into a device-mediated environment. Omnichannel management and exploration in this area therefore calls for a more nuanced view of "the online channel" and a rejection of the traditional desktop-centric perspective in customer behaviour research (Verhoef et al., 2015; Wagner et al., 2020). That said, research on the influence of digital devices on customer behaviour on the Internet is still in its infancy. Wagner et al. (2020, p. 257) have stated that it is "surprising" that such a small number of studies consider different digital devices despite obvious differences in their characteristics. The 59 articles summarized in this review demonstrate that the device characteristics do indeed strongly influence customer behaviour on the Internet along the entire customer journey. However, several unanswered questions and opportunities for additional investigation persist (see Table 8). Against this backdrop, the subsequent sections discuss potential future research directions based on the ADO and the TCM frameworks.

### 5.1 | Research agenda for antecedents, decisions and outcomes (ADO)

Our literature review showed that customers on the Internet are influenced by various device characteristics and the resulting decision processes. We identified screen size and format as well as the operating mode as two of the most frequently mentioned device characteristics

**TABLE 8** Summary of future research directions

| Where should we be heading? (ADO) | Research agenda |
|---|---|
| *Antecedents* (*A*) | |
| Interrelationship of device characteristics | • A broader, more holistic view of devices characteristics would be desirable besides the separate investigation of their influence on psychological decision processes and behavioural outcomes.<br>• Emerging and novel technical features and their influence should be investigated and integrated in the extant research.<br>• The effects of some device characteristics, particularly touchscreen interfaces, vibration feedback and voice control, are still under-researched. |
| New devices and novel technologies | • Further research should examine the impact of new digital devices (e.g. wearables, Internet-enabled TVs) and novel technologies (e.g. virtual and augmented reality, gamification) on customer behaviour on the Internet. |
| *Decisions* (*D*) | |
| Underlying mechanisms | • Underlying mechanisms of device-mediated customer behaviour on the Internet should be investigated more closely. |
| *Outcomes* (*O*) | |
| Under-investigated customer behaviours | • Future research examining device-related differences in customer responses to advertising and other messages could inform managers on how to most effectively design media strategies and message placement.<br>• The benefits and potential drawbacks of smartphone use in stores should be further explored to inform retailers.<br>• The effects of mobile payment applications on customer behaviour in the purchase stage remain unclear and require further research.<br>• Differences in price sensitivity depending on the device used and reactions to device-based pricing should be investigated.<br>• The influence of submission device on the valence and volume of user-generated content should be further explored to advise companies on which devices to encourage content creation.<br>• Content creation on different devices should be investigated for types of electronic word-of-mouth other than online reviews (e.g. recommendations, social media posts) and for different content aspects (e.g. types of information revealed, degree of truth, degree of perceived helpfulness).<br>• Another notable research gap relates to the impact of devices on service requests such as complaints.<br>• Findings on the influence of digital devices on behaviour should be extended to non-commercial fields. |
| Interaction between touchpoints, devices and channels | • Since customer behaviour and experience on the same device might differ depending on the touchpoint (e.g. usage of app or website on tablets), a comprehensive understanding of the interaction between touchpoints and devices is needed.<br>• The changing role of brick-and-mortar stores in the omnichannel environment and the influence of digital devices, and smartphones in particular, on this change should be explored in future research. |
| Device-related marketing measures | • Future research should investigate how marketing measures (e.g. assortment, communication, or pricing) can be adapted to device-specific characteristics.<br>• Cross-device targeting offers interesting directions for future research. |
| **How can we get there? (TCM)** | **Research agenda** |
| *Theories* (*T*) | |
| Theory development | • More comprehensive theories or models are needed that encompass the complex interplay of various device characteristics and resulting decision processes and behavioural outcomes.<br>• Future research should contrast the media richness theory, cognitive cost theories and the construal level theory to find which device characteristics and resulting psychological processes are most important along the customer journey. |
| Definition development | • The current multi- and omnichannel research lacks an unambiguous definition and classification of devices and device types. |
| Device choice | • Device choice, device switching and cross-device usage along the entire customer journey, as well as factors of device choice, lack a theoretical foundation. |
| *Context* (*C*) | |
| Countries and cross-cultural | • The complete absence of studies from South America, Africa and Australia highlights the need for research in various countries and developing countries in particular.<br>• Researchers are recommended to conduct cross-national and cross-cultural studies for generalization purposes. |

(Continues)

**TABLE 8** (Continued)

| Where should we be heading? (ADO) | Research agenda |
|---|---|
| Industries and cross-industrial | • The findings from the literature should be validated in other industry sectors and for other product categories.<br>• Cross-industrial research is needed to ascertain the generalizability of the findings.<br>• Future research is encouraged to find higher-quality segmentation criteria for product and services with regard to the influential role of digital devices on customer behaviour. |
| Customer journey | • It is recommended to examine the role of devices and its influence along the entire customer journey. |
| Covid-19 | • There is clearly much research to be done into the short- and long-term impact of the current Covid-19 pandemic on device-mediated customer behaviour. |
| *Methods (M)* | |
| Qualitative and mixed- or multi-method research | • Qualitative and mixed-methods research should be applied to gain deeper insights into the influence of the devices used and to advance theory development.<br>• Mixing the analysis of field data with experimental data seems to be particularly promising to avoid a self-selection bias, to investigate underlying mechanisms, and to highlight the external and internal validity of findings.<br>• Other methods could be used to study device-mediated customer behaviours more reliably and validly (e.g. eye-tracking combined with choice-based conjoint analysis). |
| Longitudinal studies | • Longitudinal studies can be applied to examine long-term effects and the impact of device experience on customer behaviour. |
| Machine learning approaches | • Extant literature lacks data-driven methods based on machine learning that use customer-related data (e.g. clickstream data) to predict specific customer behaviours on the Internet. |

in the articles. Most studies investigate these characteristics separately, despite the potential interactions and interrelationships (e.g. Brasel & Gips, 2014; Ghose et al., 2013; Zhu & Meyer, 2017). A more holistic view of device characteristics would be desirable for a complete understanding of device-mediated behaviour on the Internet. Moreover, emerging and novel technological features and their influence should be investigated and integrated into existing research. For example, augmented and virtual reality applications enabled by embedded cameras and sensors in smartphones are becoming increasingly important (Meißner et al., 2020; Qin, Osatuyi, & Xu, 2021). Other fields related to device characteristics and features that seem to be underrepresented in the literature include the influence of touchscreens (Brasel & Gips, 2014; Melumad & Pham, 2020), the impact of vibrational feedback (Hadi & Valenzuela, 2020), and the effects of voice control instead of other operation or input modes (Pagani et al., 2019; Shen et al., 2016; Zhu et al., 2020). In addition, emerging Internet-enabled devices such as wearables or smart TVs promise interesting areas for additional exploration (Hadi & Valenzuela, 2020; Lurie et al., 2014; Piccoli, 2016; Wagner et al., 2020; Zhang et al., 2021). Melumad and Meyer (2020), for instance, have encouraged future researchers to investigate whether the effects of small screens on attentional focus and ultimately content creation extend to smartwatches. In summary, digital devices and their characteristics are constantly evolving in parallel with technological developments. Channel managers as well as investigators should acknowledge this dynamic nature, in terms of both the spectrum of digital devices (new devices such as smartwatches may emerge, others such as cell phones may decline) and technical features (e.g. new capabilities such as virtual or augmented reality).

