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EXTENDING BOUNDARIES

The Impact of the Digital World on Consumers and Marketing

EDITORS
Marcin Awdziej ▪ Jolanta Tkaczyk

KOZMINSKI UNIVERSITY

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– Blake Crouch

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– John Russell, President of Harley Davidson

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"Technology is nothing. What's important is that you have a faith in people, that they're basically good and smart, and if you give them tools, they'll do wonderful things with them."

– Steve Jobs

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Extending Boundaries: The Impact of the Digital World on Consumers and Marketing

"There are no boundaries or borders in the digital age."

– Karim Rashid

Digitalisation is no longer a "thing of the future", it is an irrefutable fact of life. But what does "digitalisation" actually mean? Does it start with reading morning news online and end with travelling by self-driving car? Or working, shopping and entertaining online from home? "Digitalisation" is a term that embraces many things and relates to a vast field. Regardless of the definition, it is an integral part of our private and professional lives and a growing part of our everyday experience. The boundaries between "digital" and "real" world are so blurred that they seem almost non-existent. The "real" world digitalises rapidly, while "digital" becomes the "new real".

In the last decades, we witnessed the triumph of technology, which – as Alvin Toffler foresaw – is "the great growling engine of change". From the ways consumers buy, relax and communicate to the ways companies and whole global industries market their offerings – the impact of technology and digitalisation is groundbreaking, disruptive, creative and unstoppable.

This book presents various views and perspectives on the impact of digital world on consumers, marketing and industries. The authors present a series of novel contributions and highlight some emerging issues relating to consumer–technology interactions, technology's impact on marketing practice and digitalisation's consequences in the selected industries.

This book is divided into three parts: the first part surveys complexities and the sophistication of the contemporary consumer–technology interaction. The second explores digital technologies' impact on consumer behaviour. The third discusses industry-level changes to marketing practice brought by digitalisation.

There are four chapters in the first part of the monograph. The opening chapter by **Martin Aubel** is dedicated to the uncanny valley phenomenon. After an in-depth literature review, the author proposed a theoretical model to guide future research in navigating the uncanny valley by distinguishing between primary and

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secondary mechanisms and proposes future research directions to further disambiguate the mechanisms of uncanniness. The next three chapters present the results of the authors' research on virtual influencers, cashier-free supermarkets and consumer emotions and the influence of haptic feedback on the perception of product placement in a virtual reality simulation.

In the chapter on virtual influencers, **Marcin Awdziej**, **Dagmara Plata-Alf** and **Jolanta Tkaczyk** presented the concept of a virtual influencer and established that a virtual influencer can be just as credible as a real one if he or she is attractive to the audience and posts valuable content on social media.

The chapter on cashier-free supermarkets by **Sofia Kousi** and **Gaetano Naselli** proved that compared to the traditional self-checkout supermarket, the cashier-free technology is well accepted by young consumers who find it more empowering and exciting, more useful and easier to understand and use. Additionally, consumers are not overly concerned about their privacy while using the cashier-free technology and have similar affective and behavioural reactions to technical problems that may arise in the store.

In the chapter on VR (virtual reality) simulation, **Marcin Awdziej**, **Filip Grudzewski** and **Jolanta Tkaczyk** demonstrate that the presence of haptic feedback does not impact the noticeability of brand placement but affects the evaluation of the simulation's attractiveness.

The second part of the monograph takes a closer look at the various dimensions of consumer engagement. The first three chapters present the author's research on consumer brand engagement in digital environments, trust and loyalty drivers in online subscription services, adoption of virtual dressing room technologies. The last chapter is a broad overview of secondary research with elements of the author's own research on gamification of marketing research.

Martina Toni and **Giovanni Mattia** discuss the concept of CBE (consumer brand engagement) in the context of a new social media using the example of McDonald's digital strategy launched on TikTok for promoting one of its well-known products.

Matej Kovač and **Vesna Žabkar**, the authors of the next chapter about trust and loyalty drivers in online subscription services, show, by using multigroup structural equation modelling, that customer exposure to email communication, customer-based reputation and brand credibility have a positive impact on trust and that trust has a positive impact on loyalty.

In the next chapter, **Amir Heiman**, **Thomas Reardon** and **David Zilberman** analyse how the adoption of virtual dressing rooms changes consumers' preferences for offline or online stores and decreases returns. The analysis was based on a conceptual microeconomic model of the adoption of technologies. The authors found that larger retailers are more likely than smaller ones to adopt VDRs, and the higher the retailer's share of online trade, the earlier the adoption.

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The last chapter by **Michał Ścibor-Rylski** is devoted to the gamification of marketing research. The author draws from the literature on the subject, his own practical and scientific experience to illustrate the idea and possibility of applying gamification in marketing research by engaging respondents more, indicating that the use of gamified tasks makes people write more.

The third part of the monograph is devoted to digital transformation at various levels – in the context of personal marketing and from the sector perspective, on the example of railway transport. **Magdalena Sobocińska** presents the concept of personal marketing in the digital world. The purpose of the chapter is to present the premises, determinants and possibilities of using innovative technologies in personal marketing. The findings indicate that the use of the internet and artificial intelligence in personal marketing requires considering several conditions, including psychological as well as sociocultural ones, related to the observed generational changes.

Mirosław Antonowicz and **Jakub Majewski** state that new digital technologies have been changing virtually all aspects of the functioning of companies and organisations. Digital transformation is a comprehensive way of moving to the new ways of operating, new business models using digital technologies. This also applies to rail transport, which itself can gain a lot from the introduction of novel solutions. Digital transformation in rail transport can have a positive impact on existing customers and generate interest of new customers in this mode of transport – by creating new opportunities as a result of digitalisation, thus increasing the comfort zone of customers within the transport services offered.

Combining insights from empirical studies, this book is addressed to a wide range of researchers across disciplines, as well marketing practitioners. It can also be an interesting supplement to knowledge as additional literature for students of management, marketing, and digital transformation.

The book is the result of cooperation between scientists and practitioners from seven countries, who met during the 12th international EMAC (European Marketing Academy) Regional 2021 conference. The conference was organised by Kozminski University, and it was held on 22–24 September 2021. **The publication of the book was possible thanks to the support of the Polish National Agency for Academic Exchange under the Welcome to Poland Program (2020).** We also invite you to visit the website dedicated to podcasts with the results of research presented during the EMAC Regional 2021 conference – https://www.kozminski.edu.pl/en/emac-regional-podcast.

We hope that our proposal will be welcomed by you.

Marcin Awdziej
Jolanta Tkaczyk

Warsaw, 15 February 2022

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Part 1
Consumers in the Uncanny Valley

"There's a theory in the field of aesthetics called the uncanny valley. It holds that when something looks almost like a human being – a mannequin or humanlike robot – it creates revulsion in the observer, because the appearance is so close to human, yet just off enough to evoke a feeling of uncanniness, of something that is both familiar and alien."

– Blake Crouch

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Illuminating the Dark Side of Anthropomorphism: Mechanisms of the Uncanny Valley Phenomenon

Martin Aubel[1]

ISM University of Management and Economics

Abstract

Despite a growing body of literature studying the uncanny valley phenomenon and its manifestations, the mechanisms of uncanniness remain a subject of debate. Unresolved problems regarding the mechanisms of uncanniness exist, among others, in a set of disconnectedly treated and often similar theories, as well as in a lack of evidence on which theories are the most suitable to explain the emergence of the uncanny valley phenomenon. In this chapter, we review two contestants – *categorical conflict* and *mind perception* – and lay out a lower-level explanation for uncanniness by borrowing the notion of *predictive coding* from computational neuroscience. We propose a theoretical model to guide future research in navigating the uncanny valley by distinguishing between primary and secondary mechanisms and propose future research directions to further disambiguate the mechanisms of uncanniness.

Keywords: anthropomorphism, uncanny valley, category conflict, mind perception, predictive coding

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Introduction

Research associated with robots and particular robots in service function has gained increasing momentum in the past years. In particular, the uptake of those ideas by consumer behaviour and marketing scholars has reinvigorated the discussion and shows that the relationship between consumers and AI holds a plethora of open questions, i.a. those regarding the social experience of interactive agents with robots in general (for a comprehensive review of the consumer and AI domain, see Puntoni, Reczek, Giesler and Botti, 2020), but also in the specific context of anthropomorphised robotic agents (Blut, Wang, Wünderlich and Bock, 2021).

Anthropomorphism refers to "perceiving human-like traits in nonhuman agents" (Epley, 2018, p. 591), and thus represents a "process of inference about unobservable characteristics of a nonhuman agent" (Epley, Waytz and Cacioppo, 2007, p. 865), which pertains both to form and mind (Müller et al., 2020). Generally, anthropomorphism leads to greater familiarity, explainability and predictability (Epley et al., 2007), which positively affects the customer experience with anthropomorphised robots (Van Doorn et al., 2017) and perceived psychological warmth (Kim, Schmitt and Thalmann, 2019). Yet, as robotic agents become more human-like, those beneficial effects dissipate and they turn uncanny (Mori, 1970 [2012]). This non-linear effect associated with anthropomorphism, called the uncanny valley phenomenon, has been a matter of interest – and concern – for consumer researchers trying to chart the "optimal level of anthropomorphism for consumer robots" (Kim et al., 2019, p. 11). However, despite a growing body of literature studying the uncanny valley phenomenon and its manifestations, the mechanisms of uncanniness remain a subject of debate.

Unresolved problems regarding the mechanisms of uncanniness exist, among others, in a set of disconnectedly treated theories, and in a lack of evidence on which theory is the most suitable and offers the greatest explanatory power. Additionally, too many similar explanations, or explanations that represent secondary functions are currently entertained, such as threat avoidance theories, which seem to be not directly related to the core mechanism of uncanniness (see Diel and MacDorman, 2021).

In this review paper, we focus on two contestants: *categorical conflict* and *mind perception*. We have chosen those as they directly relate to the basic dimensions of anthropomorphism, i.e. form and mind (Müller et al., 2020), and moreover appear to be grounded in basic cognitive functions; categorical conflict in categorical perception, and mind perception in theory of mind.

In the following sections, we will discuss both categorical conflict and mind perception in relation to categorical perception and theory of mind. We also lay out a lower-level explanation for uncanniness by borrowing the notion of predictive coding from computational neuroscience, illustrating the process of percep-

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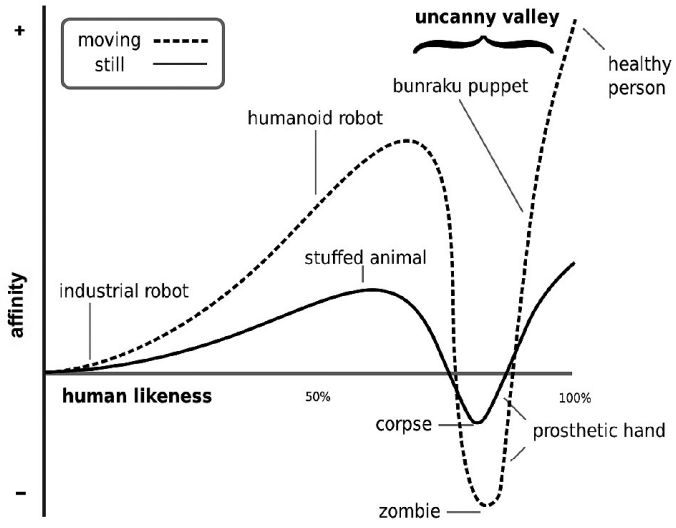
tual processing of information as a framework for examining the uncanny valley phenomenon in the future. We propose a theoretical model to guide future research in navigating the uncanny valley.

Literature Review

The Origin of the Uncanny Valley

In the domain of anthropomorphised robots, the uncanny valley phenomenon plays a focal role as a key concept. Originally, the uncanny valley phenomenon had been proposed in 1970 by the Japanese roboticist, Masahiro Mori, who had been interested in the effect of human-like robots on individually experienced affinity towards those robots, depending on both their degree of human likeness and animacy. In general, the uncanny valley phenomenon describes a non-linear relationship between human likeness and affinity to robots: its key proposition. Mori showed that human likeness first increases affinity in a positive linear fashion until a certain point is reached, at which the affinity sharply drops, causing individuals to experience a sensation of eeriness towards the robot. The presence of movement amplifies this effect in both directions, meaning that it increases both the factor by which human likeness evokes affinity, and the factor by which a further increase of human-likeness leads to a steep decrease of affinity (see Figure 1 for the difference between still and moving agents).

Figure 1. The uncanny valley according to Mori (1970) (Retrieved from Wiki Creative Commons, adapted by the author)



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In his seminal work, Mori additionally set out to formulate some preliminary explanations for the emergence of the uncanny valley. For one, he proposed that imitating human movements can backfire because of variations in the movement of human-like objects, e.g. the speed at which a robotic smile is formed, which leads to distress and to a descent into the uncanny valley. Moreover, Mori linked in his closing remarks the uncanny valley phenomenon with death – which is now called the *morbidity hypothesis* (see Weis and Wiese, 2017) – positing an instinctive self-preservation which could explain the urge to disassociate with death (see Figure 1) and thus with the anthropomorphised agent in the uncanny valley.

