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Making omnichannel an augmented reality: the current and future state of the art

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Making omnichannel an augmented reality: the current and future state of the art

Abstract

Purpose—This paper explores the current and future role of Augmented Reality (AR) as an enabler of omnichannel experiences across the customer journey. To advance the conceptual understanding and managerial exploitation of AR, the paper synthesises current research, illustrating how a variety of current applications merge online and offline experiences, and provides a future research agenda to help advance the state of the art in AR.

Design/methodology/approach—Drawing on situated cognition theorising as a guiding framework, the paper reviews previously published research and currently deployed applications to provide a roadmap for future research efforts on AR-enabled omnichannel experiences across the customer journey.

Findings—AR offers myriad opportunities to provide customers with a seamless omnichannel journey, smoothing current obstacles, through a unique combination of i) embedded, ii) embodied, and iii) extended customer experiences. These three principles constitute the overarching value drivers of AR and offer coherent, theory-driven organising principles for managers and researchers alike.

Originality/value—Current research has yet to provide a relevant, conceptually robust understanding of AR-enabled customer experiences. In light of the rapid development and widespread deployment of the technology, this paper provides an urgently needed framework for guiding the development of AR in an omnichannel context.

Keywords—Augmented reality, omnichannel management, digital customer experience, customer journey, situated cognition

Paper type—Conceptual paper

Firms are increasingly challenged to provide compelling customer experiences across online and offline touch points (Lemon and Verhoef, 2016). As customers no longer complete their journey exclusively in one channel (Wolny and Charoensuksai, 2014), they expect firms to integrate online and offline experiences into a seamless omnichannel experience (Cummins *et al.*, 2016). However, despite firms' channel integration efforts, recent market reports show that 54% of UK customers are disappointed with their most recent experiences (Temkin Group, 2017). For instance, many customers find it difficult to envision how online offerings physically fit their personal environments, leading to dissatisfaction when they discover that a sofa that looked good online does not fit the actual décor of their homes. In a similar vein, many customers miss the online world's abundance of digital product information, customisability, and social media connectivity in their physical store experiences. Further, a persistent managerial challenge is to counteract customers' showrooming or webrooming behaviours and thus prevent churn when customers switch between channels (Accenture, 2014).

To address these challenges, a growing number of firms (including L'Oreal, IKEA, Akzo Nobel, and Nike) leverage Augmented Reality (AR) applications to enable omnichannel experiences (Brynjolfsson *et al.*, 2013). Uniquely, AR embeds digital content (such as product information, images, and animations) into the customer's physical environment, interactively and in real time (Azuma *et al.*, 2001). For instance, L'Oreal's AR-based virtual mirror allows customers to virtually try on makeup, thus integrating the 'fit and feel' sensory richness of trying on a physical product into customers' online experience. In similar fashion, Nike's in-store customiser lets customers virtually design a pair of sneakers, thus bringing the

1
2
3 customisability and social connectivity inherent to the online channel into customers' offline
4
5 experience. According to Apple CEO Tim Cook, AR is "changing the whole experience of
6
7 how [customers] shop" (Bloomberg, 2017), leading Apple to refer to AR as a core technology
8
9 and pursue an AR-driven acquisition strategy. The promise of AR is a uniquely persuasive set
10
11 of 'smart' technologies (Marinova *et al.*, 2017) set to seamlessly merge online and offline
12
13 customer experiences through an intuitive, context-sensitive, and socially connected interface.
14

15
16 However, despite these developments, it seems that customers remain underwhelmed
17
18 by current AR experiences. A recent survey by DigitalBridge (2017) reveals that although
19
20 customers indicate they would be more likely to purchase when firms offer AR applications,
21
22 more than half (51%) believe that firms are currently failing to take full advantage of the
23
24 technology. A main reason for such disappointing performance may lie in the fact that firms
25
26 are not yet able to successfully integrate digital online and offline customer experiences
27
28 (Accenture, 2016). According to Gartner (2017), inflated expectations have lead initial AR
29
30 platforms to fail (e.g., Google Glass) and the technology is only expected to deliver value if
31
32 firms are able to prioritise actual customer needs, such as more efficient and enjoyable
33
34 shopping experiences that reduce decision making uncertainty (Dacko, 2016).
35
36