With regard to device-mediated behaviour in general, some questions remain despite a growing body of work. For instance, the studies provide conflicting results regarding the influence of digital devices on message and advertising processing (Ghosh et al., 2021; Maslowska et al., 2021; Sreejesh et al., 2021; Stewart et al., 2019; Tseng & Wei, 2020). Future research examining device-related differences in customer responses to brand-related messages could therefore inform managers on how to most effectively design media strategies and message placements. Similarly, the effects of mobile payment applications on customer behaviour in the purchase stage remain unclear and require additional investigation (Boden et al., 2020; Liu & Dewitte, 2021). Differences in price sensitivity between devices are likewise investigated in one work only (Meißner et al., 2020). However, one might expect differences in price sensitivity and reactions to different prices depending on the device used due to different decision processes (Wang et al., 2015). While several companies already differentiate their prices depending on the device employed, there is a lack of evidence regarding the impact of device-based pricing on customers.

Notwithstanding the numerous works on the influence of devices on online reviews (e.g. Kim et al., 2021; Zhu et al., 2020), research on the impact of digital devices on content creation is still in its infancy. For example, the studies do not speak with one voice on the impact of submission device on volume and valence of electronic word-of-mouth. Further analysis examining whether content created on mobile devices is more positive or negative could help retailers in their decision to encourage customers to use certain channels or devices for word-of-mouth creation (Melumad et al., 2019; Zhu et al., 2020). Furthermore, it is important to understand the reasons and underlying

mechanisms for differences in valence depending on the device employed to react accordingly (Piccoli, 2016). In addition, content creation on different devices should be explored for types of electronic word-of-mouth other than online reviews (e.g. recommendations, social media posts) and for different content aspects (e.g. types of information revealed, degree of truth, degree of perceived helpfulness; Mariani et al., 2019; Melumad et al., 2019; Melumad & Meyer, 2020; Melumad & Pham, 2020). Previous investigation has shown that the digital devices utilized to generate and submit electronic word-of-mouth can affect customers' perception and reaction toward the content (Grewal & Stephen, 2019; Ransbotham et al., 2019; Yang et al., 2022). Additional exploration is encouraged to advance these findings and comprehensively investigate the influence of the submission device on the processing of contents from a receiver perspective.

Another notable research gap in terms of post-purchase behaviour concerns the impact of devices on service requests such as complaints. Companies and retailers would benefit from analyses that investigate whether complaint behaviour differs across devices or whether customers are more easily gratified on certain devices. As a result of such findings, retailers could push customers to use specific channels for complaints. Finally, additional investigation into the interaction between digital devices and channel touchpoints (i.e. social media, corporate websites, applications) is needed, since customer behaviour and experiences on the same device might differ depending on the touchpoint utilized (McLean et al., 2020; Sreejesh et al., 2021; Wagner et al., 2020).

In light of the highlighted differences between decision processes and behavioural outcomes, the question arises as to how retailers should adapt marketing measures (e.g. assortment, communication, or pricing) to device-specific characteristics (Kaatz, 2020; Kim et al., 2022; März et al., 2017). As outlined above, future research should investigate the effects of device-based pricing and communication, as well as cross-device targeting (Haan et al., 2018; Wang et al., 2015). Moreover, encouraging customers to use specific devices for certain tasks, such as the issuing of online reviews or complaints, may lead to favourable outcomes and offers interesting directions for additional exploration (Kim et al., 2020; Lurie et al., 2014). Finally, future studies could extend findings on the influence of digital devices on behaviour to non-commercial fields such as medicine (e.g. the use of digital devices by physicians; Raphaeli et al., 2017) or methods research (e.g. the influence of devices on survey response behaviour; Shen et al., 2016).

## 5.2 | Research agenda for theories (T)

Our SLR shows that the media richness (Daft & Lengel, 1986), uses and gratification (Blumler, 1979), and construal level theories (Trope & Liberman, 2010) are the most frequently applied in research on device-mediated behaviour. While these theories help to understand the influence of device characteristics on decision processes and ultimately behavioural outcomes, they focus on individual properties separately, risking the overlooking or omission of possible interrelationships. For instance, the media richness theory suggests that small device screens lead to lower media richness and information vividness, and thus to differences in the processing of brand-related messages (Ghosh et al., 2021; Sreejesh et al., 2021). However, this theory neglects the influence of accessibility and ubiquity and therefore may underestimate the importance of mobile devices along the customer journey. The construal level theory, by contrast, is used to demonstrate that the ubiquity of mobile devices leads to more concrete mental construal, resulting in different purchase and content creation behaviour (Kaatz, 2020; Kim et al., 2020; Lurie et al., 2014; Ransbotham et al., 2019). Yet, the theory fails to explain observed behaviours, such as why both purchase intention and willingness to pay are higher when mobile phones are employed at home versus on the go (Kaatz, 2020) or the contradictory results with regard to online reviews (e.g. Kim et al., 2020; Kim et al., 2021). This underscores that theories focusing on single device characteristics separately cannot sufficiently explain customer behaviour in omnichannel contexts. In addition to the shortcomings of applied theories and models in the extant literature, 26 of the articles reviewed (44%) did not specify a theoretical foundation for their studies. Therefore, established theories should be extended or new models should be developed for an improved theoretical understanding of the influential role of digital devices on customer behaviour on the Internet and its underlying mechanisms. More comprehensive theories or models are needed that account for the complex interplay of various device characteristics and the resulting decisional and behavioural outcomes. The conceptual framework in this review (see Figure 4) may serve as a starting point for such new theories.

Despite the variety of digital devices in existence and the wide range of different device characteristics, most of the studies reviewed persist in distinguishing only between mobile and non-mobile or stationary devices (e.g. Kim et al., 2021; Wang et al., 2015). The fact that only nine of the articles differentiate more than two device types in their papers (e.g. Kaatz et al., 2019; Xu et al., 2017) accentuates the necessity of extending the knowledge on device-mediated behaviour. Current multi- and omnichannel research lacks an unambiguous definition of the term "channel" and a clear classification and categorization of digital devices within the channel concept (Wagner et al., 2020; Wolf & Steul-Fischer, 2022). Based on the differences between device characteristics, Wagner et al. (2020) distinguished four groups of devices, including traditional (i.e. PCs, laptops and netbooks), mobile (i.e. tablets and smartphones) and complementary devices (including e-readers and portable media players), as well as Internet-enabled TVs. However, the multitude of different device characteristics and their interplay complicate a segmentation of devices. For instance, other works treat tablets as a separate channel (e.g. Banerjee et al., 2021) or classify tablet computers within the traditional channel together with desktop computers (e.g. Zhang et al., 2021); several publications omit tablets altogether (e.g. Ghose et al., 2013). Additional investigation is encouraged to identify higher-quality segmentation criteria for digital devices besides portability to

enable a consistent understanding in omnichannel management and research.