Mori, in fact, hoped to device an "Escape by Design" (Mori, 1970 [2012, p. 6]) and concluded his essay, musing about "the secret lying deep beneath the uncanny valley" (Mori, 1970 [2012, p. 7]) and the potential, by means of understanding those secrets, also to uncover what makes us human.

Today, we are a little closer to understanding those secrets and in the following section, we are discussing two of the most fruitful theories with the purpose of answering the question: what are the mechanisms of uncanniness?

Categorisation Conflict

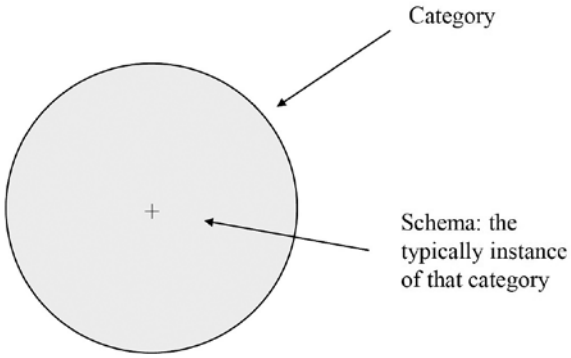
Perception, Categories and Schemata

Categorisation conflict is the first explanation that will receive our attention. The categorisation conflict is based on the notion of categorical perception, which states that we differentiate objects along categories (Harnad, 1987; de Gelder, Teunisse and Benson, 1997). More specifically, in the process of perception a percept, i.e. that quality which is perceived, is assigned to an existing category which can be defined as "a type, or a group of things having some features that are the same" (Cambridge Dictionary). We then recognise those categories through schemata, typical instances of that category (see Figure 2). Schemata represent the "building blocks of [human] cognition" (Rumelhart, 1980, p. 33) and describe an "active organization of past reactions, or of past experiences" (Bartlett, 1932, p. 201). They are formed and revised by experience (Fiske and Linville, 1980) and "guide the processing of new information and the retrieval of stored information" (Fiske and Linville, 1980, p. 543).

Schema representations of objects which we previously encountered, such as what perceptual configuration signifies an apple or a tree, allow us, upon apprehending those objects, to assign them to their respective category. If the match between the percept and the available categories is clear, we experience no ambiguity consulting past experience and come to the conclusion that the apple is a fruit and the tree is a plant and that they are, in fact, inherently different.

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Figure 2. Schemata and categories (by the author)



However, there are instances in which categorical discrimination cannot be made unambiguously, e.g. when two categories are merged. As one category is merged with another category, an individual's confidence in assigning the percept to one over the other category declines until it reaches 50% – the category boundary (de Gelder, Teunisse and Benson, 1997). In other words, their discrimination performance, i.e. the time that it takes to identify a percept, is diminished relative to both sides of the category boundary where each of the merged categories is more distinct; their response time increases as categories become less distinguishable (de Gelder, Teunisse and Benson (1997). Work by de Gelder, Teunisse and Benson (1997) showed that the process of categorical perception applies, for instance, to human-human spectra of facial expressions (angry–sad, happy–sad and angry–afraid) leading to impaired identification velocity at the category boundary.

The idea of merged categories providing conflicting cues about the percept can be also translated to the domain of anthropomorphised robots. A robot (category A), gradually imbued with human-like features representing category B, becomes uncanny as category A is morphed with category B. The effect is the strongest when it is the most difficult to distinguish category A from category B and vice versa.

Previous research has delved into exactly this proposition and found that on seeing category morphs of robots and humans, people showed reduced cognitive performance (Wiese and Weis, 2020) as experiencing conflict at the category boundary (for robot-human morphs, it ranges at around 70% human likeness (Weis and Wiese, 2017)) led to a "drainage of cognitive resources" (Wiese, Mandell and Smith, 2019, p. 1) and, in turn, to longer reaction times for the categorisation of human-robot morphs at the category boundary (Mathur and Reichling, 2016). It might be so that the emergence of the negative affect of uncanniness is due to growing cognitive processing costs associated with resolving the ambiguity of two blended categories (Cheetham et al., 2011; Yamada, Kawaba and Ihaya, 2013), but also with reduced fluency, which was shown to conjure negative evaluations of a stimulus (Winkielman, Schwarz, Fazendeiro and Reber, 2003). Seeing anthro-

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pomorphised robots that range at the category boundary between robot and human thus seems to evoke a negative affect that is experienced as uncanniness.

However, new evidence shows that the location of the category boundary and the deepest point of the uncanny valley may not coincide. Mathur et al. (2020) conducted a quantitative analysis with the attempt to map both the category boundary and the uncanny valley onto a spectrum consisting of 182 robot and human "faces" featuring varying degrees of anthropomorphism, as determined per pre-test, in which each stimulus was rated so as to receive a mechano-humanness score. They complemented this rating with a categorisation task (similar to Weis and Wiese, 2017 and Wiese and Weis, 2020) in which respondents had to identify stimuli as either belonging to the robot or the human category as well as to indicate its likeability. Combining both ratings means and the results from the categorisation task, they found that the spectrum contained four relevant and distinct points: (1) the initial likeability apex; (2) the likeability low point, (3) the robot–human category boundary, and (4) the final apex of likeability (Mathur et al., 2020). They were thus able to map the uncanny valley phenomenon as described by Mori (1970 [2012]), featuring two maxima of likeability, i.e. the first being the initial rise as anthropomorphic features become more salient, and the second being the "final apex of likability" in which the stimuli approach perfect human likeness. In between the two they identified the global minimum of likeability – representing the lowest point in the uncanny valley – and the category boundary. Interestingly, the global minimum of likeability and the category boundary do not coincide. Even though they located the category boundary at about 71% human likeness in concurrence with previous research (e.g. Weis and Wiese, 2017), their findings indicate that the categorisation conflict hypothesis might not provide a full explanation of the mechanism behind the uncanny valley phenomenon.

Thus, recent works begin to gradually question the categorisation conflict, implying that this hypothesis may not drive the emergence of the uncanny valley. Additional evidence for this is that conflict at the category boundary is arising independent of whether a morph contains a human endpoint (e.g. human-robot) (see Wiese and Weis, 2020). That means that perceiving **form** might be a necessary, however, not a sufficient explanation for the emergence of uncanniness in response to anthropomorphised robots. Thus, let us explore **mind** next.

Mind Perception

Perceiving Mind in Others

When we interact with other humans, the tacit assumption is that our conversation partner has a conscious experience akin to ours. They experience, feel and act in the world based on their own intent. We try to model their experience of the world to

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understand and empathise with them as well as to predict their behaviour (see effectance motivation, Epley et al., 2007; Banks, 2020). A function called Theory of Mind is "an inferential system central to human–human communication by which people ascribe mental states to self and other, and then use those deductions to make predictions about others' behaviors" (Banks, 2020, p. 403). However, this process is not a unique function towards other people; the same process of inference is applied to non-human agents (Epley et al., 2007). This is the case with non-human objects that seem to act and interact independently (Heider and Simmer, 1944, the triangle video), or that behave unpredictably and call for explanation (Waytz et al., 2010). Perceiving mind is consequently used to "predict another's behavior" (Epley and Waytz, 2010, p. 499), for both human and non-human entities.

Dimensions of Mind Perception

Mind perception research sets out to quantify psychological dimensions that constitute the perception of mind (Gray, Gray and Wegner, 2007) under the premise that a unidimensional view on mind, i.e. from having to not having a mind, represents a too simplistic view on the matter. For that purpose, Gray, Gray and Wegner devised a questionnaire featuring 13 characters (humans in various life stages, animals, the dead, God and social robots) that were rated on 18 mental capacities (e.g., to feel pain, see Table 1). They paired those assessments with the individual judgements of the respective character, such as liking, "wanting to save it from destruction […], and perceiving it as having a soul" (Gray et al., 2007, p. 619) and determined that those mental capacities fall into two categories – experience and agency, with experience explaining 88% and agency 8% of variance in the degree of perceiving a mind.

Table 1. Capacities related to the two dimension of mind perception, experience and agency (Gray et al., 2007). Note: Capacities are presented in order from the highest loading as in the source paper

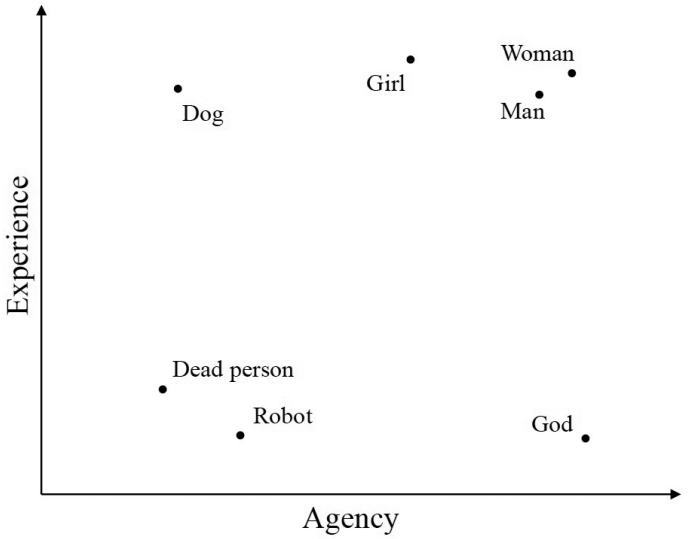
Dimensions	Capacities
Experience (11)	Hunger, fear, pain, pleasure, rage, desire, personality, consciousness, pride, embarrassment and joy.
Agency (7)	Self-control, morality, emotion recognition, planning, communication and thought.

An interesting visualisation of their findings can be seen below (Figure 3). It depicts all 13 characters presented to participants in this research and places them along the two dimensions of agency (x-axis) and experience (y-axis). Living characters, or those who we might assume to have an experience of being in the world, are found on the upper half of the figure; the dead, robots and God are found on the lower half. Those seem to lack that essential experience of being in the world

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("experience gap", Gray and Wegner, 2012, p. 126), despite being to some extent expected to be agentic.

Figure 3. Selected characters of the Gray et al. (2007) study organised along the two dimensions of agency and experience (adapted by the author)



As mentioned, the figure also refers to robots. According to the authors, robots are perceived as having some agency, but no experience, i.e. as having little mind. What can be inferred from their findings is that as robots are made more human-like, they may move to the upper quadrants of the figure – they suddenly will be perceived as having more experience and close the "experience gap" (Gray and Wegner, 2012, p. 126). It may thus be that the uncanny valley phenomenon is grounded in mind perception. A robot may become unnerving, as it ceases to be solely an agentic object and appears to have experience as well.

"The unnerving nature of humanlike robots" as a consequence of mind perception has been experimentally explored by Gray and Wegner (2012, p. 125). They hypothesised that a robot's "appearance prompts attributions of mind". They further proposed that this occurrence of attributing mind to robots depends rather on whether a person ascribes experience as opposed to agency – the two dimensions of mind perception. In a series of three experiments, they ascertained that, in fact, experience, but not agency, led to sensations of uncanniness, confirming their insights of the 2007 study (Gray et al., 2007) that experience appears to be the main predictor of mind perceptions and, in turn, uncanniness. Their interpretation of the results stated that bestowing robots with human-like features leads to the attribution of experience which in connection with the human form "violates expec-

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tations" (Gray and Wegner, 2012, p. 127). Interestingly, they also found this effect when manipulating mind perception for a computer without human-like appearance (Gray and Wegner, 2012). Uncanniness seems thus to occur independently of form. It appears that if form is not indicative of human qualities, other cues may become sufficient to trigger mind perception and consequently uncanniness. In fact, Stein and Ohler (2017) corroborated the findings of Gray and Wegner (2012), providing experimental evidence for an "uncanny valley of the mind" emerging independently of respondent ratings for the form of the presented agent. They showed that a computer presented as autonomous evoked greater uncanniness than as its scripted counterpart (Stein and Ohler, 2017), the only caveat being that they did not ascertain what qualities were eliciting the mind perception response independent of form.

Recent work further supported the role of mind perception in robots, replicating the results of Gray and Wegner (2012), indicating that mind perception in robots increases uncanniness and that mind perception is driven by a robot's capacity for experience rather than agency, i.e. a robot's "capacity to plan ahead and to exert self-control" (Appel, Izydorczyk, Weber, Mara and Lischetzke, p. 274). Moreover, Banks (2020) showed that as discrete human-like cues or behaviours are salient, "people do implicitly mentalize robots" and that "implicit mind perception emerges similarly for robots as for humans" (Banks, 2020, p. 412).

We seem thus to judge human and non-human entities as in possession of mind along two dimensions – experience and agency – which can evoke uncanniness even in the absence of physical cues of form; the "uncanny valley of the mind". As discussed in the previous section, form does not appear to bear as much sway on the emergence of uncanniness as initially thought but it still may be a relevant cue, particularly in the domain of social robotics.