37
38 Existing research into AR offers little guidance to managers on how to successfully
39
40 deploy AR as an enabler of omnichannel experiences across the customer journey. Prior
41
42 studies suggest AR's potential to deliver compelling customer experiences (e.g., Poushneh
43
44 and Vasquez-Parraga, 2017). However in doing so, the literature has predominantly focused
45
46 on technology acceptance modelling (e.g., Rese *et al.*, 2014), or the investigation of AR
47
48 media characteristics (e.g., Javornik, 2016a). Identification of AR's overarching value drivers
49
50 in the context of customer experience, and how these ultimately benefit customers' decision
51
52 making, has been neglected to date. A coherent, theory-based research agenda that accounts
53
54 for how AR can address current obstacles and uniquely integrate online and offline
55
56 experiences would enable managers to deliver integrated, real-time, and contextual customer
57
58
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60

1
2
3 experiences. That is, fulfil the right customer need at the right moment in the customer
4
5 journey (Marketing Science Institute, 2016).

6
7 To guide both the conceptual and managerial development of AR-enabled
8
9 omnichannel experiences, we draw on contemporary theorising of situated cognition (Robbins
10
11 and Aydede, 2009; Semin and Smith, 2013). Situated cognition implies that customer
12
13 experiences seem most realistic when they integrate information about products and services
14
15 in real-time within the immediate decision context (i.e., are embedded), allow for physical
16
17 interaction with a product or service (i.e., are embodied), and provide opportunities for
18
19 communication with other customers (i.e., are extended). We posit that AR is unique because
20
21 it satisfies all three criteria. AR's integration of interactive, real-time virtual content into the
22
23 customers' view of physical environment enables *embedded*, *embodied*, and *extended*
24
25 customer experiences. This combination allows linking of customer experience across
26
27 channels where behaviours traditionally reserved for offline business can be expressed into
28
29 the online world, and vice versa. The three principles of embedding, embodiment, and
30
31 extension provide a much needed and strong conceptual foundation for future research efforts
32
33 on AR. In turn, this foundation will benefit management through engendering development of
34
35 AR as a novel form of digital customer experience that facilitates omnichannel behaviour
36
37 throughout the customer's journey.

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39
40
41 Following a brief introduction to situated cognition theory and a discussion of its
42
43 suitability for guiding the research agenda, we take stock of current AR literature and identify
44
45 key research themes and gaps. To paint a more vivid picture of AR-enabled omnichannel
46
47 experiences, we then illustrate how a variety of currently deployed AR applications enhance
48
49 key steps in the customer journey. We conclude by providing a range of relevant,
50
51 conceptually robust research directions to inform future inquiry into AR.
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Grounding AR in situated cognition theory

The seamless integration of the online and offline worlds lies at the heart of omnichannel experience (Brynjolfsson et al., 2013). A marketing imperative is thus to provide customers with an authentic omnichannel experience. For customers, a sense of authenticity and realism arises when they can naturally interact with—and make purchase decisions about— firms' products and services. Yet achieving this in both online and offline settings is a key challenge for managers. Emerging theories of situated cognition (Robbins and Aydede, 2009; Semin and Smith, 2013) help explain how people naturally engage in information processing, preference formation, and decision-making. Increasingly, situated cognition has been applied to explain customer experience and behaviour (e.g. Krishna and Schwarz, 2014). In particular, situated cognition suggests that customer experiences are most realistic and compelling when they are:

Embedded—Customers often find it difficult to imagine how firms' products and services fit them personally or fit with their environment. Customers therefore use their immediate surroundings as a real-life 'drawing board', which they can alter in ways that facilitate the evaluation of products or services (Wilson 2002). For instance, some customers may lay out placeholders in their home to assess the placement of furniture vis-à-vis the current décor; others will mix and match pieces of clothing in a department store to find the best look.

Embodied—Customers draw on their own physical experiences and actions to learn more about products and services. Research has shown that physical interaction such as touching, rotating, or moving around a product, but also the simulation of physical interaction, via touchscreens or 360-degree product rotations for example, may evoke affective reactions and improve customers' ability to evaluate an offering (Brasel and Gips, 2014; Grohmann et al., 2007; Rosa and Malter, 2003). To illustrate, customers will often physically move furniture, or sit in different positions on a new couch,

1
2 before they decide where to position it. Similarly, an online 360-degree product view
3
4 may simulate physical interaction with a piece of clothing. Rotating it provides an
5
6 experience of not just how the product looks, but may even suggest how it feels to
7
8 wear the look.
9