The comprehensive understanding of device-mediated behaviour further requires theoretical underpinnings with respect to device choice and switching, as well as cross-device usage, along the customer journey (Haan et al., 2018; Singh & Swait, 2017; Wang et al., 2015). Despite some initial attempts to explain these concepts (e.g. Singh & Jang, 2022; Singh & Swait, 2017), several questions remain. These include investigating the factors involved in device choice for different product types and for behaviours along the entire customer journey (going beyond device switching between pre-purchase and purchase; e.g. Haan et al., 2018; Piccoli, 2016; Wagner et al., 2020).

### 5.3 | Research agenda for contexts (C)

Research on device-mediated behaviour has been carried out in 18 countries, with the US being the most frequently studied country ($n = 15$ articles). Except for one from Israel (Raphaeli et al., 2017), all the papers refer to countries and samples from Western Europe (e.g. Germany, Italy, UK), South and East Asia (e.g. China, South Korea, Japan, India), or the US. This is despite the fact that 63.1% of the total population worldwide are regular Internet users and these numbers are steadily increasing across all countries (GWI, 2022). Thus, the complete absence of works from South America, Africa and Australia underscores the need for investigation in different countries and developing ones in particular (Boden et al., 2020; Fuentes & Svingstedt, 2017; Lee et al., 2020; Liu & Dewitte, 2021; Mariani et al., 2019; Nakano & Kondo, 2018). The country in which a study is conducted could act as a moderator for customer behaviour research findings and therefore explain some of the inconsistent results (Holmes et al., 2013; Maseeh et al., 2021). Consequently, researchers are advised to conduct cross-country and cross-cultural analyses to enable generalizations and help retailers decide whether to make their channel strategies global, international, or national (McLean et al., 2018; Zhu et al., 2020).

Furthermore, the literature on device-mediated customer behaviour to date is limited in terms of the industries and phases of the customer journey studied. Thirty-eight of the articles cover travel and tourism ($n = 15$), fashion and beauty ($n = 14$), or groceries ($n = 9$). Other industry sectors and products, such as customer electronics or financial services and insurances, remain heavily under-investigated or are completely omitted. Thus, several authors have encouraged future research to validate their findings for other product categories and industries (e.g. Han, Han, et al., 2022; Holmes et al., 2013; Kaatz, 2020; Kim et al., 2020; Kim et al., 2021; Li et al., 2021; Luo et al., 2022; Mariani et al., 2019; Wagner et al., 2020; Wang et al., 2015; Zhu et al., 2020). Additionally, despite some analyses on hedonic versus utilitarian product categories (Pagani et al., 2019; Singh & Swait, 2017; Stewart et al., 2019; Zhu & Meyer, 2017), differences in device-mediated behaviour between other product classifications (e.g. search versus experience goods) should be explored (Lurie et al., 2014; Orimoloye et al., 2022). For instance, Orimoloye et al. (2022) called for a replication of their study in the context of experiential goods and services, such as the online purchase of event tickets. In a similar way to countries, cross-industry assessments are needed to ascertain the generalizability of the findings. Beyond that, the works reviewed focus specifically on typical pre-purchase and purchase ($n = 16$) or post-purchase tasks ($n = 13$) separately. An investigation of the whole customer journey, by contrast, would be desirable for a comprehensive understanding of customer behaviour and an improvement of customer experience management (Kaatz et al., 2019; Lemon & Verhoef, 2016). Finally, the current Covid-19 pandemic and associated measures such as governmental lockdowns or calls for social distancing are having severe impacts on the multi- and omnichannel environment (Verhoef, 2021). There is clearly much investigation to be conducted into the short- and long-term impact of the pandemic on device-mediated customer behaviour and omnichannel management in general.[6]

### 5.4 | Research agenda for methods (M)

The literature on device-mediated customer behaviour is still at an early stage of development and requires validation through various methods, other samples and longitudinal analyses. As shown in Table 4, 55 (93%) of the articles are based on quantitative data; primarily utilizing field data ($n = 32$), experiments ($n = 21$), surveys ($n = 17$), or a mix thereof. The small number of qualitative methods (four publications use focus groups) stands in sharp contrast to these figures. In fact, there is only one purely qualitative paper (Fuentes & Svingstedt, 2017). Yet qualitative methods such as focus groups or expert interviews could deepen existing knowledge about device-mediated behaviour and reveal psychological drivers and underlying mechanisms that may have been neglected in quantitative works (Fuentes & Svingstedt, 2017; Kim et al., 2021). Moreover, qualitative studies could aid the much-needed theory development (see Section 5.2). Multi- and mixed-method designs comprising different qualitative and quantitative approaches can further augment the understanding of causal relationships and assist the exploration of customer behaviour on the Internet (Qin, Osatuyi, & Xu, 2021). In this regard, combining the analysis of field data with experimental data seems to be particularly promising for investigating underlying mechanisms, highlighting the external and internal validity of the results, and avoiding selection biases (Kim et al., 2020; Luo et al., 2022; Melumad et al., 2019; Park et al., 2022). In many evaluations, the device chosen by customers is subject to self-selection and devices are not randomly assigned. As a consequence, varying behaviours might stem from customer heterogeneity rather than different device characteristics. While this issue can be solved by employing a propensity score matching method with two matched samples (e.g. Haan et al., 2018; Kaatz, 2020), we encourage additional investigation to incorporate multi- or mixed-method approaches to triangulate findings and enable more complete explanations. In addition to qualitative approaches and experiments, longitudinal assessments with an extended observation

period would enable an examination of long-term effects and an advanced understanding of the impact of device experience on customer behaviour (Herhausen et al., 2019; Singh & Swait, 2017). The application of other methods employed in customer research, such as eye-tracking, might capture the unconscious and conscious mechanisms influencing device-mediated customer behaviour (Maslowska et al., 2021).

The Internet allows researchers to collect rich customer-related data (e.g. clickstream data) easily and inexpensively. As a result, several studies of device-mediated customer behaviour are based on such field data (e.g. Goldstein & Hajaj, 2022; Raphaeli et al., 2017). However, current literature lacks data-driven, machine learning-based methods to predict specific customer behaviours using this source of information. Future research could incorporate different device types and device characteristics into machine learning models to test whether this improves their performance. In addition, future research is encouraged to develop device-related outcome variables and metrics for machine learning models. For example, virtual shopping cart abandonment on desktop devices may better reflect actual purchase dropout and might therefore be more relevant for prediction compared with cart abandonment on mobile devices, as the latter may simply indicate device switching (Haan et al., 2018; Rausch et al., 2022).