Predictive Coding

Up to this point, we have explored anthropomorphism and uncanniness from a psychology perspective covering the interplay of perception and cognition limited to that fairly abstracted plane where psychology is situated, as psychology abstracts the phenomena of the mind. Borrowing from computational neuroscience, we now peruse the notion of predictive coding and take a look at the neurological process of perception.

The predictive coding literature is rooted in the premise that top-down processes predict bottom-up sensory input and that the brain is, in fact, a "prediction machine" that hallucinates reality (Seth, 2020). It builds on the idea that we construct our perceptions (higher-level representations) from our sensations (low-level sensory input), as a process of 'unconscious inference' (von Helmholtz, 1910; in: Rogers, 2017). This constructivist approach to perception is antithetical to the position

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of direct perception, the notion that perception represents a mere taking in of the objective world. Perception is thus an active "guessing game" (Clark, 2015) guided by the construction of hypotheses to match physical reality (Gregory, 1980).

Predictive coding follows that logic, too, but extends it to propose a recurrent function: it postulates that while top-down predictions shape what we perceive, "bottom-up signals are akin to error signals that modulate top-down predictions" (Butz, 2016, p. 2). If predictions are not well matched to bottom-up sensory input, brain activity increases in an attempt to minimise prediction errors (Friston, 2010; Clark, 2013; Millidge, Seth and Buckley, 2021) and to muster a more suitable prediction for the sensory data. Consequently, "probable objects are more readily seen than improbable objects" (Gregory, 1980, p. 182).

This latter idea can also be translated into perceiving anthropomorphised robots. Humans possess a general preference of interpreting visual stimuli as anthropomorphic (Epley et al., 2007). In the case of anthropomorphised robots, that would mean that the reflexive anthropomorphic interpretation triggered by human-like features would need to be updated in the presence of diverging sensory input. Prediction error occurs; the recurrent process of predictive coding takes place.

Previous research in neuroscience has tried to connect the predictive coding paradigm to the uncanny valley phenomenon and showed that predictive coding was indeed able to explain the emergence of uncanniness (Saygin et al., 2012). In their experimental study, they presented 20 participants with video clips of a human, a robot or an android to determine the selectivity of their perception for the appearance and motion of the presented agents. Functional magnetic resonance imaging (fMRI) scans indicated elevated activity for the android agent which featured a mismatch between appearance and motion, i.e. biological appearance and mechanical movement. The authors state that this might be explained by means of the predictive coding framework. Due to the mismatch of relevant cues pertaining to the agent, top-down predictions incur errors that "manifest as activity in relevant brain regions" (Saygin et al., 2012, p. 420) and provide an explanation for the uncanny valley.

Urgen, Kutas and Saygin (2018) corroborated this first evidence by testing for N400, an event-related brain potential, which is associated with meaning processing in various contexts, i.a. faces and objects (Kutas and Federmeier, 2011). Moreover, it ties together both bottom-up sensory data and top-down representations and is more pronounced when predictions are violated (Kutas and Federmeier, 2011). They showed that an android robot indeed led to a N400 effect in the brain. Urgen, Kutas and Saygin (2018) thus provided further evidence for the role of prediction violation in uncanniness and for N400 as a neurological correlate of the uncanny valley phenomenon.

Predictive coding thus seems to offer both a theoretical lens and an empirical lens onto the uncanny valley phenomenon. In the following section, we will con-

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nect predictive coding with the major theoretical takes on the mechanism of uncanniness: categorisation conflict and mind perception.

A New Theoretical Framework

We have reviewed two major contestants for explaining the uncanny valley phenomenon: categorisation conflict and mind perception. Although both focus on separate aspects of the experience with robots, a materially and an immaterially bound experience, they nonetheless coalesce on the point that they both entail violations of expectations, which is also a focal component of the predictive coding framework.

As we have seen, predictive coding in connection with uncanniness has been explored from a neurological perspective, even though this seems to be limited to a literal handful of researchers, who nonetheless seem to find support for that relationship and evidence for neurological correlates of the experience of uncanniness. In consumer behaviour and marketing literature, as well as in the computer and robot interaction literature, this connection has scarcely been acknowledged and, to our knowledge, not yet been exploited. We find some hints in a paper on mind perception that explicitly state the theory, but with the intention to explain the initial benefits of anthropomorphising robots, not the emergence of uncanniness (Müller et al., 2020), as well as in a paper on categorisation conflict delineating an alternative explanation of the experience of conflict at the category boundary besides the conflict of categories, i.e. in conflicting top-down and bottom-up processes of predicted inputs and actual inputs (Wiese and Weis, 2020), yet, without explicitly stating predictive coding. Moreover, we argue that this alternative explanation of Wiese and Weis (2020) is fundamentally connected to the first. Extending our purview to predictive coding with the aim of developing a novel theoretical approach to the mechanism of uncanniness seems thus justified.

Fundamentally, we argue that uncanniness as a phenomenon is more complex than currently recognised. Usually, present research sets out to describe uncanniness through the lens of a single theory at a time (category conflict, mind perception, or something else), while not taking into account others (Diel and MacDorman, 2021). Moreover, those theories often fail to address fundamental processes; processes that as we have lined out above and that we find in the perception of mind and the perceptual processing of form.

Here, we propose predictive coding as a theoretical basis and a low-level theory from which category conflict and mind perception emerges, as they both represent mismatches of the "process of inference about unobservable characteristics of a nonhuman agent" (Epley, Waytz and Cacioppo, 2007, p. 865). We see them connected to predictive coding as follows: category conflict first relies on a reflexive human interpretation followed by an update through error propagation and ad-

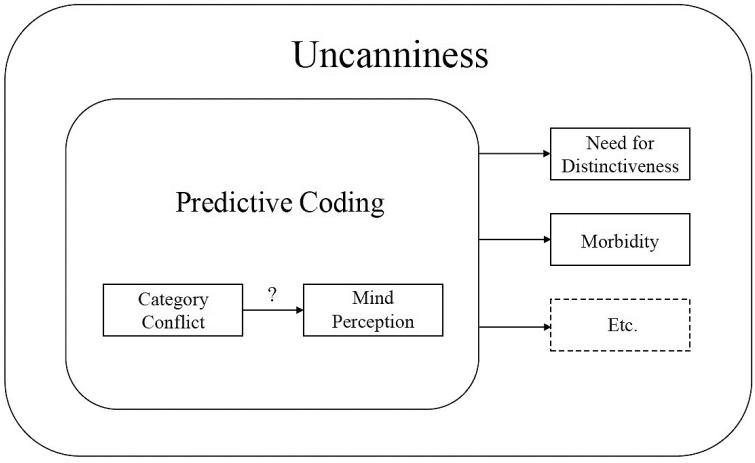
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justments of prediction to sensory data input. Mind perception towards robots functions similarly. If a robot behaves like a robot in line with one's prediction, i.e. it is mostly agentic, it is assessed favourably. However, if attribution of experience in connection with the human form arises, mind is perceived and predictions are being violated (Gray and Wegner, 2012). It is, however, unclear whether category conflict and mind perception would arise a) simultaneously but independently, or b) whether mind perception would follow from category conflict. We hence denoted this relationship with a question mark (see Figure 4).

Category conflict and mind perception would represent the first layer of uncanniness that emerges from bottom-up sensory data and top-down prediction, i.e. predictive coding. Besides that, there are secondary mechanisms of uncanniness that often describe social, group and inter-individual processes which are the consequences of those primary processes, e.g. morbidity (Mori, 1970 [2012]) or need for distinctiveness (see Müller et al., 2020).

Beyond that, there might also be contextual influences at play which we have not included here, and which also already may be relevant on a lower level. This model is far from exhaustive but serves the attempt to find a common basis and with that – new ways of thinking about the emergence of uncanniness. The theoretical model is shown below (see Figure 4).

Figure 4. The mechanisms of uncanniness framework (made by the author)



Research Direction

Based on both the literature and the theoretical model including predictive coding, we see several new avenues for future research, including both higher-level (psychology, cognition) and lower-level approaches (neuroscience).

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As regards the higher-level approaches, we see that both form and mind are relevant dimensions that guide the "process of inference about unobservable characteristics of a nonhuman agent" (Epley, Waytz and Cacioppo, 2007, p. 865; Müller et al., 2020). However, as we stated above, the categorisation conflict alone seems to be unable to fully explain the emergence of uncanniness based on form, as the deepest point of the uncanny valley does not coincide with the point of the greatest category conflict (Mathur et al., 2020). Moreover, conflict at the category boundary arises independently of whether a morph contains a human endpoint (e.g. human-robot) (see Wiese and Weis, 2020). It appears that the categorisation conflict provides merely a general metacognitive affective state irrespective of the specification of one of the endpoints as human, upon which anthropomorphic cues evoke mind perception. The question that follows from this is whether then anthropomorphism represents a cascading effect or a composite effect of form and mind, and whether the categorisation conflict is indeed irrelevant in describing the mechanisms of uncanniness.

Cascading or Composite Effect?

Future research could address this by corroborating the findings of Mathur et al. (2020) that form does not contribute to feelings of uncanniness and probe whether it merely provides cues for mind perception. The categorisation conflict could, in fact, be irrelevant for uncanniness. This would contribute to the proposition that uncanniness is a *cascading effect* depending on form as a mere anthropomorphic cue, which, however, does not contribute to the uncanniness effect independently of the category conflict. However, other research states that uncanniness could be a *composite effect*, i.e. that form and mind create uncanniness. A recent paper by Yin, Wand and Guo (2021) set out to address a lack of research on the interplay of form and mind in eliciting uncanniness and concluded that it indeed seems to depend on both. Others, however, largely disregard the dimension of mind and show that visual cues of form are the main cue for evaluating anthropomorphised agents (Ferrari, Paladino and Jetten, 2016), while again others find that uncanniness is a consequence of perceiving mind, providing evidence for the "uncanny valley of the mind" (Stein and Ohler, 2017; Gray and Wegner, 2012). Moreover, experimental research on mind perception uses anthropomorphic cues as manipulation stimuli to elicit variation in mind perception (e.g. Gray and Wegner, 2012; Müller et al., 2020). However, it does not differentiate the effect between form and mind, while the categorisation conflict literature largely overlooks mind perception effects (e.g. Wiese and Weis, 2020).

It seems that research could benefit from, firstly, using an integrative perspective on uncanniness, including both form and mind, and secondly, from using the distinction between composite and cascading effects to further disentangle the un-

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canny valley phenomenon as well as to focus on its mechanism rather than what consequences it manifests. Moreover, it is usually unclear under what assumption research states that form and mind create uncanniness, e.g. "appearance prompts attributions of mind" (Gray and Wegner, 2012, p. 125), i.e. whether form merely provides the cues or contributes directly to the affective state of uncanniness. Future research could set out to disambiguate this space and provide more conclusive evidence of whether uncanniness is a composite or cascading effect of form and mind.

Competing Theories

Related to the effect of form and mind is the general landscape of theories that compete to explain the mechanism of uncanniness. So far, studies have mostly addressed one theory at a time, acknowledging the connection of form and mind. Future studies could gauge how uncanniness in robots comes about as a composite effect of form and mind as well as subsequent secondary mechanisms, such as the need for distinctiveness.

Diel and MacDorman's 2021 work represents one of the few studies which took such an integrative view and addressed the predictive power of nine different theories, comparing them with eeriness and coldness ratings of ten different stimuli. They also highlighted the need for integrative research in the form of within-subjects experimental design studies to further evaluate current theories of uncanniness (Diel and MacDorman, 2021).

This would cater to the current want of work on "theory comparison and falsification" (Diel and MacDorman, 2021, p. 2) and determine how theories could be aligned, merged, dismissed or put in a relationship. This would declutter the literature while simultaneously creating new theory.

The Uncanniness Operationalisation Problem

One more unaddressed problem is diverging operationalisations of uncanniness. Mathur et al. (2020) selected a previously created (Mathur and Reichling, 2016) bipolar single item likeability scale (from enjoyable to creepy) to measure uncanniness reactions of their study participants versus an operationalisation of the concept devised by Gray and Wegner (2012) that has been repeatedly used, e.g., by Kim, Schmitt and Thalman (2019), featuring a unipolar three-item scale measuring the agreement towards semantically similar adjectives. Those differences may affect the comparability of previous and future findings.

Additionally, despite the fact that Mathur et al. (2020) adopted a novel approach to mapping the uncanny valley, their stimuli selection might further introduce noise in their rated pictures series, due to varying defining features, such as gender, age,

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hair and skin colour, and different shapes for the more mechanical robots. It seems that it is more suitable to rely on the morph approach of creating artificial spectra, using only two distinct category stimuli, particularly when the aim of the study is to disentangle the mechanism of the uncanny valley phenomenon more clearly. Future research could take a closer look and compare morphs consisting of two stimuli with rated picture series (Mathur et al. (2020) provide their material online).