10
11 *Extended*—Customers rely on others to support them in product or service evaluation.
12
13 Because people have a natural tendency to share their experiences with peers
14
15 (Echterhoff *et al.*, 2009), customers commonly consult peer reviews, go shopping
16
17 together, and increasingly share their shopping in real-time through highly visual
18
19 social media such as Snapchat. Asking family and friends to rearrange placeholders
20
21 around a home provides customers with new perspectives, and getting others to
22
23 comment on a mix of clothing may change how customers see themselves in those
24
25 clothes.
26
27

28
29 In contrast to other emerging technologies, which immerse customers into a fully
30
31 synthetic environment (e.g., virtual reality), AR supplements reality rather than replaces it. As
32
33 such, it is the perfect lynchpin between the online and offline world and provides a natural
34
35 application for a situated cognition perspective. AR contextualises products and services by
36
37 embedding digital content into the customer's physical environment, interactively and in real-
38
39 time (Azuma *et al.*, 2001); and increasingly allows customers to share their enhanced view of
40
41 reality with others (Scholz and Smith, 2016). We contend that AR blurs the boundaries
42
43 between online and offline channels by providing a unique combination of embedded,
44
45 embodied, and extended experiences.
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48
49 In online settings, a multitude of virtual try-on or try-out tools have emerged to
50
51 provide customers with vivid contextual information (e.g., L'Oreal's makeup or Mr. Spex'
52
53 new pair of sunglasses on one's face) that has traditionally been reserved for offline
54
55 experiences (Yim *et al.*, 2017). In contrast for offline settings, AR provides customers with
56
57 customised and interactive information (e.g., Siemens' product use animations, or Nike's
58
59
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1
2
3 product customisation options) previously absent from the physical point-of-sale (Olsson *et*
4 *al.*, 2013). By virtually tagging online product ratings on the physical product packaging, apps
5 like the ‘Vivino’ wine scanner also empower customers with immediate access to social
6 communication. The value proposition of AR is thus to enhance the customer experience by
7 merging the touch-and-feel of the physical world with highly vivid, customised, and
8 connected digital content. This naturally blends online and offline experiences to overcome
9 limitations of any individual distribution channel. Initial evidence on the performance of
10 deployed AR applications is promising. For example, the online marketplace Apollo Box has
11 experienced a 25% increase in conversion rates and greater customer engagement with their
12 offerings (Techcrunch, 2017); the French eyewear retailer Direct Optic reports 41% higher
13 conversion rates and 12.5% larger basket sizes for customers using their AR try-on tool (Total
14 Immersion, 2012). For managers, AR thus addresses the concerns of showrooming and
15 webrooming, and maintains customers as they switch between channels during their journey.

31 **Explicating AR-enabled omnichannel experiences**

32
33
34 To comprehensively describe AR’s omnichannel potential, we review selected
35 relevant literature and consider how AR links offline with online, and online with offline
36 experiences. In Figure 1, we summarise the specific conceptualizations and measurements of
37 AR’s unique features in current research according to the situated cognition principles of
38 embedding, embodiment, and extension. Furthermore, we provide an overview of their effects
39 on customer experience-relevant downstream consequences and identify a number of
40 contingency factors. This research synthesis reveals several common themes, but also
41 research gaps, which we discuss in greater detail in the following sections.
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52 INSERT FIGURE 1 ABOUT HERE
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Integrating offline experiences into the online experience

AR offers myriad opportunities to enable omnichannel experiences by integrating elements into the online environment that traditionally have been reserved for in-store experiences. An acknowledged obstacle for customers starting their journey online is the absence of direct product trial, which in turn may lead to virtual shopping cart abandonment, product returns, and webrooming behaviour. Many AR applications are thus aimed at empowering customers to try on (e.g., Ray-Ban sunglasses, Gap clothing, or L'Oreal makeup in a virtual mirror) or try out products (e.g., an IKEA sofa in a real-time view of one's living room), as they would in a physical offline experience.

In line with our conceptual perspective, these AR applications create an authentic omnichannel experience across the customer's journey. Because they provide customers with an *embedded* offering virtually present in a personally relevant environment, AR applications close the gap between online and offline shopping. Combined with a sense of *embodiment* resulting from a natural interactivity and simulation of physical control over virtual offerings, which often goes beyond what is possible in physical environments, AR-enabled experiences may not only surpass traditional online shopping but also offer many advantages over offline experiences. For instance, the largest European online retailer for eyewear, Mister Spex, provides its customers with a wholly new experience in the online pre-purchase stage; with the help of an AR virtual mirror, customers can virtually try on any pair of sunglasses from their vast online assortment and assess the resulting look from all sides through natural head movements.