## 6 | CONCLUSION

This systematic literature review aims to summarize the fast-growing body of research on device-mediated customer behaviour on the Internet and highlight what we know and how, as well as where we should be heading and how we should get there. To this end, 59 articles from academic journals were retrieved and descriptively and thematically analysed based on two established SLR frameworks. The TCM framework (Paul et al., 2017) highlights that the extant literature lacks comprehensive theories and clear definitions and classifications of devices in the omnichannel environment. Furthermore, existing findings should be generalized for other contexts (e.g. industries and countries) and validated via the introduction of other research designs and methods (see Table 8). The thematic analysis based on the ADO framework (Paul & Benito, 2018) demonstrates that customers on the Internet are influenced by the digital device used throughout their customer journey. The resulting conceptual framework suggests that differences in device characteristics (antecedents) directly affect customers' decision processes (decisions) and eventually their behaviours (outcomes). For instance, the small screens of mobile devices lead to higher cognitive costs and thus more task-oriented browsing behaviour, as well as lower conversion rates, preferences for low-risk or habitual products, and shorter, more affective online reviews (Ghose et al., 2013; Kaatz et al., 2019; Melumad et al., 2019; Raphaeli et al., 2017; Wang et al., 2015; Zhu et al., 2020). Figure A1 outlines a state-of-the-art overview of the antecedents, decisions and outcomes of device-mediated customer behaviour on the Internet and its supporting theories, contexts and methods in the existing literature. Despite a rising number of publications, the understanding of device-mediated customer behaviour on the Internet and the consequently arising marketing measures remains scarce. As a result, several questions continue to be unanswered, as highlighted in this review. Additional investigation is encouraged to extend the literature in this field to new devices and technologies as well as unexplored types of customer behaviour.

### 6.1 | Practical implications

The proliferation of smartphones and tablets and the continued evolution of technologies and new devices pose challenges for researchers and practitioners alike. Understanding how Internet-enabled devices are reconfiguring the practice of online shopping and changing the focus of customers is crucial for retailers to optimize customer experience (Lemon & Verhoef, 2016). Our conceptual model identified different factors and relationships in the existing literature on device-mediated customer behaviour. Retailers should acknowledge these factors and integrate them into marketing strategies to obtain favourable outcomes. Among others, they should consider the different roles of devices along the customer journey (Haan et al., 2018; Xu et al., 2017). Conversion rates, for instance, tend to decrease with smaller screens and lower usability (Kaatz et al., 2019; Raphaeli et al., 2017). However, the utilization of multiple devices and cross-device usage in particular lead to significant higher purchase probabilities and enhance sales outcomes, as mobile devices might act as complementary channel for information search and consideration (Haan et al., 2018; Luo et al., 2022; Wang et al., 2015; Xu et al., 2017). Thus, managers should facilitate easy device switching and adapt marketing measures to different customer motivations and needs when using different devices (Fuentes & Svingstedt, 2017; Kukar-Kinney et al., 2022; Raphaeli et al., 2017).

A superior omnichannel strategy goes beyond one-size-fits-all channel management and the traditional and still predominant consideration of only one online channel (Lemon & Verhoef, 2016; Verhoef et al., 2015). Companies seeking to improve customer experience on the Internet need to adapt marketing measures to different device characteristics and the resulting decision processes. A clear understanding of the differences between devices may help companies to adopt suitable device-related marketing measures, which could significantly improve firm performances. Jain and Tan (2022), for example, impressively showed that undifferentiated planning, as for the conventional PC channel, has considerable disadvantages for sales via the mobile channel in terms of inventory procurement, assortment planning and product presentation.

Managers should reduce cognitive efforts on smaller devices by simplifying online processes via easy-to-use systems and lower barriers. Examples of such measures in the reviewed literature include the auto-completion of texts, saving of information and shopping carts across sessions, implementation of recommendation systems and display of top suggestions, as well as easy check-out processes, responsive designs and convenient payment methods (Kaatz

et al., 2019; Kaatz, 2020; Kim et al., 2020; Kukar-Kinney et al., 2022; Lee et al., 2020; März et al., 2017; Raphaeli et al., 2017; Wagner et al., 2020). To capitalize on the higher media richness and information vividness of devices with large screens, by contrast, managers should enable product and price comparisons on such devices (Raphaeli et al., 2017; Singh & Swait, 2017). Moreover, devices with larger screens are better suited to the presentation and introduction of novel or utilitarian products (Kaatz et al., 2019; Wang et al., 2015), while touchscreens seem to induce greater purchase intentions for hedonic products (Shen et al., 2016; Zhu & Meyer, 2017). Building on this, device-based pricing, assortment planning and communication might result in favourable customer behaviours, but require further research.

Besides differences in usability, companies should also consider the differences in accessibility and relationships with devices. For example, Melumad and Meyer (2020) highlighted that smartphones are especially suitable for obtaining sensitive or personal information, because customers show higher rates of self-disclosure once these devices are used. The use of device-specific technologies and features such as voice input, haptic feedback in the form of vibration alerts, or location detection utilizing GPS receivers could further positively influence customer behaviour (Ghose et al., 2013; Hadi & Valenzuela, 2020; März et al., 2017).

## 6.2 | Theoretical implications and limitations

Notwithstanding the need to understand the influence of digital devices along the customer journey, and despite the plethora of systematic literature reviews in the field of customer behaviour on the Internet (see Table A1), this is the first to date that systematically summarizes the currently existing studies on device-mediated behaviour. Thus, we advance the body of knowledge on customer behaviour on the Internet by descriptively and thematically analysing the relevant publications based on the TCM and ADO frameworks. In so doing, the review provides a comprehensive overview of the theories, contexts and methods applied and examined in the extant literature and proposes a conceptual framework which highlights the relationship between the antecedents, decisions and outcomes. This framework contributes to the literature by illustrating the causal path of the influential role of devices in omnichannel environments for both researchers and practitioners. Finally, the evaluation proposes a comprehensive research agenda by highlighting potential gaps and underinvestigated theories, contexts and methods. In spite of these contributions, the assessment is subject to some limitations. First, the chosen inclusion criteria may have resulted in the exclusion of relevant papers, such as conference papers and articles from non-business journals. To better acknowledge the interdisciplinary nature of this topic, future reviews should consider including articles from related fields such as information systems and psychology. Second, the screening process of the initially identified 735 articles was partially subjective and therefore limited in its reproducibility, despite the high agreement rate of 98% between the two independent researchers. In addition, the qualitative approach based on the ADO framework utilized for the thematic analysis was highly subjective and should be validated and statistically assessed using meta-analyses (Paul & Criado, 2020). Finally, due to the constant development of digital devices and online technologies and the resulting dynamism of this research area, there is a need to replicate this SLR in the future and integrate forthcoming works.

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## DATA AVAILABILITY STATEMENT

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon request.