Predictive Coding

Another avenue to novel research ideas could be predictive coding. The predictive coding describes lower-level processes of perception. It can be taken as a starting point to develop new higher-level theories based on a more functional understanding. It also does not explicitly distinguish between mind and form yet, but it takes visual sense-data as a general cue. It provides insights into prediction violations (Urgen, Kutas and Saygin, 2018) which could qualify it as a suitable theoretical approach to explain both categorical conflict and mind perception.

Moreover, the predictive coding could be a fruitful framework since its methodology allows for disassembling the uncanniness valley more accurately in a consumer behaviour context, providing more detail on real physically manifesting changes, that could in turn inform theory development on a higher-level basis. Predictive coding methodology also allows to circumnavigate shortcomings of self-report measures by providing physiological measurements (Urgen, Kutas and Saygin, 2018), that might have greater statistical power in picking up and mapping the effect of the uncanny valley phenomenon. It would also be interesting to test whether mind perception elicits the same response as motion mismatch (see Saygin et al., 2012). For this purpose, future research could use the manipulation and set up of Grey and Wegner (2012) and measure uncanniness as a dependent variable operationalised with a measure from the predictive coding literature, e.g. N400 (Urgen, Kutas and Saygin, 2018). Basically, that could show that there is an "uncanny valley of the mind" in the mind physically manifesting itself. Moreover, those insights could be contrasted with the 2012 study by Saygin et al. on appearance and motion, which would distinguish it from the uncanniness response to motion mismatch.

Since perception depends on the content of top-down processes, predictive coding would also suggest that uncanniness is malleable. If top-down content is altered, perception should change. And, in fact, recent work suggested that the response towards anthropomorphised service robots is based on our expectation (Sarigul and Urgen, 2021) and that repeated interactions reduce the uncanniness response to anthropomorphised service robots (Zlotowski et al., 2015). The latter may be related to how we expect those interactions to be like in the first place, and that might change with repeated interactions. Hence, if we change our expecta-

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tions, our predictions change as well and, as a logical consequence, uncanniness could be unlearned.

This also indicates that there are individual differences in uncanniness that may be directly dependent on top-down content pertaining to anthropomorphised service robots, such as technology readiness (Parasuraman and Colby, 2014), which renders individuals more open to new technologies. Future studies could investigate other concepts that reflect content structure that affects the perception of robots, but also delve into manipulating this content in experimental studies.

Conclusion

In this chapter, we set out to explore the mechanism of the uncanny valley phenomenon. We focused particularly on category conflict and mind perception which both are grounded in basic cognitive function, categorical perception and theory of mind. We additionally complemented those theories common in consumer behaviour and marketing research with the concept of predictive coding in order to derive a lower-level understanding of the mechanism of uncanniness that could potentially inform higher-level theory building. Our proposed theoretical model puts those different domain perspectives on uncanniness in a relationship and offers a conceptual understanding that could help to navigate researchers the multitude of overlapping and competing theories as well as to systematically disambiguate the mechanism of uncanniness.

References

Appel, M., Izydorczyk, D., Weber, S., Mara, M. and Lischetzke, T. (2020). The uncanny of mind in a machine: Humanoid robots as tools, agents, and experiencers. *Computers in Human Behavior*, *102*, 274–286, https://doi.org/10.1016/j.chb.2019.07.031.

Banks, J. (2020). Theory of Mind in Social Robots: Replication of Five Established Human Tests. *International Journal of Social Robotics*, *12*, 403–414, https://doi.org/10.1007/s12369-019-00588-x.

Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge University Press.

Blut, M., Wang, C., Wünderlich, N. V. and Brock, C. (2021). Understanding anthropomorphism in service provision: a meta-analysis of physical robots, chatbots, and other AI. *Journal of the Academy of Marketing Science*, 1–27, https://doi.org/10.1007/s11747-020-00762-y.

Butz, M.V. (2016). Toward a Unified Sub-symbolic Computational Theory of Cognition. *Frontiers in Psychology*, *7*, 1–19, https://doi.org/10.3389/fpsyg.2016.00925.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Cambridge Dictionary (n.d.). Category. In: *dictionary.cambridge.org* dictionary. Retrieved January 30, 2022, from https://dictionary.cambridge.org/dictionary/english/category.

Cheetham, M., Suter, P. and Jäncke, L. (2011). The human likeness dimension of the "uncanny valley hypothesis": behavioral and functional MRI findings. *Frontiers in Human Neuroscience*, *5*, 1–14, https://doi.org/10.3389/fnhum.2011.00126.

De Gelder, B., Teunisse, J.-P. and Benson, P. J. (1997). Categorical Perception of Facial Expressions: Categories and their Internal Structure. *Cognition and Emotion*, *11*, 1–23, http://dx.doi.org/10.1080/026999397380005.

Diel, A. and MacDorman, K. F. (2021). Creepy cats and strange high houses: Support for configural processing in testing predictions of nine uncanny valley theories. *Journal of Vision*, *21*(1), 1–20. https://doi.org/10.1167/jov.21.4.1.

Epley, N. (2018). A Mind like Mine: The Exceptionally Ordinary Underpinnings of Anthropomorphism. *Journal of the Association for Consumer Research*, *3*(4), 591–598, https://doi.org/10.1086/699516.

Epley, N. and Waytz, A. (2010). Mind perception. In: S. T. Fiske, D. T. Gilbert and G. Lindzey (eds.), *Handbook of social psychology* (pp. 498–541). John Wiley & Sons, Inc., https://doi.org/10.1002/9780470561119.socpsy001014.

Epley, N., Waytz, A. and Cacioppo, J. T. (2007). On seeing human: a three-factor theory of anthropomorphism. *Psychological Review*, *114*(4), 864–886, https://doi.org/10.1037/0033-295X.114.4.864.

Fiske, S. and Linville, P. W. (1980). What does the Schema Concept Buy us? *Personality and Social Psychology Bulletin*, *6*(4), 543–557, https://doi.org/10.1177%2F014616728064006.

Gray, H. M., Gray, K. and Wegner, D. M. (2007). Dimensions of mind perception. *Science*, *315*(5812), 619, https://doi.org/10.1126/science.1134475.

Gray, K. and Wegner, D. (2012). Feeling robots and human zombies: Mind perception and the uncanny valley. *Cognition*, *125*(1), 125–130, https://doi.org/10.1016/j.cognition.2012.06.00.

Harnad, S. (1987). Psychophysical and cognitive aspects of categorical perception: A critical overview. In: S. Harnad (ed.), *Categorical Perception: The Groundwork of Cognition* (pp. 1–25). New York: Cambridge University Press.

Heider, F., and Simmel, M. (1944). An experimental study of apparent behavior. *The American Journal of Psychology*, *57*, 243–259. https://doi.org/10.2307/1416950

Keijsers, M., Bartneck, C. and Eyssel, F. (2021). Pay Them No Mind: The Influence of Implicit and Explicit Robot Mind Perception on the Right to be Protected. *International Journal of Social Robotics*, https://doi.org/10.1007/s12369-021-00799-1.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Kim, S.-Y., Schmitt, B.H. and Thalmann, N.M. (2019). Eliza in the uncanny valley: anthropomorphizing consumer robots increases their perceived warmth but decreases liking. *Marketing Letters*, *30*, 1–12, https://doi.org/10.1007/s11002-019-09485-9.

Kutas, M. and Federmeier, K. D. (2011). Thirty Years and Counting: Finding Meaning in the N400 Component of the Event-Related Brain Potential (ERP). *Annual Review of Psychology*, *62*(1), 621–647, https://doi.org/10.1146/annurev.psych.093008.131123.

Mathur, M. B. and Reichling, D. B. (2016). Navigating a social world with robot partners: A quantitative cartography of the uncanny valley. *Cognition*, *146*, 22–32, https://doi.org/10.1016/j.cognition.2015.09.008.

Mathur, M. B., Reichling, D.B., Lunardini, F., Geminiani, A., Antonietti, A., Ruitjen, P. A. M., Levitan, C. A., Nave, G., Manfredi, D., Bessette-Symons, B., Szuts, A., and Azcel, B. (2020). Uncanny but not confusing: Multisite study of perceptual category confusion in the Uncanny Valley. *Computers in Human Behavior*, *103*, 21–30, https://doi.org/10.1016/j.chb.2019.08.029.

Millidge, B., Seth, A., & Buckley, C. L. (2021). *Predictive coding: a theoretical and experimental review*. arXiv preprint https://arxiv.org/abs/2107.12979.

Mori, M. (1970). The Uncanny Valley. *Energy*, *7*(4), 33–35, https://doi.org/10.1109/MRA.2012.2192811.

Müller, B. C. N., Gao, X., Nijssen, S. R. R. and Damen, T.G.E. (2020). I, Robot: How Human Appearance and Mind Attribution Relate to the Perceived Danger of Robots. *International Journal of Social Robotics*, *13*, 691–701, https://doi.org/10.1007/s12369-020-00663-8.

Parasuraman, A. and Colby, C.L. (2014). An Updated and Streamlined Technology Readiness Index: TRI 2.0. *Journal of Service Research*, *18*(1), 59–74, https://doi.org/10.1177%2F1094670514539730.

Puntoni, S., Reczek, R. W., Giesler, M. and Botti, S. (2020). Consumers and Artificial Intelligence: An Experiential Perspective. *Journal of Marketing*, *85*(1), 131–151. https://doi.org/10.1177%2F0022242920953847.

Rogers, B. (2017). *Perception: A Very Short Introduction*. Oxford University Press. https://doi.org/10.1093/actrade/9780198791003.001.0001.

Rumelhart, D. E. (1980). Schemata: The Building Blocks of Cognition. In: R.J. Spiro, B.C. Bruce and W.F. Brewer (eds.). *Theoretical Issues in Reading Comprehension: Perspectives from Cognitive Psychology*, *Linguistics*, *Artificial Intelligence*, *and Education*. London: Routledge. https://doi.org/10.4324/9781315107493.

Sarigul, B. and Urgen, B. A. (2021). *Audio-visual predictive processing in perception of humans and robots*. PsyArXiv, https://doi.org/10.31234/osf.io/kfa3r.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Saygin, A. P., Chaminade, T., Ishiguro, H., Driver, J. and Frith, C. D. (2012). The thing that should not be: predictive coding and the uncanny valley in perceiving human and humanoid robot actions. *Social Cognitive and Affective Neuroscience*, *7*(4), 413–422. https://doi.org/10.1093/scan/nsr025.

Seth, A. (2020). Preface: The Brain as a Prediction Machine. In: D. Mendonça, M. Curado and S. S. Gouveia (eds.). *The Philosophy and Science of Predictive Processing*. Bloomsbury Academic.

Stein, J.-P. and Ohler, P. (2017). Venturing into the uncanny valley of mind – The influence of mind attribution on the acceptance of human-like characters in a virtual reality setting. *Cognition*, *160*, 43–50. http://dx.doi.org/10.1016/j.cognition.2016.12.010.

Urgen, B. A., Kutas, M. and Saygin, A. P. (2018). Uncanny valley as a window into predictive processing in the social brain. *Neuropsychologia*, *114*, 181–185, https://doi.org/10.1016/j.neuropsychologia.2018.04.027.

Van Doorn, J., Mende, M., Noble, S. M., Hulland, J., Ostrom, A. L., Grewal, D. and Petersen, J. A. (2017). Domo arigato Mr. Roboto: Emergence of automated social presence in organizational frontlines and customers' service experiences. *Journal of Service Research*, *20*(1), 43–58, https://doi.org/10.1177%2F1094670516679272.

Weis, P. P. and Wiese, E. (2017). Cognitive Conflict as Possible Origin of the Uncanny Valley. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *61*(1), 1599–1603, https://doi.org/10.1177%2F1541931213601763.

Wiese, E., Mandell, A., Shaw, T. and Smith, M. A. (2019). Implicit Mind Perception Alters Vigilance Performance Because of Cognitive Conflict Processing. *Journal of Experimental Psychology: Applied*, *25*(1), 25–40, https://doi.apa.org/doi/10.1037/xap0000186.

Wiese., E. and Weis, P.P. (2020). It matters to me if you are human – Examining categorical perception in human and nonhuman agents. *International Journal of Human-Computer Studies*, *133*, 1–12, https://doi.org/10.1016/j.ijhcs.2019.08.002.

Winkielman, P., Schwarz, N., Fazendeiro, T. and Reber, R. (2003). The hedonic marking of processing fluency: implications for evaluative judgement. In: J. Musch and K. C. Klauer (eds.). *The Psychology of Evaluation: Affective Processes in Cognition and Emotion* (pp. 189–217). Lawrence Erlbaum Associates Publishers.

Yamada,Y., Kawabe, T. and Ihaya, K. (2013). Categorization difficulty is associated with negative evaluation in the "uncanny valley" phenomenon. *Japanese Psychological Research*, *55*(1), 20–32, https://doi.org/10.1111/j.1468-5884.2012.00538.x.