Early research explicated AR effects in terms of generic media characteristics (see also Figure 1). Authors noted providing customers with interactivity and a more vivid, richer, or highly personalised presentation format as key characteristics of AR (Javornik, 2016b; Parise *et al.*, 2016; Poushneh and Vasquez-Parraga, 2017; Yim *et al.*, 2017). This approach, however, has difficulty explaining the value creation within AR-enabled experiences in online

1
2
3 contexts where interactivity and enhanced presentation formats are common. In response, a
4
5 recent work by Hilken *et al.* (2017) investigated the utilitarian and hedonic value of AR by
6
7 suggesting a fit with the situated mode of cognition, which customers preferentially employ in
8
9 everyday shopping situations. From this perspective, the value of AR-enabled experiences is
10
11 explained by the conjunction of environmental embedding and sense of embodiment.
12
13 Focusing on these conceptual dimensions highlights AR's uniqueness in the online channel—
14
15 that is, providing customers with the means for direct examination of offerings within a
16
17 personally relevant context.
18

19
20 Because customer-to-customer connectivity is increasingly important in delivering
21
22 omnichannel customer experiences (Verhoef *et al.*, 2017), the early absence of AR social
23
24 features has been a limiting factor in the technology's proliferation (Javornik, 2016a).
25
26 However, recent applications have begun to address this limitation by enabling *extended* AR
27
28 experiences. Akzo Nobel's 'Visualiser' application is one example of this. Customers using
29
30 this application can virtually redesign the wall colour in their home, and they can then share
31
32 an image or video with peers. By inviting peers to directly modify the shared images or
33
34 videos with their colour recommendations, a shared model of AR is co-created through
35
36 iterative feedback between customers. This highly visual, context-sensitive form of
37
38 communication enables peer customers, who in current online interactions are oftentimes
39
40 limited to 'liking' or commenting, to become active contributors to a shared customer
41
42 experience (Scholz and Smith, 2016). Research has yet to conceptualise and empirically
43
44 assess the ability of AR to provide such extended customer experiences. However, our strong
45
46 conjecture is that shared visualisation and manipulation of AR objects is critical to its success,
47
48 and likely leads to enhanced perceptions of embedded and embodied experiences that may be
49
50 explained along the theories of socially situated cognition (e.g., Semin and Smith, 2013).
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54 Because current AR applications vary in the extent to which they provide embedding,
55
56 embodiment, and extension, the resulting customer experiences likely vary accordingly. The
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1
2
3 literature shares a common view that a compelling AR experience provides customers with a
4
5 balance of utilitarian and hedonic value, enhanced decision-making, and positive behavioural
6
7 intentions such as purchase and word-of-mouth or intentions (e.g., Hilken *et al.*, 2017;
8
9 Poushneh and Vasquez-Parraga, 2017; Yim *et al.*, 2017). Research has also revealed that
10
11 measures of the realism of the experience constitute the process variables underlying these
12
13 effects (see also Figure 1). Several studies have shown that general sensations of flow and
14
15 immersion in the experience may help to explain the benefits of AR use (Javornik, 2016b;
16
17 Parise *et al.*, 2016; Yim *et al.*, 2017). Most recently Hilken *et al.* (2017) emphasised an AR-
18
19 specific process by which customers gain a feeling of spatial presence of virtual objects; that
20
21 is, when using AR, customers suspend disbelief and become convinced that they are really
22
23 trying on and interacting with an actual pair of sunglasses, a new makeup look, or clothing
24
25 from next season's fashion line. However, there is limited insight into relevant boundary
26
27 conditions of AR omnichannel experiences, such as customer preference for visual or verbal
28
29 information processing, or privacy concerns about using new technology (Hilken *et al.*, 2017;
30
31 Poushneh and Vasquez-Parraga, 2017).
32
33
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36