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## ENDNOTES

[1] The screening process resulted in the exclusion of 666 articles due to inapposite content (i.e. no investigation of the influence of digital devices on customer behaviour on the Internet). Most works were excluded because digital devices or mobile services were only the focal product category in the studies (approximately 30%). For example, Nasiri and Shokouhyar (2021) studied customer purchase behaviour regarding refurbished smartphones. However, the paper does not provide any insights on the influence of the used digital device on customer behaviour on the Internet. Similarly, approximately 15% of the initial selection of papers were excluded because they focused only on antecedents of device use or factors of acceptance or adoption (e.g. Huang et al., 2019). Approximately 11% were disregarded because they adopted an exclusive management perspective that did not center on customer behaviour, but instead concentrated solely on management implications (e.g. Dubé et al., 2017). Other reasons for exclusion included a lack of distinction between digital devices or an undifferentiated discussion of the Internet as one online channel (e.g. Sajeesh et al., 2021), the mere focus on specific device users as a sample for analyses, but not statements regarding device-related behaviours (e.g. Hou & Elliott, 2021), or completely off-topic content (e.g. similar words such as "phonetic" in title or abstracts; e.g. Davis et al., 2016). In addition, other literature reviews and conceptual analyses found in the literature search were removed and compared to the present review (e.g. Krishen et al., 2021).

[2] The numbers are based on Scopus' CiteScore 2021. Only the journal *Psychology and Marketing* has a CiteScore below 5 (i.e. 4.9) and the Marketing Science Institute Working Paper Series is not listed on Scopus. Three journals (Internet research, MIS Quarterly Executive, and Manufacturing and Service Operations Management) are not listed in the Business, Management, and Accounting subject area on Scopus.

[3] Besides the obvious differences between devices, technical features such as screen size or software differ for the same device types as well. Smartphone screens, for instance, range from 4 to 7 inches. Thus, customer behaviour may vary not only by device but also within the same device type, as pointed out by several studies (Han, Goh, et al., 2022; McLean et al., 2020). In this SLR, however, we focus on a comparison between devices.

[4] Stationary devices are used more frequently during working times (Park & Lee, 2017), in the evening (Singh & Swait, 2017), and on weekdays (Canova & Nicolini, 2019; Haan et al., 2018). Tablets are utilized relatively more at home and on weekends than on weekdays (Haan et al., 2018; Xu et al., 2017). Smartphones, by contrast, tend to be operated throughout the day and week and in both indoor and outdoor situations (Canova & Nicolini, 2019; Fuentes & Svingstedt, 2017; Holmes et al., 2013; Park & Lee, 2017).

[5] Of course, the assigned role of devices is very subjective and mobile phones are multi-purpose devices with multiple meanings for their users. However, smartphones with their special characteristics are destined to be perceived as personal and fun devices (Fuentes & Svingstedt, 2017; Melumad & Pham, 2020; Shen et al., 2016).

[6] For a comprehensive overview of future research directions regarding the influence of the Covid-19 pandemic on omnichannel retailing, see Salvietti et al. (2022).

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## APPENDIX A

**TABLE A1** Comparison of recent systematic literature reviews in the field of customer behaviour on the Internet and digital devices with the present study

| Author (year) | Title | Focus | Type of review (according to Paul, Lim, et al., 2021) | Sample | Time span | Databases |
|---|---|---|---|---|---|---|
| Cavalinhos et al. (2021) | The use of mobile devices in-store and the effect on shopping experience: A systematic literature review and research agenda | In-store usage of mobile devices | Hybrid review (structured theme-based + framework-based review [TCM]) | 46 articles | 2007–2020 (May) | Scopus, Web of Science |
| Cummins et al. (2014) | Consumer behaviour in the online context | Customer behaviour on the Internet | Structured theme-based review | 942 articles | 1993–2012 | Not specified |
| Dastane et al. (2020) | A synthesis of constructs for modelling consumers' perception of value from mobile-commerce (M-VAL) | Value creation via mobile commerce | Structured theme-based review | 108 articles | 2012–2018 | Scopus |
| Güngör and Çadırcı (2022) | Understanding digital consumer: A review, synthesis and future research agenda | Digital customer behaviour | Bibliometric review | 5505 articles | 2001–2021 (Aug.) | Web of Science |
| Jebarajakirthy et al. (2021) | Mobile advertising: A systematic literature review and future research agenda | Mobile advertising | Framework-based review (TCCM) | 90 articles | 2002–2021 | Emerald, Google Scholar, JSTOR, ProQuest, Sage, Science Direct, Taylor & Francis, Web of Science |
| Krishen et al. (2021) | A broad overview of interactive digital marketing: A bibliometric network analysis | Interactive digital marketing | Bibliometric review | 45,260 articles | 1990–2019 | Scopus |
| Luceri et al. (2022) | What drives consumers to shop on mobile devices? Insights from a Meta-Analysis | Adoption and usage of mobile devices | Meta-analytical review | 207 articles | 2000–2020 (Feb.) | EBSCOhost, Google Scholar, JSTOR, ProQuest, Science Direct, Scopus, Web of Science, other Internet sources |
| Maseeh et al. (2021) | A meta-analytic review of mobile advertising research | Mobile advertising | Meta-analytical review | 51 articles | Not specified | Academia, Emerald Group Publishing, Gale Academic OneFile, JSTOR, ProQuest, Research Gate, Sage Publications, Science Direct, Scopus, Springer, Taylor & Francis, Web of Science |
| Mishra et al. (2021) | Consumer decision-making in omnichannel retailing: Literature review and future research agenda | Omnichannel customer behaviour | Structured theme-based review | 131 articles | 2011–2020 (April) | Web of Science |
| Tong et al. (2020) | Personalized mobile marketing strategies | Mobile marketing | Structured theme-based review | 33 articles | 2002–2019 | EBSCO |
| Singh and Basu (2023) | Online Consumer shopping Behaviour: A Review and Research Agenda | Customer behaviour on the Internet | Framework-based review (TCCM) | 197 articles | 2000–2022 | Scopus, Web of Science |

(Continues)

**TABLE A1** (Continued)

| Author (year) | Title | Focus | Type of review (according to Paul, Lim, et al., 2021) | Sample | Time span | Databases |
|---|---|---|---|---|---|---|
| Vanhala et al. (2020) | The usage of large data sets in online consumer behaviour: A bibliometric and computational text-mining-driven analysis of previous research | Customer behaviour on the Internet | Bibliometric review | 495 articles | 2000–2018 | Web of Science |
| Varnali (2021) | Online behavioural advertising: An integrative review | Online behavioural marketing | Structured theme-based review | 80 articles | 2000–2018 | ABI/INFORM, Communication & Mass Media Complete, EBSCOhost, Emerald, IEEE Xplore, Science Direct, Web of Science |
| Wolf and Steul-Fischer (2022) | Factors of customers' channel choice in an omnichannel environment: a systematic literature review | Omnichannel customer behaviour | Hybrid review (structured theme-based + framework-based review [TCM]) | 128 articles | 2000–2022 (May) | EBSCO, Scopus, Web of Science |
| This paper | Device-mediated customer behaviour on the Internet—a systematic literature review | Device-mediated customer behaviour | Framework-based review (TCM-ADO) | 59 articles | 2012–2022 (Oct.) | Scopus, Web of Science |