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Yin, J., Wang, S. and Guo, W. (2021). More than appearance: the uncanny valley effect changes with a robot's mental capacity. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues. Advance online publication*, https://doi.org/10.1007/s12144-021-02298-y.

Zlotowski, J. A., Sumioka, H., Nishio, S., Glas, D. F., Bartneck, C. and Ishiguro, H. (2015). Persistence of the uncanny valley: the influence of repeated interactions and a robot's attitude on its perception. *Frontiers in Psychology*, *6*, https://doi.org/10.3389/fpsyg.2015.00883.

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Real or Not, Doesn't Matter, As Long As You Are Hot: Exploring the Perceived Credibility of an Instagram Virtual Influencer

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Abstract

The following study aimed to check whether or not the knowledge regarding the fact that an influencer is a fictional/virtual character affects their perceived credibility. The research is of a pioneering nature, as the virtual influencer phenomenon is just developing. When conducting the study, we wanted to find out whether or not the knowledge regarding the virtual influencer differentiates the assessment of their credibility in relation to its three dimensions: attractiveness, trust towards them and their expertise. In order to meet the objectives of the study, our own experimental research was conducted (246 management students were recruited for the study). The research findings confirm that when it comes to assessing the source credibility, it is irrelevant whether recipients know (or not) if the character that they come in contact with is virtual or real.

Keywords: virtual influencer, Instagram, credibility theory

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Introduction

Instagram is one of the fastest-growing online photo social web services where users share their life images with others, however, the academic research related to this medium is limited especially in the context of virtual influencers (Sheldon & Bryant, 2016; Djafarova & Rushworth, 2017; Bendoni & Danielian, 2019).

Being mainly a photo-sharing application, Instagram stands out as an effective tool supporting communication of industries for which the use of visual content is its basis (Ting, Wong Poh Ming, De Run & Choo, 2015). Many company representatives use the indicated application to promote their products and services, which is manifested by its use on the fashion market, whose representatives use mainly photos in the message (Lim & Yazdanifard, 2014). The largest brands, designers, stylists, models, journalists as well as photographers related to the fashion industry have created their space in this portal by actively using it in promotional campaigns. Social media as well as mobile image-sharing platforms, in particular Instagram, are revolutionizing the global fashion industry (Kietzmann, Hermkens, McCarthy & Silvestre, 2011), which in particular is manifested in allowing models to interact directly with recipients by maintaining their personal profiles on social media (Mears & Finley, 2005).

Celebrities' profiles are at the top of the list of the most-followed pages on Instagram, frequently used to deliver marketing communication messages to their followers. Consumers perceive individuals with a large number of subscribers as more attractive and trustworthy, this is in line with Source Credibility Theory (Djafarova & Rushworth, 2017). Source credibility refers to the consumer perception of the information source based on attractiveness, trustworthiness, and knowledge in the area of the endorsed product (Ohanian, 1990).

Miquela Sousa, more widely known as Lil Miquela, has 3 million followers on Instagram, the YouTube channel with 282,000 subscribers, her own playlist on Spotify, and the creative community connected with an online shop, called Club 404 (Instagram, 2020). As an influencer, she has cooperated with numerous brands, including Gucci, Calvin Klein, Prada, Supreme, Diesel, or Pat McGrath. She belongs to the most influential Instagrammers, for all that… she does not exist.

When Miquela appeared on the web in 2016, it was not exactly clear who stood behind her. There was no end to speculations, spurring the number of followers to grow month after month before it finally exploded as the truth came to light. It turned out that the 19-year-old model and singer was a fully artificial creature by Brud, a Los Angeles-based start-up. The influential robot girl is the first and very spectacular, however, not the only example of a virtual influencer on Instagram. As of yet, the cooperation with virtual influencers is the most preferred by luxurious and premium brands.

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Figure 1. Lil Miquela on Instagram (retrieved from: https://www.instagram.com/lilmiquela/ 14 February 2022)



The importance of virtual influencers grows every year and they can be neither stopped, nor ignored anymore. The New York Times even predicts that engagement of virtual influencers will be a dominating trend in the coming years, particularly thanks to the artificial intelligence that has already made the creation of this type of celebrity quite easy (Hsu, June 17, 2019). On one hand, the use of virtual influencers can be very beneficial for companies, but on the other, it is likely to complicate a bit their consumer relations. Thus, it seems reasonable to ask a question, whether the awareness of the fact that virtual influencers are only digital characters, CGI constructs, may influence the assessment of their credibility.

Literature Review

The Concept of a Virtual Influencer

A virtual influencer is a robot or an avatar created and developed for a specific brand promotion or as an independent project for cooperation with many different brands, having its own personality and profile on social media, used for communicating with its followers. It is designed from head to toe, which makes it predictable. In general, it would appear that the use of virtual influencers means nothing but benefits for a brand. First of all, they constitute a modern form of fictional characters connected with the brand, a kind of virtual brand heroes or simply manne-

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quins in shop windows that have suddenly come to life. Such influencers do not need days off, they are never tired, always stick to the script and look perfect. However, they are like an empty vessel that can be filled with literary everything, as they have no their own thoughts and they are not independent, in fact, becoming another way of communicating sponsored content to consumers. It may be tempting to abuse the consumers' trust and hide the influencer's origin, particularly at the stage of the project launch, while their use has not been regulated so far.

Consumers being unaware they are dealing with an avatar instead of a real person, available through social media, may feel disappointed and misled. The clear indication of virtual influencers becomes both a necessity and a priority. Hiding the identity of digital personalities undermines profoundly the confidence in a brand.

Paradoxically, the brands willingly employing virtual influencers point out that they do it because real influencers become more and more artificial. Meanwhile, there is nothing worse for any brand than to cooperate with a well-known person who declares certain values and it turns out that it is just for show on Instagram, while in real life these values are not important for this person.

Virtual influencers can be perceived as a remedy for the saturated influencer market, which offers limited possibilities to stand out from the crowd. So far, however, fans and followers still prefer to interact with real people (Hoffower, 2019).

Virtual influencers may resemble human figures, but they may be non-human figures (such as "Nobody Sausage" – the fastest growing profile on Instagram in 2021). They can be clearly gendered or non-binary. They can be 2D or 3D visualisations.

Figure 2. Imma.Gram – virtual human influencer (retrieved from https://www.instagram.com/imma.gram/ 14 February 2022)



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Figure 3. Nobody Sausage – non-human virtual influencer (retrieved from https://www.instagram.com/nobodysausage/ 14 February 2022)

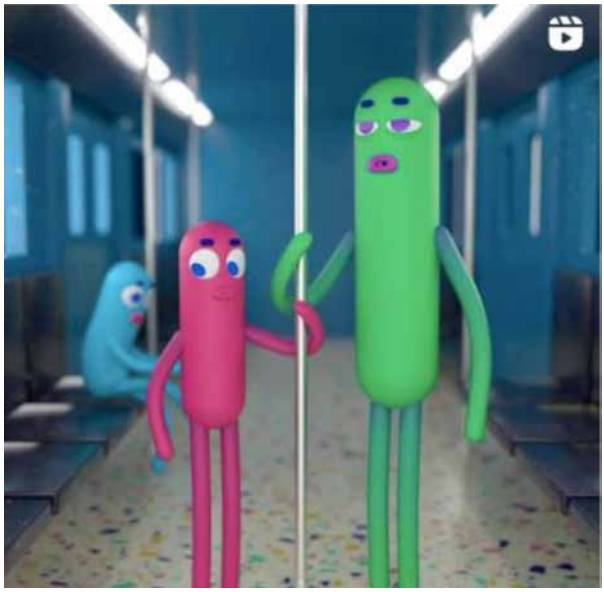


Figure 4. The Good Advice Cupcake – non-human 2D virtual influencer (retrieved from https://www.instagram.com/thegoodadvicecupcake/ 14 February 2022)



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The virtual influencer website virtualhumans.org lists 217 avatars of different types and forms that can be considered influencers. Obviously, artificial, non-existent characters appeared before the emergence of the social media. Table 1 shows the characters who can be considered the first virtual influencers.

Table 1. First Virtual influencers (retrieved from: https://www.virtualhumans.org/article/who-was-the-first-virtual-influencer, 27 January 2022)

Virtual Influencer	First Appearance
Barbie	Jan 1, 1959
Geico Gecko	Aug 1, 2000
Hatsune Miku	Aug 31, 2007
Lu of Magalu	Aug 13, 2009
Serah Reikka	Sep 3, 2010
Anna Cattish	Jan 10, 2011
Ami Yamato	May 18, 2011
Pete Zaroll	Jun 2, 2014
Ion Gottlich	Feb 28, 2015
Any Malu	Aug 10, 2015
Miquela Sousa	Apr 23, 2016
Kizuna AI	Nov 29, 2016

In the Google Scholar browser (2022), there can be found 199 results literary referring to this phenomenon. The majority of them date from 2018 to 2022. The considerable part includes master theses written by students who explored this new phenomenon, comparing CGI Instagram influencers with human Instagram influencers in various cultural aspects (Kuhnle, 2019; Luitse, 2019; Tanzi, 2019; Darner & Arvidsson, 2019; Misasi 2021). The remaining studies focus on the following issues: virtual influencers as a type of specific influencers having an impact on generation Z (Kadekova & Holienčinová, 2018), virtual influencers as a new tool for promoting fashion brands (Bendoni & Danielian, 2019), and virtual influencers as the fake news evolution and negative aspect of emerging technologies (Adriani, 2019; Dahle & Olsson, 2019).

In the Web of Science database gathering journals from the JCR, there are only 3 entries focused on the phenomenon of virtual influencers (WOS, 2021). The remaining articles focus on the following issues: the effects of the number and types of social actors in the contents of Instagram on users' reactions (Park, Nan, Kim, Han, & del Pobil, 2021), analysis of some of the ontological and ethical issues associated with the rise of virtual influencers on social media platforms like Instagram (Robinson, 2020), and analyses of the posting behaviour of and reactions to

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one human, one human-like virtual, and one anime-like virtual influencer active on a popular social media platform via text and emoji postings (Arsenyan & Mirowska, 2021).

The most important findings regarding interaction with virtual influencers on social media are as follows (Park, Nan, Kim, Han, & del Pobil, 2021):

- People use personal pronouns more often in comments – and treat the avatar like a human if the virtual influencer is surrounded by other virtual influencers rather than alone.
- People write more negative comments if there is more than one virtual influencer in the photo.
- People are more positive in the comments if the avatar in the photo is in the company of real people.

Comparing the profiles of three influencers – a human virtual influencer, a non-human virtual influencer and a real influencer, Aryenyan and Mirowska (2021) observed that the most written posts had a non-human profile, the most vulgar language was used by a virtual human influencer, the longest comments from followers, the most likes and the most positive emoji received a virtual human influencer, and the highest number of comments was received by a virtual non-human influencer. According to Robinson (2020), recipients of online content should have the right to know who controls the virtual influencer.

Credibility of Influencers

The credibility of influencers can be explained in the same manner as of celebrity endorsers. In the literature the most often used theory is the Source Credibility Model, which assumes that the effectiveness of a message depends on the perceived level of expertise and trustworthiness of an endorser (Ohanian, 1991). Early research studies indicated that a source with high credibility induces higher behavioural compliance among viewers than a source with low credibility. Credibility has a significant and a direct effect on consumers' attitudes and the behavioural intentions. Consistent with the work of Hovland & Weliss (1952), Ohanian views expertise as the extent to which the communicator is perceived to be a source of valid assertions about the object/message. This includes the source's competence, expertise, and qualifications concerning the object/message. Also consistent with Hovland & Wellis (1952), trustworthiness is viewed as the degree of confidence in the communicator's intent to communicate the assertions he or she considers most valid. This includes both trust and acceptance of the speaker and message. In this context, attractiveness is referred to as the physical attractiveness of the source to the audience, and to a lesser extent, the emotional attractiveness of the source. This includes elements of physical beauty, sexiness, chicness and elegance.

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The internet and social media have changed the context in which messages and sources are assessed, also in terms of their credibility. Online celebrity endorsements have become the basic communication tool used by many brands, because they are perceived to be of significant importance and credibility when communicating marketing messages (Djafarov & Rushworth, 2017). Social media have given prominence not only to celebrities, but also to micro-influencers who are seen as more credible and relevant than celebrities because they are closer to the consumers (Kadekova & Holienčinová, 2018; Alassani & Göretz, 2019).

Source Credibility Theory is addressed in this study to examine the main research objective: whether the knowledge of the influencer's fictional character affected their perceived credibility.

Research Method

The main research hypothesis was formulated as follows:

H: The knowledge of virtual influencers differentiates the assessment of their credibility.

The achievement of the research goal was possible thanks to the use of experimental research with the CAWI survey. The research included 246 students of the management faculty in the leading non-public business school in Poland. The respondents were randomly (according to students' ID numbers) assigned to one of two experimental groups that analysed the photo of Shudu, a virtual influencer, downloaded from her Instagram profile. The group exposed to the photo description consisted of 122 respondents, while in the group not exposed to the description there were 124 people.