37 *Integrating online experiences into the offline experience*

38

39
40 In offline settings, AR provides an opportunity for novel in-store experiences and
41
42 increased engagement by providing seamless access to digital content that is traditionally
43
44 available only to online shoppers. A variety of AR applications digitally animate products or
45
46 their packaging (e.g., Lego's product visualiser) and provide contextualised product or service
47
48 information, such as online reviews (e.g., the Yelp 'monocle' overlays online ratings on
49
50 physical restaurant locations). At Walgreens, customers can use the 'Aisle411' application to
51
52 receive digital way-finding support that helps them locate products in the supermarket aisle.
53
54 Similar to the filter functionalities of online shops, recent AR applications also let customers
55
56 visually highlight or de-saturate products in the physical assortment to personalise their
57
58
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1
2
3 choice set. AR thus offers firms a powerful tool to create memorable in-store experiences,
4
5 increase fun and the time spent in-store. It also delivers on digital customer experience
6
7 imperatives for offline retail (Deloitte, 2014): offering better price comparisons, facilitating
8
9 product browsing and assortment navigation, and providing enhanced information about
10
11 product features, variations, and availability. From an omnichannel perspective, augmentation
12
13 of the in-store experience promises to promote store loyalty, whilst counteracting the loss of
14
15 customers to online shops, reduced in-store traffic, and showrooming behaviour.
16
17

18
19 Following the line of argumentation on situated cognition, the focus of augmenting a
20
21 product or service has largely been on the firm's own brand to increase perceived information
22
23 (Park *et al.*, 2008), reduced risk (Alimamy *et al.*, 2017), and a positively perceived shopping
24
25 experience by *embedding* virtual information into the physical environment of the customer
26
27 (Poncin and Mimoun, 2014). Enhancing the product at the point-of-sale with contextual-
28
29 relevant information by displaying a link to the firm's webpage, a product-video, or nutrient
30
31 information on the customer's devices at the point-of-sale (Olsson and Salo, 2011) creates a
32
33 brand-centric approach to AR. Firms often conceive of AR as a way to enhance the brand or a
34
35 service. Hyundai's AR application 'X-ray', for example, provides information about a car's
36
37 engine for easier maintenance and decreased maintenance costs due to lower customer service
38
39 enquiries and changes the consumption experience as we currently know it (Farkhatdinov and
40
41 Ryu, 2009). Similar applications can be found in virtual travel agents, for example by
42
43 National Geographic, in which the augmented reality application displays historical
44
45 information to the customer when the camera of a mobile device is pointed at a specific
46
47 monument or historic place or building (Han *et al.*, 2013). Managers, however, should be
48
49 mindful of AR enhancements not only in how they affect a brand but also the customer's
50
51 perception of the brand in relation to its competitors on the retail floor.
52
53

54
55 *Embodied* digital information in an offline retail setting is another important
56
57 consideration. By uniquely adapting to a customer's location, motion, and self-controlled
58
59

1
2
3 interaction with the product, AR offers enhanced experiences as well as a wealth of
4
5 information about customer behaviour in the store. Enhancements of the service consumption
6
7 experience such as the Digital Binocular Station Canterbury Museum (NZ) in which
8
9 exhibition pieces become virtually alive (Neuhofer *et al.*, 2014) not only make the experience
10
11 fun but also can record how individuals respond and react to these enhancements in real time.
12

13
14 Peer-to-peer communication, while still not being fully modelled by marketing
15
16 literature (Mulhern, 2009) can significantly impact a customer's attitude and purchase
17
18 intention towards a product (Wang *et al.*, 2012) as well as increase customer loyalty (Rapp *et al.*,
19
20 2013). Recent applications, such as the social AR application 'Mirage', enable customers
21
22 to view, react to, create, and co-create augmented content in physical environments by
23
24 attaching virtual information (e.g. text, pictures, emoji, and videos) to physical objects,
25
26 disrupting how customers leave feedback about locations or products and services consumed
27
28 in certain areas. Virtual tags can range from customer rating about a certain retail store to
29
30 opinions or recommendations about a product, or even a virtual representation of the walking-
31
32 path a peer took along a series of monuments. These offline experiences are *extended* by
33
34 socially co-created information that can be accessed on demand. Similar applications in retail
35
36 environments create numerous strategic implications for managers looking to communicate
37
38 with customers at the point of sale. AR will likely also disrupt the dominance of product
39
40 packaging and in-store promotions, which will compete with socially generated content that
41
42 exists on the retail floor, and in relation to specific products and brands.
43
44

45
46 Comparable to the previously mentioned applications of AR in online environments,
47
48 there are multiple situations in which AR enables omnichannel experiences and current
49
50 applications vary in their degree of embedding, embodiment, and extension. As illustrated in
51
52 Figure 1, scholarly research has yet to explore the effects of AR on the offline channel
53
54 experience, as prevailing literature on AR applications in offline environments focuses on
55
56 technology-acceptance, user-evaluations, and affective customer reactions (Dieck *et al.*, 2015;
57
58
59