**TABLE A2** Final selection of articles on device-mediated behaviour.

| Articles included after assessment for eligibility ($n$ = 53) | | | | |
|---|---|---|---|---|
| **Author (year)** | **Title** | **Journal** | **Devices investigated**[a] | **Stage of customer journey** |
| Banerjee et al. (2021) | How does location based marketing affect mobile retail revenues? The complex interplay of delivery tactic, interface mobility and user privacy | Journal of Business Research | Smartphone, tablet | Pre-purchase and purchase |
| Bhatnagar and Papatla (2019) | Do habits influence the types of information that smartphone shoppers seek? | Journal of Business Research | Electronic readers, game consoles, MP3 players, smartphone, tablet | Pre-purchase |
| Boden et al. (2020) | The effect of credit card versus mobile payment on convenience and consumers' willingness to pay | Journal of Retailing and Consumer Services | Mobile | Purchase |
| Brasel and Gips (2014) | Tablets, touchscreens and touchpads: How varying touch interfaces trigger psychological ownership and endowment | Journal of Consumer Psychology | Desktop, mobile | Purchase |
| Canova and Nicolini (2019) | Online price search across desktop and mobile devices: Evidence on cyberslacking and weather effects | Journal of Retailing and Consumer Services | Desktop, mobile | Pre-purchase |
| Flavián et al. (2019) | Integrating virtual reality devices into the body: effects of technological embodiment on customer engagement and behavioural intentions toward the destination | Journal of Travel and Tourism Marketing | Desktop, mobile, VR device | Pre-purchase |
| Fuentes and Svingstedt (2017) | Mobile shopping and the practice of shopping: A study of how young adults use smartphones to shop | Journal of Retailing and Consumer Services | Smartphone | All |
| Ghosh et al. (2021) | Examining the Deferred Effects of Gaming Platform and Game Speed of Advergames on Memory, Attitude and Purchase Intention | Journal of Interactive Marketing | Desktop, mobile | Pre-purchase |
| Goldstein and Hajaj (2022) | The hidden conversion funnel of mobile vs. desktop consumers | Electronic Commerce Research and Applications | Desktop, mobile | Pre-purchase and purchase |
| Haan et al. (2018) | Device Switching in Online Purchasing: Examining the Strategic Contingencies | Journal of Marketing | Desktop, smartphone, tablet | Pre-purchase and purchase |
| Hadi and Valenzuela (2020) | Good Vibrations: Consumer Responses to Technology-Mediated Haptic Feedback | Journal of Consumer Research | Smartphone, wearables | Not specified |
| S. Han, Han, et al. (2022) | Mapping consumer's cross-device usage for online search: Mobile- vs. PC-based search in the purchase decision process | Journal of Business Research | Desktop, mobile | Pre-purchase and purchase |
| Herhausen et al. (2019) | Loyalty Formation for Different Customer Journey Segments | Journal of Retailing | Desktop, mobile | Pre-purchase and purchase |
| Holmes et al. (2013) | Mobile shopping behaviour: insights into attitudes, shopping process involvement and location | International Journal of Retail and Distribution Management | Desktop, smartphone, tablet | Pre-purchase and purchase |
| Hovy et al. (2021) | Wordify: ATool for Discovering and Differentiating Consumer Vocabularies | Journal of Consumer Research | Desktop, smartphone | Post-purchase |
| Jain and Tan (2022) | M-Commerce, Sales Concentration and Inventory Management | Manufacturing and Service Operations Management | Desktop, mobile | Purchase |
| Joa et al. (2018) | What Makes People Watch Online In-Stream Video Advertisements? | Journal of Interactive Advertising | Desktop, game console, smartphone, smart TV, tablet | Pre-purchase |

(Continues)

**TABLE A2** (Continued)

| Articles included after assessment for eligibility (*n* = 53) | | | | |
|---|---|---|---|---|
| **Author (year)** | **Title** | **Journal** | **Devices investigated**[a] | **Stage of customer journey** |
| Kaatz et al. (2019) | Are you still online or are you already mobile?—Predicting the path to successful conversions across different devices | Journal of Retailing and Consumer Services | Desktop, smartphone, tablet | Pre-purchase and purchase |
| Kaatz (2020) | Retail in my pocket– replicating and extending the construct of service quality into the mobile commerce context | Journal of Retailing and Consumer Services | Desktop, mobile | Purchase |
| Kim et al. (2020) | Differences in Mobile and Nonmobile Reviews: The Role of Perceived Costs in Review-Posting | International Journal of Electronic Commerce | Desktop, mobile | Post-purchase |
| Kim et al. (2021) | The influence of launching mobile channels on online customer reviews | Journal of Business Research | Desktop, mobile | Post-purchase |
| Kim et al. (2022) | How mobile users respond to pre-roll skippable advertising differently than personal computer (PC) users: an analysis of individual-level clickstream data | International Journal of Advertising | Desktop, mobile | Pre-purchase |
| Kukar-Kinney et al. (2022) | A model of online shopping cart abandonment: evidence from e-tail clickstream data | Journal of the Academy of Marketing Science | Desktop, smartphone | Pre-purchase and purchase |
| Li et al. (2021) | The role of marketing channels in consumers' promotional point redemption decisions | Journal of Business Research | Desktop, mobile | Post-purchase |
| Liu and Dewitte (2021) | A replication study of the credit card effect on spending behaviour and an extension to mobile payments | Journal of Retailing and Consumer Services | Mobile | Purchase |
| Luo et al. (2022) | Effects of visit behaviour on online store sales performance: personal computer (PC) versus mobile channels | Internet Research | Desktop, mobile | Pre-purchase and purchase |
| Maslowska et al. (2021) | Attention to Social Media Ads: The Role of Consumer Recommendations and Smartphones | Journal of Interactive Advertising | Desktop, smartphone | Pre-purchase |
| McLean et al. (2018) | Developing a Mobile Applications Customer Experience Model (MACE)-Implications for Retailers | Journal of Business Research | Mobile | Not specified |
| McLean et al. (2020) | Examining consumer attitudes toward retailers' m-commerce mobile applications—An initial adoption vs. continuous use perspective | Journal of Business Research | Smartphone | Pre-purchase and purchase |
| Meißner et al. (2020) | How virtual reality affects consumer choice | Journal of Business Research | Desktop, smart glasses | Purchase |
| Melumad et al. (2019) | Selectively Emotional: How Smartphone Use Changes User-Generated Content | Journal of Marketing Research | Desktop, smartphone | Post-purchase |
| Melumad and Meyer (2020) | Full Disclosure: How Smartphones Enhance Consumer Self-Disclosure | Journal of Marketing | Desktop, smartphone | Post-purchase |
| Melumad and Pham (2020) | The Smartphone as a Pacifying Technology | Journal of Consumer Research | Desktop, smartphone | Not specified |
| Nakano and Kondo (2018) | Customer segmentation with purchase channels and media touchpoints using single source panel data | Journal of Retailing and Consumer Services | Desktop, mobile | Pre-purchase and purchase |