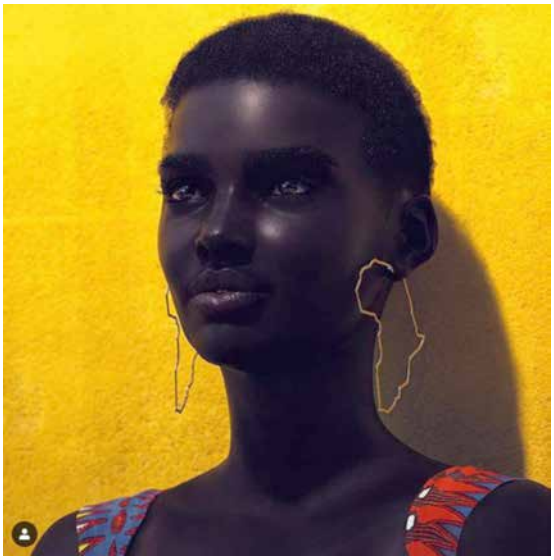
Shudu has an Instagram account (@shudu.gram) with 224,000 followers. She looks real, and endorses fashion and cosmetic products like 'Fenty Beauty' created by Wilson – a British fashion photographer (Moustakas, Lamba, Mahmoud & Chandrasekaran, 2020). She is mostly followed by women (61%) and by African ethnicity followers (32%). The community of followers is primarily real accounts (60.2%), a small percentage of influencers (3%), mass observers (15.5%) and suspect profiles (21.5%). According to the HypeAuditor tool, the profile is characterised by a high indicator of recipient quality of 66 (on a scale 1 to 100) and an excellent involvement rate against accounts with a similar profile – 5.51%. Profile posts are published relatively rarely (1.38 posts per week), and 91% of them are advertising/sponsored posts (Hypeauditor, 2019). Shudu frequently appears as an ambassador for fashion products but is not yet as popular as Lil Miquela, which is why she was chosen for the experiment.

Respondents were asked to fill a short questionnaire about their behaviour related to the use of social media. Next, they were shown a photo with or without a description of a virtual influencer. Their next task was to evaluate the photo on a

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dichotomous 7-point scale across the following dimensions: sad-funny, boring–exciting, traditional–unconventional, interesting–uninteresting, ugly–pretty, professionally developed–unprofessionally developed.

Figure 5. Shudu photo used in research (retrieved from https://www.instagram.com/shudu.gram/ 20 May 2020)



The assessment of the virtual influencer's perceived credibility was conducted with the use of the celebrity endorser's credibility scale (Ohanian, 1990). This scale is posited to be characterised by three dimensions: the source's expertise, trustworthiness, and attractiveness. Each dimension of source credibility is composed of five semantic differential items scored on 7-point scale. Thus, the measure is multidimensional, and scores on each dimension are derived by summing the responses per item within each dimension (Bearden et al., 2011).

The scale reliability was verified with the use of Cronbach's alpha. For the scale measuring the virtual influencer's attractiveness the coefficient was 0.893; for the scale measuring trustworthiness it was 0.787, while in the case of scale measuring the influencer's expertise, it was 0.895. The coefficient in all cases met the criteria of admitting the scale for use in the research.

In order to compare the average values resulting from the measurement of the virtual influencer's credibility in both groups, the Student t-test was applied for independent samples, as the groups were equinumerous, and the dependent variable was quantitative with the distribution close to the normal one. The statistical analyses were conducted with the use of SPSS.

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Results

Among the research participants, there were 58% of women and 42% of men. The average age of respondents was 26.3 years, while the median value was 24 years. Over 90% of respondents use mainly Facebook, 88% visit YouTube and 78% are on Instagram. For more than 60% of the time spent on social media ranges from 1 to 3 hours a day. The majority of respondents using Instagram (78%) mainly prefer following profiles and reacting to posts, but not engaging in wider discussions. The average number of Instagram profiles followed by respondents is 310, while the median value is 290. Nearly 40% of respondents using Instagram follow profiles of over 20 well-known people.

Due to the use of the scale designed by Ohanian (1990) for the measurement of the virtual influencer's credibility, the research hypothesis was developed based on three dimensions of credibility.

The detailed hypotheses were formulated as follows:

H1: The knowledge on the virtual influencer differentiates the assessment of their credibility.

H2: The knowledge on the virtual influencer differentiates the assessment of their trustworthiness.

H3: The knowledge on the virtual influencer differentiates the assessment of their expertise.

The average values obtained for respective dimensions of credibility are presented in Table 2.

Table 2. Average values and standard deviations for credibility dimensions in two experimental groups (made by the authors)

Type of the photo		N	Mean	SD
Attractiveness	Photo with description	122	24.3852	5.29688
	Photo without description	124	24.3952	5.42025
Trustworthiness	Photo with description	122	21.9344	4.02007
	Photo without description	124	22.5000	3.93958
Expertise	Photo with description	122	23.4918	5.23536
	Photo without description	124	23.6532	4.65046

The highest assessment was granted for attractiveness, which is understandable, because the analysed character is presented as the first digital supermodel, and for any supermodel, the attractiveness is the most important feature in influencing others. In order to verify whether the differences between these two groups are statistically significant, the Student t-test was conducted for independent samples.

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Table 3. The Student t-test for independent samples

Dimension of credibility		F	Significance	t	df	Significance (bilateral)
Attractiveness	Variance equality assumed	0.080	0.777	-0.015	244	0.988
	Variance equality not assumed			-0.015	243.989	0.988
Trustworthiness	Variance equality assumed	0.001	0.981	-1.114	244	0.266
	Variance equality not assumed			-1.114	243.675	0.266
Expertise	Variance equality assumed	1.327	0.250	-0.256	244	0.798
	Variance equality not assumed			-0.256	239.688	0.799

The Student t-test did not prove statistical significance. The reached numbers at $p > 0.05$ did not allow for rejecting the null hypothesis regarding the lack of difference between groups with the photo description and without it in any of the three analysed credibility dimensions. Therefore, there is no basis for accepting the detailed hypotheses, and consequently the general hypothesis cannot be accepted, either.

Apart from the comparison of the perceived credibility, the evaluation of the photo itself was also compared between two groups of respondents, with the use of the same procedure. The Student t-test showed statistical significance for two dimensions of the photo assessment: sad-funny ($t = -2.230$; $df = 232$; $p = 0.27$) and interesting-uninteresting ($t = 2.419$; $df = 238$; $p = 0.16$). The result of Cohen's d coefficient for measuring effect size for the first dimension (sad–funny) was 0.286, while for the latter it was 0.309, which confirms small, though statistically significant differences between the groups. It turned out that the photos with no description explaining the influencer was virtual were assessed as more interesting and funnier.

Conclusion, Limitations and Further Research

When it comes to assessing the source credibility, it is irrelevant whether recipients know (or not) if the character that they have contact with is virtual or real. What matters is the way of presenting her photo, the model's attractiveness, her ability to build both trustworthiness and expertise in the field of modelling, not her virtual origin. Companies operating in the fashion industry more and more frequently engage virtual influencers, using their image for supporting products

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they offer. It seems that the credibility of such influencers is not affected, even if they are commonly recognised as virtual characters. Taking into consideration the ethical aspects of cooperation with influencers and in order to avoid misleading consumers, virtual characters should be indicated as unreal ones. Companies should not be afraid that such indication will unfavourably affect the credibility of cooperation.

The research was conducted on the quite homogenous group of young consumers of content provided on social media. This group is by its nature more favourably disposed towards unconventional solutions. The ground-breaking nature of the research conducted in this field results from the fact that the phenomenon of virtual influencers is in the early stage of growth. As the upward trend continues, they will become more popular and recognizable, which will surely affect their perceived credibility, at least through the occurrence of the 'uncanny valley' effect that did not appear in our study, due to the low awareness of the virtual influencers' existence (Mori, McDormand & Kageki, 2012).

As the artificial intelligence and the robots become more and more ubiquitous in our society, virtual influencers may be a great new marketing tool, used by companies for launching their brands and building a specific and stable image. However, it is worth taking into account certain threats that may occur in the coming age of artificial influencers. Not every brand can benefit from using them. Contrary to real influencers, the number of virtual ones is still too small to gain the rich nuance effect and consequently the better match and compatibility with the brand. So far, the potential of virtual influencers has been mostly discovered and used in such businesses as technology, entertainment, and fashion. It would be interesting to compare the credibility of various virtual influencers from the macro to the micro category and to examine whether the mechanisms in the world of real influencers are equally affected in the case of virtual ones.

References

Adriani, R. (2019). The Evolution of Fake News and the Abuse of Emerging Technologies. *European Journal of Social Sciences*, *2*(1), 32–38.

Alassani, R., & Göretz, J. (2019, July). Product Placements by Micro and Macro Influencers on Instagram. In: *International Conference on Human-Computer Interaction* (pp. 251–267). Springer, Cham.

Aliaga Kuhnle, D. (2019). *A comparative analysis of CGI Instagram influencer*, @lilmiquela, and human Instagram influencer, @_emmachamberlain.

Arsenyan, J., & Mirowska, A. (2021). Almost human? A comparative case study on the social media presence of virtual influencers. *International Journal of Human-Computer Studies*, *155*.

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Bearden, W. O., Netemeyer, R. G., & Haws, K. L. (2011). *Handbook of marketing scales: Multi-item measures for marketing and consumer behavior research*, 237–316.

Bendoni, W., & Danielian, F. (2019, July). The Future of Influencer Marketing in the Digital Age of Virtual Influencers. In: *2019 Global Fashion Management Conference at Paris* (pp. 604–607).

Dahle, O., & Olsson, E. (2019). *The fake-real or the real-fake?* En bild-och innehållsanalys om Lil Miquela, Kenza och Johanna E. Olsson på Instagram.

Darner, A., & Arvidsson, N. (2019). *Virtual influencers: Anonymous celebrities on social media*.

Djafarova, E., & Rushworth, C. (2017). Exploring the credibility of online celebrities' Instagram profiles in influencing the purchase decisions of young female users. *Computers in Human Behavior*, *68*, 1–7.

Hoffower H. (June 19, 2019). There's new competition in town for influencers who can rake in as much as $1 million per Instagram post — and it isn't even human. *Business Insider*. Retrieved from https://www.businessinsider.com/virtual-influencers-versus-bloggers-celebrities-social-media-2019-6?IR=T (Last accessed: December 3, 2019).

Hovland, C., I., & Weliss, W. (1952). Source Credibility and effective communication. *Public Opinion Quarterly*, 16, 35–650.

Hsu, T. (June 17, 2019). These Influencers Aren't Flesh and Blood, Yet Millions Follow Them. *The New York Times*. Retrieved from https://www.nytimes.com/2019/06/17/business/media/miquela-virtual-influencer.html (Last accessed: December 3, 2019).

Kadekova, Z., & Holienčinová, M. (2018). Influencer Marketing as a Modern Phenomenon Creating a New Frontier of Virtual Opportunities. *Communication Today*, *9*(2).

Kietzmann, H. McCarthy, & Silvestre (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, *54*(3), 241–251.

Lim, P. L., & Yazdanifard, R. (2015). What internal and external factors influence impulsive buying behavior in online shopping? *Global Journal of Management and Business Research*.

Luitse, D. (2009). *AI Influencers: Preaching to the Choir?* Masters of Media.

Mears A., Finlay W. (2005). Not Just a Paper Doll How Models Manage Bodily Capital and Why They Perform Emotional Labor. *Journal of Contemporary Ethnography*, *34*, 317–34.

Misasi, B. (2020). *How are virtual influencers perceived? A study across two industries*, http://tesi.luiss.it/28002/

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Mori, M., MacDorman, K. F., & Kageki, N. (2012). The uncanny valley [from the field]. *IEEE Robotics & Automation Magazine*, *19*(2), 98–100.

Moustakas, E., Lamba, N., Mahmoud, D. & Chandrasekaran, R. (2020). *Blurring lines between fiction and reality: Perspectives of experts on marketing effectiveness of virtual influencers*. Social Media Conference. 10.22619/IJCSA.

Ohanian, R. (1990). Construction and validation of a scale to measure celebrity endorsers' perceived expertise, trustworthiness, and attractiveness. *Journal of Advertising*, *19*(3), 39–52.

Park, G., Nan, D., Park, E. Kim K. J., Han, J. & del Pobil, A.P. (2021). *Computers as social actors? Examining how users perceive and interact with virtual influencers on social media*.

Robinson, B. (2020). Towards an ontology and ethics of virtual influencers. *Australasian Journal of Information Systems*, *24*.

Sheldon, P., & Bryant, K. (2016). Instagram: Motives for its use and relationship to narcissism and contextual age. *Computers in Human Behavior*, *58*, 89–97.

Tanzi, G. (2019). *Virtual ambassadors*, *is this new trend changing the video advertising landscape? A preliminary analysis of the Renault Kadjar case*.