1
2
3 Olsson *et al.*, 2013; Rese, *et al.*, 2014). Limited research is available to explain which
4
5 attributes AR needs to provide to enhance customer's experiences (Poushneh and Vasquez-
6
7 Parraga, 2017), in which contexts customers are willing to use augmented reality
8
9 (Rauschnabel and Krey, 2017), and how AR enables customer satisfaction and value (Ross
10
11 and Labrecque, 2017).
12

13 14 **Mapping AR-enabled omnichannel experiences across the customer journey**

15
16 The key premise of this paper is that AR provides customers with a seamless
17
18 omnichannel experience by closing the channel gap at various online and offline touch points.
19
20 A customer journey sequences these touch points into steps that customers go through when
21
22 making a purchase. At each step customers have distinct feelings, thoughts, and behaviours
23
24 that jointly produce the customer experience (Wolny and Charoensuksai, 2014). Table 1
25
26 presents the expanded customer journey model by Batra and Keller (2016). In contrast to
27
28 traditional purchase funnel models, this more detailed view of the customer journey accounts
29
30 for the complex and omnichannel paths to purchase that customers increasingly follow. For
31
32 each step in the journey, we illustrate how current AR applications enable an embedded,
33
34 embodied, and/or extended experience, and how this enables firms to integrate offline into
35
36 offline experience, and vice versa.
37
38
39
40

41 -----
42 INSERT TABLE 1 ABOUT HERE
43 -----

44 45 **Setting the research agenda for realising the promise of AR**

46
47 Digital and mobile channels have advanced the necessity of developing omnichannel
48
49 strategies as various customer contact points are used interchangeably. Within this context,
50
51 AR applications hold the promise of playing a prominent role in shaping the customer's
52
53 experience across the customer journey. In order to sustain such a role, research is needed that
54
55 extends the depth of our understanding of AR in the omnichannel context. By formulating a
56
57
58
59
60

1
2
3 future research agenda, we propose a number of directions that may advance scholarly
4
5 knowledge and guide firms in shaping their omnichannel strategies.

6
7 *1. Mapping journey complexity*—To begin with, we feel that more research such as
8
9 that of Wolny and Charoensukai (2014) is needed that takes a number of trajectory
10
11 configurations customers follow in their omnichannel journey into account. By deploying
12
13 longitudinal designs, insights can be developed with regards to the how and when AR
14
15 technology can most optimally be deployed to enhance the customer experience across
16
17 various touch points. The categorisation provided in Table 1 may provide a valuable guiding
18
19 structure for such research efforts.

20
21
22 *2. Unpicking decision complexity*—Current research has largely focused on assessing
23
24 AR's impact in terms of perceived value, satisfaction, and purchase and recommendation
25
26 intentions (see also Figure 1). Future research should incorporate a wider array of variables
27
28 beyond these commonly used evaluative judgments. As customers are using a mix of channels
29
30 for purchase decisions it seems pertinent to gauge the impact of AR on both elements of the
31
32 customer decision making process (e.g., gathering and assimilating information), reflections
33
34 thereof (e.g., decision confidence or comfort), and actual choice behaviour.

35
36
37 *3. Seamless integration of modalities and channels*—Because the embedding of digital
38
39 information into the customer's physical environment is a key feature of AR, there is a need
40
41 for further insights as to which modalities of information (e.g., text, image, or video) and
42
43 combinations thereof work best for enhancing the customer experience across various
44
45 channels.

46
47
48 *4. Equivalence of augmentation across channels*—Perhaps fundamentally, there is a
49
50 need to identify what factors are pivotal to translating specific AR attributes and affordances
51
52 (such as those illustrated in Table 1) into positive customer experience evaluations. Recent
53
54 research on embodied cognition (e.g., Elder and Krishna, 2012) reveals that when customers'
55
56 perceptions between physical control and certain types of products (e.g., a bottle of soda)
57
58

1
2 align, this underscores the expectation of a sense of movement. It remains unclear whether
3 such effects come into play in relation to virtual products and how AR could be configured to
4 simulate congruence between perceived control and virtual depictions of products.
5

6
7 Additionally, as firms are designing AR-based customer experience offerings, research needs
8 to uncover whether suspending disbelief plays a key role in creating added value in the eyes
9 of the customer. Issues related to the suspension of disbelief as a central explanatory
10 mechanism relate to how long does it take for customers to accept virtual depictions as real
11 across multiple channels?, what design parameters are pertinent to eliciting this phenomenon
12 (e.g., processing power, graphics, display or consistency, and richness of narratives)?, and do
13 these vary with the use of different information modalities?
14