**TABLE A2** (Continued)

| Articles included after assessment for eligibility ($n$ = 53) | | | | |
|---|---|---|---|---|
| **Author (year)** | **Title** | **Journal** | **Devices investigated**[a] | **Stage of customer journey** |
| Okazaki and Mendez (2013) | Perceived Ubiquity in Mobile Services | Journal of Interactive Marketing | Smartphone | Not specified |
| Orimoloye et al. (2022) | Differential Effects of Device Modalities and Exposure to Online Reviews on Online Purchasing: A Field Study | Journal of Advertising | Desktop, smartphone, tablet | Pre-purchase and purchase |
| Pagani et al. (2019) | Adding Voice to the Omnichannel and How that Affects Brand Trust | Journal of Interactive Marketing | Mobile | Not specified |
| Park et al. (2022) | The effect of mobile device usage on creating text reviews | Asia Pacific Journal of Marketing and Logistics | Desktop, mobile | Post-purchase |
| Piccoli (2016) | Triggered essential reviewing: the effect of technology affordances on service experience evaluations | European Journal of Information Systems | Desktop, mobile | Post-purchase |
| Qin, Osatuyi, and Xu (2021) | How mobile augmented reality applications affect continuous use and purchase intentions: A cognition-affect-conation perspective | Journal of Retailing and Consumer Services | Mobile | Purchase |
| Ransbotham et al. (2019) | Creation and Consumption of Mobile Word of Mouth: How Are Mobile Reviews Different? | Marketing Science | Desktop, mobile | Pre-purchase, post-purchase |
| Raphaeli et al. (2017) | Analysing Online Consumer Behaviour in Mobile and PC Devices: A Novel Web Usage Mining Approach | Electronic Commerce Research and Applications | Desktop, mobile | Pre-purchase and purchase |
| Shen et al. (2016) | Computer Interfaces and the "Direct-Touch" Effect: Can iPads Increase the Choice of Hedonic Food? | Journal of Marketing Research | Desktop, tablet | Not specified |
| Singh and Swait (2017) | Channels for search and purchase: Does mobile Internet matter? | Journal of Retailing and Consumer Services | Desktop, mobile | Pre-purchase and purchase |
| Sreejesh et al. (2021) | Moving beyond the content: The role of contextual cues in the effectiveness of gamification of advertising | Journal of Business Research | Desktop, smartphone | Pre-purchase |
| Stewart et al. (2019) | Examining digital video advertising (DVA) effectiveness: The role of product category, product involvement and device | European Journal of Marketing | Desktop, mobile | Pre-purchase |
| Tseng and Wei (2020) | The efficiency of mobile media richness across different stages of online consumer behaviour | International Journal of Information Management | Mobile | All |
| Wagner et al. (2020) | Online retailing across e-channels and e-channel touchpoints: Empirical studies of consumer behaviour in the multichannel e-commerce environment | Journal of Business Research | Desktop, mobile, smart TV, others | Not specified |
| Wang et al. (2015) | On the Go: How Mobile Shopping Affects Customer Purchase Behaviour | Journal of Retailing | Desktop, mobile | Purchase |
| Xu et al. (2017) | Battle of the Channels: The Impact of Tablets on Digital Commerce | Management Science | Desktop, smartphone, tablet | Pre-purchase and purchase |
| Zhang et al. (2021) | Information Search and Product Returns Across Mobile and Traditional Online Channels | Journal of Retailing | Desktop/tablet, smartphone | All |

(Continues)

**TABLE A2** (Continued)

| Articles included after assessment for eligibility ($n$ = 53) | | | | | |
|---|---|---|---|---|---|
| **Author (year)** | **Title** | | **Journal** | **Devices investigated**[a] | **Stage of customer journey** |
| Zhu and Meyer (2017) | Getting in touch with your thinking style: How touchscreens influence purchase | | Journal of Retailing and Consumer Services | Desktop, mobile | Purchase |
| Zhu et al. (2020) | Understanding the influence of submission devices on online consumer reviews: A comparison between smartphones and PCs | | Journal of Retailing and Consumer Services | Desktop, smartphone | Post-purchase |
| *Articles included by cross-referencing*[b] ($n$ = 6) | | | | | |
| **Author (Year)** | **Title** | **Journal** | **Cited by** | **Devices investigated**[a] | **Stage of customer journey** |
| Ghose et al. (2013) | How Is the Mobile Internet Different? Search Costs and Local Activities | Information Systems Research | Canova and Nicolini (2019), Goldstein and Hajaj (2022), Han, Han, et al. (2022), Kaatz (2020), Kim et al. (2022), Luo et al. (2022), McLean et al. (2020), Melumad et al. (2019), Orimoloye et al. (2022), Park et al. (2022), Ransbotham et al. (2019), Raphaeli et al. (2017), Singh and Swait (2017), Wang et al. (2015), Zhu et al. (2020) | Desktop, smartphone | Pre-purchase |
| Lee et al. (2020) | Different but Equal? A Field Experiment on the Impact of Recommendation Systems on Mobile and Personal Computer Channels in Retail | Information Systems Research | Goldstein and Hajaj (2022) | Desktop, mobile | Pre-purchase and purchase |
| Lurie et al. (2014) | The Characteristics and Perceived Value of Mobile WOM | Marketing Science Institute Working Paper Series | Zhu et al. (2020) | Desktop, mobile | Post-purchase |
| Mariani et al. (2019) | Online reviews: Differences by submission device | Tourism Management | Kim et al. (2021), Zhu et al. (2020) | Desktop, mobile | Post-purchase |
| März et al. (2017) | "Why Would I Read a Mobile Review?" Device Compatibility Perceptions and Effects on Perceived Helpfulness | Psychology And Marketing | Orimoloye et al. (2022), Park et al. (2022), Ransbotham et al. (2019), Zhu et al. (2020) | Desktop, mobile | Post-purchase |
| Piccoli and Ott (2014) | Impact of Mobility and Timing on User-Generated Content | MIS Quarterly Executive | Zhu et al. (2020) | Desktop, mobile | Post-purchase |
| *Articles excluded after assessment for eligibility* ($n$ = 16) | | | | | |
| **Author (year)** | **Title** | | **Journal** | **Reason for exclusion** | |
| Bartikowski et al. (2018) | The type-of-internet-access digital divide and the well-being of ethnic minority and majority consumers: A multi-country investigation | | Journal of Business Research | No customer behaviour on the Internet investigated | |