Ting, H., Ming, W. W. P., de Run, E. C., & Choo, S. L. Y. (2015). Beliefs about the use of Instagram: An exploratory study. *International Journal of Business and Innovation*, *2*(2), 15–31.

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Cashier-Free Supermarkets and Consumer Emotions

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Abstract

AI technology has changed the retail shopping experience, with several supermarket chains investing in cashier-free store formats. Using a real store, the present paper examines how the new technology impacts young consumers' affective responses, including in cases of service disruptions. The results of an exploratory experiment (N = 151) indicate that compared to the traditional self-checkout supermarket, the cashier-free technology is well accepted by young consumers, who find it more empowering and exciting, more useful, easier to understand and use. Contrary to our expectations, consumers are not highly concerned about their privacy while using the cashier-free technology and have similar affective and behavioural reactions to technical problems that may arise in the store. Implications for retailers who plan to invest in cashier-free stores are discussed.

Keywords: AI, cashier-free, consumer emotions

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Introduction

"...technology can assimilate people while at the same time it isolates them;
it can provide a sense of control and at the same time feelings of ineptitude;
it can facilitate involvement and activity between people,
while it can simultaneously lead to disconnection and passivity..."
(Bitner, 2001, p. 377)

The retail industry, and particularly the supermarket sector, has seen significant innovations in recent years with the introduction and application of several AI technologies. AI in this context is defined as "the application of self-learning and self-upgrading systems, along with other technological support (e.g. big data, deep learning, vision sensors) in brick-and-mortar settings that enables a (fully- or semi-) checkout-free shopping experience and automatically charges consumers through their connected account(s)" (Cui, van Esch & Jain, 2021, p. 2).

Older technologies such as self-service checkout systems – machines that allow consumers to complete their own checkout and payment at the end of the shopping trip, thus replacing the cash registry attendant – are by now considered a common part of a traditional supermarket format (GVR, 2020). The introduction of the "Just Walk-Out Technology" (JWOT) by Amazon in 2018 in their Amazon Go stores (Nishihara, 2018) dramatically revolutionised the industry by creating a new supermarket concept without a physical cashier system (cashier-free). JWOT is based on a combination of computer vision, deep-learning algorithm and sensors and completely eliminates the traditional checkout process (Amazon.com, n.d.). Through its sensors, JWOT automatically recognises if products are taken from or returned to the store's shelves and keeps track of them in a virtual cart.

Following Amazon's example, several retailers in Europe invested in similar technologies. In 2019, the Dutch supermarket chain Albert Heijn introduced an autonomous mini supermarket Albert Heijn to go (Clark, 2019), while Lifvs opened a series of unmanned supermarkets in remote rural areas in Sweden (Phillips, 2020). In 2019, the Portuguese retailer Jeronimo Martins launched Pingo Doce & Go Nova (ESM, 2019). The technology behind this new concept is a mix of Near Field Communication (NFC) and computer vision (Outsystems, n.d.). After installing a smartphone application, customers can enter the store by scanning a QR code. Once inside the store, the NFC technology allows consumers to scan the products that they want to buy, using their phone, and place the goods in their basket. Those are stored automatically into a virtual shopping cart that can be paid instantly, through the credit card associated with the application, without waiting in a queue or going through a physical cashier registry.

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Besides reducing costs and increasing profitability for the retailer (Chuawatcharin & Gerdsri, 2019; Kumar, Ramachandrana, & Kumar, 2021; Inman & Nikolova, 2017; Meuter, Bitner, Ostrom, & Brown, 2005), these technologies aim to enhance the grocery shopping experience for customers through delivering consistent service and saving time in the usually lengthy checkout process (Bitner, 2001). This is important, as the shopping experience itself is key in attracting consumers and increasing revenues for the retailer (Yakhlef, 2015).

The cashier-free store format is a trend that is expected to continue, with the majority of supermarkets presenting similar technology concepts, prioritising the consumers' desire to reduce checkout time through the application of technology (Portell & Ghandi, 2019). However, investment in these technologies is high (Duprey, 2019). As such, it becomes critical to understand the consumers' response to this changing shopping environment. A positive checkout experience leads to higher customer appreciation of the shopping experience, contributing positively to satisfaction and loyalty (Hasan & Mishra, 2015).

The present exploratory study aims to understand consumers' perceptions and emotions around this new format of the supermarket checkout process. As such, it answers the call and addresses a research gap highlighted by Kumar, Ramachandran and Kumar (2021) and by Ameen, Hosany and Tarhini (2021) to address the 'customer unknowns' in consumers' interaction with automated services. These unknowns include the impact of the new technology on the (mixed) emotions experienced by consumers while interacting with the technology, how and if these emotions impact behaviour and purchase decisions, and the impact of consumers' privacy concerns in their behaviour and interaction with the technology. More specifically, the present paper aims to answer the following question: is there a trade-off between the increased efficiency of the new high-tech/low-touch cashier-free checkout process and consumers' positive experience during shopping?

To address this question, we examine four dimensions of consumers' perceptions and emotions that can inform the shopping experience: overall perceptions of the ease and usefulness of the cashier-free technology, positive and negative emotions during the shopping experience and finally, emotional and behavioural reactions to a service interruption. Overall, we hypothesise that compared to a traditional self-checkout process, the cashier-free technology will be easier to use and will generate more positive emotions. However, we hypothesise that the low-touch character of the cashier-free technology will instigate negative emotions such as loneliness and frustration; feelings that will be more pronounced when faced with a problem inside the store.

More specifically, using the Technology Adoption Model (TAM; Davis, Bagozzi, & Warshaw, 1989), we consider consumers' perceptions on the ease of use and usefulness of the new technology. We hypothesise that consumers experience the cashier-free store as easier to use and more useful, compared to the tra-

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ditional self-checkout format (H1). Moreover, as the technology is still new and allows customers to take control of their in-store experience, we hypothesise that the cashier-free store will induce more positive feelings of excitement and empowerment (H2). At the same time, as this AI retail technology is likely to exacerbate consumers' privacy concerns (Grewal, Gauri, Roggeveen, & Sethuraman, 2021), we expect consumers to feel more strongly that they are being observed while in the store (H3a). Finally, a central characteristic of the cashier-free store is the absence of human presence and interaction. This loss of human connection is likely to be detrimental to a positive in-store experience, as there is a preference for human over technological interaction (Dabholkar & Bagozzi, 2002; Walker, Craig-Lees, & Francis, 2002), and consumers tend to find technological interactions less meaningful and less enjoyable (Curran & Meuter, 2007). As such, we hypothesise that consumers in a cashier-free store environment are likely to experience more loneliness and even helplessness, especially when encountering a service problem (H3b). In a self-service context, customers tend to hold machines to a higher operating standard than humans, are less tolerant of machine failures (Chen, Mohanty, Jiao, & Fan, 2021) and are more likely to blame failures on the company rather than on themselves (e.g. for pushing the wrong button), thus eliciting anger (Folkes, 1984). When a service failure takes place in an environment with reduced human presence, we hypothesise that consumers' negative reactions will be amplified: the consumers may experience a heightened sense of frustration and abandonment, with more intense feelings of anger (H4a) and thus will be more likely to "punish" the retailer with diminished re-patronage intent (H4b).

In-store Experience and Consumer Emotions

In their seminal paper on the Experience Economy, Pine and Gilmore (1998) highlighted the importance of innovative design, excellent marketing, and efficient delivery as the drivers of customers' experience. Customer participation has a key role in this experience, as the active interaction constructs and influences the experience itself (Pine & Gilmore, 1998). The connection between the customer and the business further enhances the experience, particularly in instances in which consumers are impressed by the shopping process and hence retain positive and long-term memories of this experience. Furthermore, the in-store experience can serve as a strong differentiator for retailers (Terblanche, 2018).

Hasan and Mishra (2015) highlight the shopping experience as a key driver influencing shopping behaviour in retail stores. This is also emphasised by Yakhlef (2015) who concludes that it is an instrumental factor in attracting consumers and increasing revenues. Satisfaction with the shopping experience increases referrals, profitability and even shareholder value (Anderson, Fornell, & Mazvancheryl, 2004; Anderson & Mittal, 2000). A factor that contributes to a positive shopping

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experience is the checkout process itself: a positive checkout experience makes customers appreciate their shopping experience more, positively contributing to satisfaction and loyalty (Lyu, Lim, & Choi, 2019). Thus, the cashier-free checkout process has the potential to become a key ingredient of the customer experience and a source of positive interactions.

However, in some cases, technologies such as the self-service checkout can create negative customer experiences, as these new systems might not be easy to understand (Demirci Orel & Kara, 2014). Chuawatcharin and Gerdsri (2019) highlight the role of the perceived ease of the use of the new retail technology in influencing attitudes which, in turn, influence the behavioural intention to use the technology. In the retail environment context, customer satisfaction has been found to be strongly driven by customers' emotions. This is pivotal, as satisfaction is a strong predictor of re-patronage intentions (Terblanche, 2018). Positive emotions are found to influence satisfaction more strongly than negative emotions (Rychalski & Hudson, 2017). Thus, eliciting positive emotions in the in-store experience becomes important in the long-term success of the retailer.

Methodology

A between-subjects online experiment was conducted among 151 graduate students (M_{age} = 22.4, SD = 1.98; Female: 65.6%) who participated in exchange for course credit. Participants were randomly assigned to one of two experimental conditions: (a) cashier-free checkout and (b) traditional self-service checkout technology. In both types of conditions, the questions focused on a real supermarket chain that is very well known and offers both types of stores, to allow for direct comparison without confounding effects.

In both types of conditions, the respondents were asked to indicate how frequently they visit the respective store (cashier-free or traditional, depending on the condition). The respondents who indicated "never" in either condition were terminated. All the respondents reported their perceptions regarding the ease of the use of the respective technology (cashier-free vs traditional self-checkout) and other functional benefits, such as: time-saving, easy to understand or likely to make mistakes or need assistance, as well as a range of positive and negative emotions elicited by their experience in the store.

Finally, the respondents were presented with a hypothetical scenario of a problem encountered in the store and were asked to report their reaction to this service disruption. Specifically, they were asked to rate their anger level, ranging from annoyance to rage. The scenario was the following: *"The only thing you really want right now is a strong coffee. You can't wait to taste it, especially since you haven't had one all day, and you're dying for a cup of coffee. It's your reward for studying so hard. You enter [respective store] and walk to the coffee machine and you are*

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so excited to finally get the coffee you've been dreaming of. You put your cup in the designated space and press the button. But nothing comes out. You press the button again, but again, nothing comes out. The machine is broken!"

Results

Ease of Use, Usefulness and Other Functional Benefits

Confirming our first hypothesis (H1), compared to the traditional self-checkout (M = 4.06, SD = 1.04), respondents found the cashier-free store format easier to use (M = 4.68, SD = 0.71, $t(138)$ = -4.289, p = 0.000). Similarly, the cashier-free store format was described as more useful (M = 4.57, SD = 0.78) and easy to understand (M = 4.57, SD = 0.84) than the traditional store self-checkout (M = 4.24, SD = 0.98, $t(147)$ = -2.291, p = 0.023; M = 4.10, SD = 0.78, $t(147)$ = -3.052, p = 0.003, respectively). Similarly, respondents reported being less likely to make mistakes (M = 1.90, SD = 1.09) or to require assistance (M = 1.65, SD = 1.01) when using the cashier-free technology rather than the traditional self-checkout (M = 2.29, SD = 1.19, $t(149)$ = 2.094, p = 0.038; M = 2.19, SD = 1.11, $t(149)$ = 3.100, p = 0.002, respectively).

It is interesting to note that, despite assuming that a key benefit of the cashier-free store format is saving time in the checkout process, the respondents did not report significant differences in this respect. The cashier-free store (M = 4.26, SD = 0.77) was equally highly rated in terms of time saving as the traditional self-checkout (M = 4.05, SD = 1.31, $t(138)$ = -1.365, p = 0.174).

Table 1. Summary of t-test results regarding the ease of use and other functional benefits

	Self-checkout		Cashier-free				
	M	SD	M	SD	t-test	df	p value
Overall, I find […] useful in my daily life.	4.24	0.98	4.57	0.78	-2.291	147	0.023
Overall, I find […] easy to use.	4.06	1.04	4.68	0.71	-4.289	138	0.000
My interaction with the technology of […] is easy to understand.	4.10	1.05	4.57	0.84	-3.052	147	0.003
Using […] saves my time.	4.05	1.13	4.26	0.77	-1.365	138	0.174
I make errors when using […].	2.29	1.19	1.90	1.09	2.094	149	0.038
I need to ask for assistance when I walk into […].	2.19	1.11	1.65	1.01	3.100	149	0.002

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Positive and Negative Emotions

Supporting our second hypothesis (H2), compared to the traditional self-checkout (M = 3.77, SD = 0.85), the respondents in the cashier-free store format were more likely to describe feeling "good" during the shopping experience (M = 4.35, SD = 0.73, $t(149)$ = -4.439, p = 0.000). Similarly, the respondents in the cashier-free store format reported feeling more empowered *(*M = 3.39, SD = 1.11) and excited (M = 3.24, SD = 1.14) than in the traditional store self-checkout (M = 2.65, SD = 1.12, $t(149)$ = -4.092, p = 0.000; M = 2.57, SD = 1.07, $t(149)$ = -3.698, p = 0.000, respectively).