15
16 *5. Non-equivalence of customers across channels*—Relatedly, we need additional
17 theorising and empirical assessment of relevant customer traits to account for heterogeneity in
18 AR-based customer evaluations. Figure 1 illustrates the relative paucity of knowledge about
19 such influences. Additional personality characteristics, such as need-for-touch, mental
20 imagery abilities, and product use experience and familiarity may exert an influence on the
21 way customers evaluate their omnichannel journey.
22

23
24 *6. Advanced scope of AR*—Finally, situational contingencies or the context of use,
25 such as the function or purpose of AR in relation to products (e.g., a Shazam-like approach to
26 furniture or clothing) and extending AR-based experiences through social networks (e.g.,
27 allowing the incorporation of fellow customers and joint decision making) will not only
28 determine whether customers find the technology valuable but also acceptable. Also, a
29 relatively underdeveloped direction is whether AR can be effectively used to enrich the
30 delivery experience of intangible and co-produced services (as opposed to physical products).
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33 As firms are strategising to stimulate conversions through online and mobile channels,
34 the use of AR is primarily geared towards creating a more engaging customer's journey
35 across all channels. Addressing the aforementioned issues, among others, through future
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research will be crucial in moving AR technology beyond the hype of Pokémon Go and determine whether AR-based customer experiences will be key in transforming firm's omnichannel strategies.

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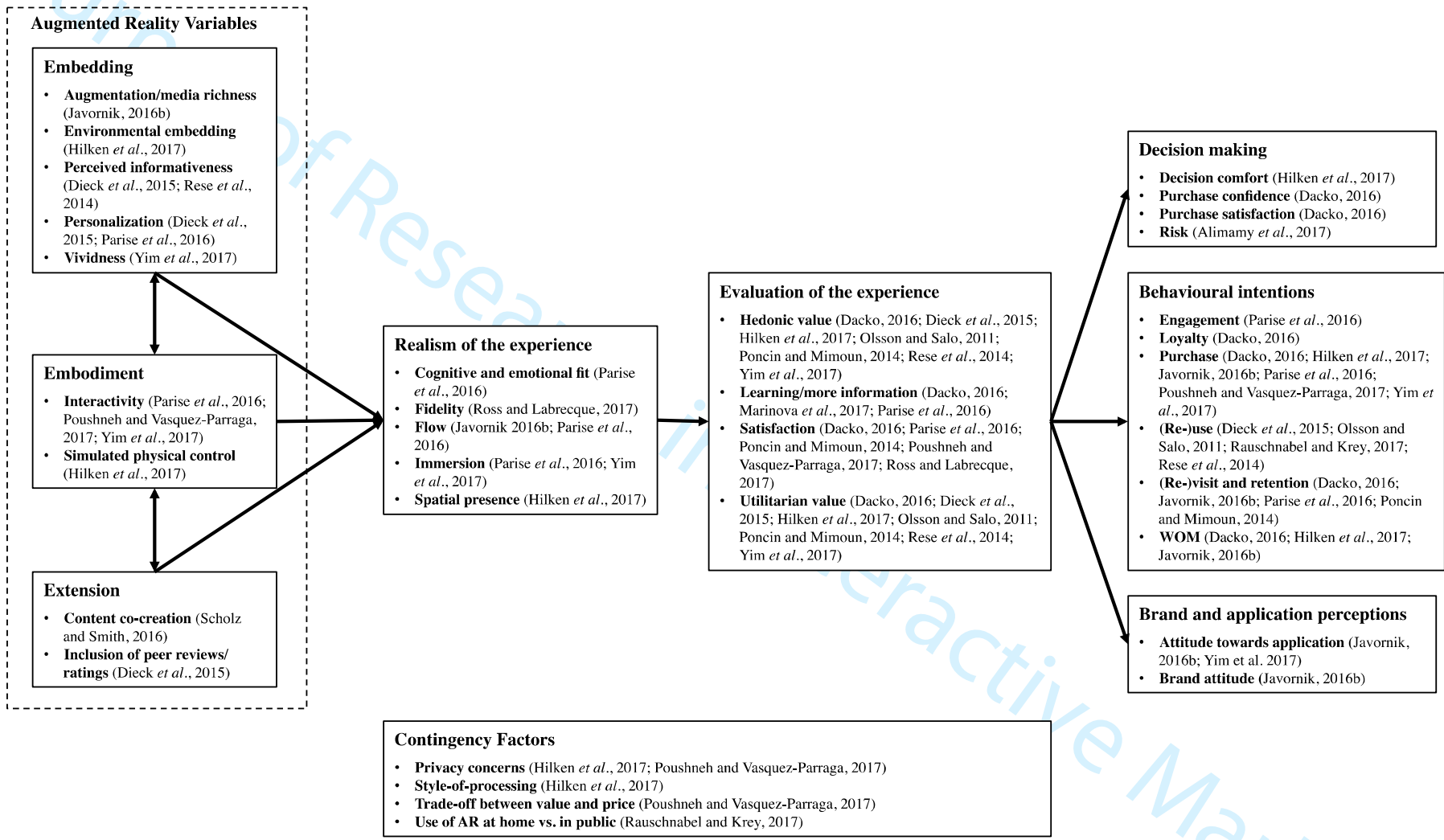
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Note: When the same reference appears next to an AR variable and a downstream variable (related to customer judgment of realism, evaluation of the experience, decision-making, behavioral intentions, and/or brand and application perceptions), then the author(s) investigated the relationship between these variables. For instance, Javornik (2016b) studies the effects of augmentation on flow, and in turn purchase/visit/recommendation intentions, brand attitude, and attitude towards the application.