**TABLE A2** (Continued)

| Articles included after assessment for eligibility ($n$ = 53) | | | | |
|---|---|---|---|---|
| **Author (year)** | **Title** | **Journal** | **Devices investigated**[a] | **Stage of customer journey** |
| Dorie and Loranger (2020) | The multi-generation: Generational differences in channel activity | International Journal of Retail and Distribution Management | Mere focus on technology acceptance or device choice | |
| Grewal et al. (2018) | In-Store Mobile Phone Use and Customer Shopping Behaviour: Evidence from the Field | Journal of Marketing | No customer behaviour on the Internet investigated | |
| Grewal and Stephen (2019) | In Mobile We Trust: The Effects of Mobile Versus Nonmobile Reviews on Consumer Purchase Intentions | Journal of Marketing Research | No customer behaviour on the Internet investigated | |
| Mulier et al. (2021) | This Way Up: The Effectiveness of Mobile Vertical Video Marketing | Journal of Interactive Marketing | Mere focus on specific touchpoint (mobile ad) | |
| Nel and Boshoff (2020) | Status quo bias and shoppers' mobile website purchasing resistance | European Journal of Marketing | Mere focus on technology acceptance or device choice | |
| Newman et al. (2018) | Bricks or clicks? Understanding consumer usage of retail mobile apps | Journal of Services Marketing | Mere focus on specific touchpoint (mobile app) | |
| Ng et al. (2022) | Fashion shopping on the go: A Dual-stage predictive-analytics SEM-ANN analysis on usage behaviour, experience response and cross-category usage | Journal of Retailing and Consumer Services | Mere focus on technology acceptance or device choice | |
| Qin, Peak, and Prybutok (2021) | A virtual market in your pocket: How does mobile augmented reality (MAR) influence consumer decision making? | Journal of Retailing and Consumer Services | Mere focus on technology acceptance or device choice | |
| Schniederjans et al. (2018) | Impression management for corporate brands over mobile media | Journal of Product and Brand Management | Mere focus on specific touchpoint (mobile media platform) | |
| Singh and Jang (2022) | Search, purchase and satisfaction in a multiple-channel environment: How have mobile devices changed consumer behaviours? | Journal of Retailing and Consumer Services | Mere focus on technology acceptance or device choice | |
| Sohn (2017) | Consumer processing of mobile online stores: Sources and effects of processing fluency | Journal of Retailing and Consumer Services | No customer behaviour on the Internet investigated | |
| Sohn and Groß (2020) | Understanding the inhibitors to consumer mobile purchasing intentions | Journal of Retailing and Consumer Services | Mere focus on technology acceptance or device choice | |
| Sohn et al. (2022) | The sources of the many faces of consumer smartphone attachment: A value-in-use perspective | International Journal of Consumer Studies | No customer behaviour on the Internet investigated | |
| Xu et al. (2014) | News Media Channels: Complements or Substitutes? Evidence from Mobile Phone Usage | Journal of Marketing | Mere focus on specific touchpoint (mobile app) | |
| Yang et al. (2022) | Fostering consumer engagement with marketer-generated content: the role of content-generating devices and content features | Internet Research | No customer behaviour on the Internet investigated | |

[a]Devices are counted as "mobile" if no further distinction was made between tablets and smartphones (e.g. Kaatz, 2020) and as "smartphone" and/or "tablet" if these devices were explicitly or separately investigated (e.g. Kaatz et al., 2019).
[b]Backward search within articles included after assessment for eligibility ($n$ = 53).

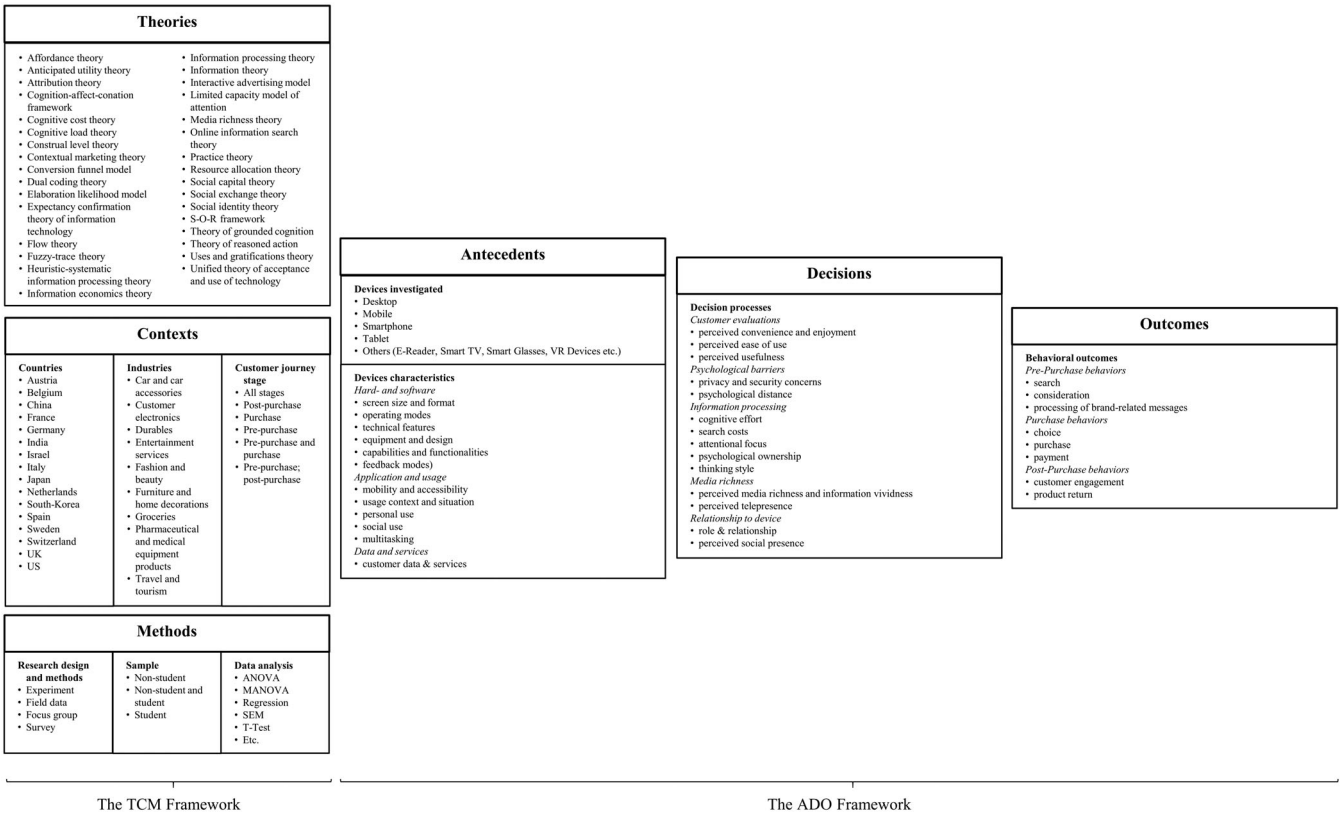


**FIGURE A1** State-of-the-art overview of the antecedents, decisions, and outcomes of device-mediated customer behavior on the Internet and its supporting theories, contexts, and methods (based on Lim et al., 2021)