Fig. 1. Synthesis of current research on AR-enabled customer experiences

Table 1—Overview of AR-enabled omnichannel experiences at different customer journey steps

Customer Journey Step	Practical AR Application	Nature of the AR-enabled experience			Omnichannel Link	
		Embedded	Embodied	Extended	Online → Offline	Offline → Online
 Needs/ Wants	AMC Theatres AR <i>'make movie posters come alive'</i>	Point phone camera at movie posters, get trailers, and ticket sales information			✓	
 Awareness/ Knowledge	The Kapaq AR menu <i>'visualize your restaurant order'</i>	Point phone camera at menu item, get realistic 3D image of a meal in front of you	Rotate and inspect the 3D image of a meal from all sides		✓	
 Considers/ Examines	Sipp AR Wine Club <i>'enhance your wine expertise'</i>	Scan label of a wine bottle to discover occasions and food pairing suggestions			✓	
 Searches/ Learns	Aisle411 and Tango AR shopping at Walgreens <i>'learn about and navigate to product location'</i>	Highlight sales promotion and provide rewards while browsing in a retail environment	Pre-select products online then search and navigate to product locations in the physical store			✓
 Likes/ Trusts	The IKEA AR app <i>'place virtual furniture in your home'</i>	Place 3D images of items from an online catalogue in a customer's room	Move and rotate 3D images of furniture to find the best fit in a room	Save and share photos of "favourite" compositions of own spaces supplemented with virtual furniture pieces		✓
 Sees Value/ Is Willing to Pay	The L'Oreal Make-up Genius <i>'virtual mirror for makeup—try, share, buy'</i>	Scan a physical product or select from online catalogue; view how make-up looks on your face	Move the head to inspect the look from different angles; ability to immediately buy the look you are 'wearing'	Save the look and share it with friends via seamless link to social media	✓	✓

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	Commits/ Plans	The Hyundai Virtual Guide <i>'select features of your new car'</i>	See how features described online change the look of a car's interior or exterior		Schedule test drive in a car with the chosen features, at a dealership	✓
	Consumes	Augmented GeoTravel <i>'learn about the places you are visiting'</i>	Scan city landmarks to get historical facts, accommodation tips, and reviews shared by other customers		Access reviews and suggestions of other customers at the point of consumption	✓
	Is Satisfied	The WallaMe App <i>'share messages and ratings of the real world using AR'</i>	Point a phone at an object and leave or view an AR text, picture, or video		Messages viewed by others who rate it includes "like" button allows others to assessing the created visuals	✓
	Is Loyal/ Repeat Buyer	Dulux Visualiser app <i>'colour your rooms'</i>	Scan physical room as picture or video and change look; return to earlier saved preferences	Move the point of view through a redesigned room	Share and co-create a design with friends for shared decision making	✓
	Is Engaged/ Interacts	Pokemon Go <i>'find and catch virtual creatures'</i>	Find AR creatures by pointing phone at physical landmarks and locations		Team play and gamification enhance engagement	✓
	Actively Advocates	Mr Spex app <i>'try glasses and share'</i>	Try on glasses in a virtual mirror	Move head to view glasses from various sides	Share an augmented picture with your friends on social media to obtain likes or comments	✓