On the contrary, we find no support for hypotheses H3a and H3b, as there were no significant differences in terms of negative feelings experienced. Respondents in the cashier-free store format did not report significantly different levels of feeling observed (M = 2.54, SD = 1.32), lonely (M = 1.69, SD = 0.82) or helpless (M = 1.64, SD = 0.92) in the store, compared to those in the traditional checkout condition (M = 2.20, SD = 1.15, $t(141)$ = -1.677, p = 0.096; M = 1.81, SD = 1.01, $t(149)$ = 0.768, p = 0.444; M = 1.61, SD = 0.90, $t(149)$ = -0.211, p = 0.833, respectively).

Service Disruptions: Emotion and Behaviour

Contrary to our fourth hypothesis (H4a), the cashier-free store format did not induce stronger negative reactions in the case of a service disruption. Respondents in the cashier-free store format reported similar anger levels (M = 2.01, SD = 0.74) to those of the respondents in the traditional checkout condition (M = 1.97, SD = 0.66, $t(149)$ = -.344, p = 0.731).

Table 2. Summary of t-test results on behavioral responses to a service disruption

	Self-checkout		Cashier-free				
	M	SD	M	SD	t-test	df	p value
I wouldn't know what to do.	2.01	1.245	1.81	1.083	1.086	149	0.279
I would continue my shopping trip without a coffee.	2.62	1.435	2.24	1.409	1.657	149	0.100
I would make a complaint in the app.	1.25	0.707	1.35	0.695	-0.823	149	0.412
I would leave the store without buying anything.	2.52	1.28	2.74	1.492	-0.956	141	0.341
I would ask one of the employees for help.	4.15	1.087	4.38	1.093	-1.256	149	0.221
I would ask the security guard for help.	2.59	1.581	3.29	1.578	-2.707	149	0.008
I would be willing to shop at the store again.	4.37	0.894	4.42	0.884	-0.342	149	0.733

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Additionally, consumers' expected behavioural responses to the service disruption produced no significant difference between the two conditions, with only one exception (Table 2) (H4b). For instance, respondents in the cashier-free store format reported being equally likely to return to the store in the future following the negative incident ($M = 4.42$, $SD = 0.88$) as respondents in the traditional checkout conditions ($M = 4.37$, $SD = 0.89$, $t(149) = -0.342$, $p = 0.733$). Similarly, the respondents in both the cashier-free ($M = 4.38$, $SD = 1.09$) and traditional self-checkout conditions ($M = 4.15$, $SD = 1.09$, $t(149) = -1.256$, $p = 0.211$) were equally likely to ask an employee for help. However, the respondents in the cashier-free store format were more likely to also ask the security guard for help ($M = 3.29$, $SD = 1.58$) than in the traditional checkout conditions ($M = 2.59$, $SD = 1.58$, $t(149) = -2.707$, $p = 0.008$).

Discussion and Conclusion

The present study has explored the impact that new AI technology, and specifically the cashier-free store, can have on customer's affective responses in a supermarket environment. The results of the study indicate that consumers regard the cashier-free checkout as easier and more useful than the traditional self-checkout format. Surprisingly, they do not perceive it as more time-saving. The cashier-free checkout elicits stronger positive feelings of excitement and empowerment, while it does not elicit more pronounced negative emotions, such as loneliness, helplessness or of being observed. Additionally, we find that – contrary to our expectations – in the case of a service disruption, the respondents' affective reactions are similar, with the respondents in both conditions reporting similar levels of anger, but also willingness to return to the store in the future.

Perceptions of the ease of use and usefulness are strong predictors of the acceptance of a new technology, according to the Technology Acceptance Model (Davis et al., 1989). As such, it indicates that the cashier-free store format is highly accepted by respondents, with positive implications for retailers who are considering investments in this store format. Despite the fact that this technology is new, the respondents report feeling very at ease with it and find it easier to use and understand, and also more useful overall. A surprising finding is that it is not perceived to save time during shopping, even though this benefit is considered a main driver for retailers. It is likely that consumers underestimate the time that they typically spend in the store, or that indeed having to scan each item separately makes the shopping visit feel equally lengthy. It is also possible that even though the total time spent in the store may be the same, the level of the ease of the experience outweighs any time savings, and thus results in more positive perceptions of ease and usefulness for the cashier-free store format overall. For retailers considering including the cashier-free format in their portfolio, focusing on the ease

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of use and usefulness may prove better avenues than highlighting the time-savings when trying to incentivise customers to visit the store.

The consumers were more likely to feel more empowered and excited about their shopping in the cashier-free store format. This may be driven by the uniqueness of the technology, which is still new and thrilling. This finding corroborates similar conclusions by Cui et al. (2021), who found increased excitement in the cashier-free shopping environment. As positive emotions in the shopping environment have been linked to higher satisfaction and loyalty, the more heightened positive emotions registered by the present study are very encouraging for retailers about to invest in this technology.

Equally encouraging is the lack of more pronounced negative emotions. Of special interest is the finding that respondents did not feel more 'observed' in the cashier-free environment. This might indicate that younger consumers might not be strongly concerned with privacy issues related to this kind of technology. Retailers can focus on these positive emotional responses when trying to attract consumers, as the shopping experience promises to be more exciting and empowering.

Finally, a service disruption does not seem to elicit disproportionately more negative emotional reactions in the cashier-free store format. This may stem from the fact that the increased perceived control that the technology allows for enhances their tolerance for frustration (Skinner, 1996). However, it is important to highlight an important difference in consumers' responses in this service failure context. The respondents in the cashier-free store condition were more likely to ask a security guard for help with their service problem, even though the security guard's job is clearly not to solve technical problems. This highlights the importance of having knowledgeable employees (regardless of their role) present in the space, rather than a high-tech store that seems to run on its own. This echoes Zhu, Nakata, Sivakumar, and Grewal (2013), who caution against fully automated and unstaffed stores. When faced with a service problem, consumers will instinctively reach out to the nearest human being. In order to ensure a positive shopping experience, retailers should invest in training all store employees on protocols for dealing with technical issues.

Limitations and Future Research

To our knowledge, this is one of the first studies that empirically test consumers' responses to this new retail technology using a real store. Despite the contributions it makes to our understanding of customer perceptions and emotions of this technology, it has several limitations which lend themselves to further research.

The main limitation comes from the age of the sample used. Younger people tend to be more accepting of new technologies and to feel more at ease with digital ap-

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plications. Replicating the study with an older audience would give a better indication of how this technology is perceived more broadly. Issues of privacy, which did not seem to be more pronounced among the younger audience, may be more critical for an older target group. It would also be of theoretical interest to explore further where the younger consumers' lack of privacy concerns stem from, for instance, general ease with technology and information sharing or the lack of understanding of how the technology works and the personal information that is collected.

Further research can focus on the outcomes of the positive emotions that were identified, including the impact on the average spending per trip and willingness to recommend the store. Additional avenues can also be explored by using a retail environment other than a supermarket, such as a clothing retailer.

References

Amazon.com. (n.d.). *Amazon Go*. Retrieved from https://www.amazon.com/b?node=16008589011. Accessed June 3, 2021.

Ameen, N., Hosany, S., & Tarhini, A. (2021). Consumer interaction with cutting-edge technologies: Implications for future research. *Computers in Human Behavior*, *120*(106761), 1–7.

Anderson, E. W., & Mittal, V. (2000). Strengthening the satisfaction-profit chain. *Journal of Service Research*, *3*, 107–120.

Anderson, E. W., Fornell, C., & Mazvancheryl, S. K. (2004). Customer satisfaction and shareholder value. *Journal of Marketing*, *68*, 172–185.

Bitner, M. J. (2001). Service and technology: Opportunities and paradoxes. *Managing Service Quality: An International Journal*, *11*(6), 375–379.

Chen, N., Mohanty, S., Jiao, J., & Fan, X. (2021). To err is human: Tolerate humans instead of machines in service failure. *Journal of Retailing and Consumer Services*, *59*(102363), 1–11.

Chuawatcharin, R., & Gerdsri, N. (2019). Factors influencing the attitudes and behavioral intentions to use just walk out technology among Bangkok consumers. *International Journal of Public Sector Performance Management*, *5*(2), 146–163.

Clark, S. (2019). *Albert Heijn opens cashier-free supermarket in the Netherlands.* Retrieved from https://www.nfcw.com/2019/09/10/364316/albert-heijn-opens-cashier-free-supermarket-in-the-netherlands. Accessed September 10, 2021.

Cui, Y., van Esch, P., & Jain, S. P. (2021). Just walk out: the effect of AI-enabled checkouts, *European Journal of Marketing*, Advance online publication.

Curan, J. M., & Meuter, M. L. (2007). Encouraging existing customers to switch to self-service technologies: Put a little fun in their lives. *The Journal of Marketing Theory and Practice 15*(4), 283–298.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Dabholkar, P. A., & Bagozzi, R. P. (2002). An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors. *Journal of the Academy of Marketing Science*, *30*(3), 184–201.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Demirci Orel, F., & Kara, A. (2014). Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. *Journal of Retailing and Consumer Services*, *21*(2), 118–129.

Duprey, R. (2019). *Amazon wants to license its cashier-free payment technology*. Retrieved from https://www.fool.com/investing/2019/10/03/amazon-wants-to-license-its-cashier-free-payment-t.aspx. Accessed September 6, 2021.

European Supermarket Magazine (ESM). (2019). *Pingo Doce opens its first check-out-free supermarket in Lisbon*. Retrieved from https://www.esmmagazine.com/technology/pingo-doce-tests-its-first-till-free-supermarket-in-lisbon-81017. Accessed September 6, 2021.

Folkes, V. S. (1984). Consumer reactions to product failure: An attributional approach. *Journal of Consumer Research*, *10*(4), 398–409.

Grand View Research (GVR). (2020). *Self-checkout systems market size, share & trends analysis report by components (systems, services), by type (cash based, cashless), by application, by region, and segment forecasts, 2020–2027*. Retrieved from https://www.grandviewresearch.com/industry-analysis/self-checkout-systems-market. Accessed September 2, 2021.

Grewal, D., Gauri, D. K., Roggeveen, A. L., & Sethuraman, R. (2021). Strategizing retailing in the new technology era. *Journal of Retailing*, *97*, 6–12.

Hasan, A., & Mishra, S. (2015). Key drivers influencing shopping behavior in the retail store. *The IUP Journal of Marketing Management*, *9*(3), 7–36.

Inman, J. J., & Nikolova, H. (2017). Shopper-facing retail technology: A retailer adoption decision framework incorporating shopper attitudes and privacy concerns, *Journal of Retailing*, *93*(1), 7–28.

Kumar, V., Ramachandrana, D., & Kumar, B. (2021). Influence of new-age technologies on marketing: A research agenda. *Journal of Business Research*, *125*, 864–877.

Lyu, F., Lim, H., & Choi, J. (2019). Customer acceptance of self-service technologies in retail: A case of convenience stores in China. *Asia Pacific Journal of Information Systems*, *29*(3), 428–447.

Meuter, M. L., Bitner, M. J., Ostrom, A. L., & Brown, S. W. (2005). Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies. *Journal of Marketing*, *69*(2), 61–83.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Nishihara, N. (2018). *"Just Walk Out" with Amazon and the Internet of Thinking*. Retrieved from https://www.accenture.com/us-en/blogs/technology-innovation/nishihara-future-retail-internet-of-thinking. Accessed September 3, 2021.

Outsystems (n.d.). *Inside supermarket giant*, *Jerónimo Martins' store of the future experiment*. Retrieved from https://www.outsystems.com/case-studies/jeronimo-martins-store-of-the-future. Accessed December 15, 2021.

Phillips, T. (2020). *Lifvs brings unmanned supermarkets to rural communities*. Retrieved from https://www.nfcw.com/2020/09/08/367784/lifvs-brings-unmanned-supermarkets-to-rural-communities. Accessed September 10, 2021.

Pine, J., & Gilmore, J. (1998). Welcome to the experience economy. *Harvard Business Review*, 97–105.

Portell, G., & Ghandi, S. (2019). *Retailers are ignoring consumer expectations around retail technology*. Retrieved from https://www.kearney.com/consumer-retail/article/?/a/retailers-are-ignoring-consumer-expectations-around-retail-technology?utm_source=PRNewswire&utm_medium=pr&utm_term=CIRP&utm_campaign=2019AmericasRetailTech&utm_content=. Accessed September 8, 2021.

Rychalski, A., & Hudson, S. (2017). Asymmetric effects of customer emotions on satisfaction and loyalty in a utilitarian service context. *Journal of Business Research*, *71*, 84–91.

Skinner, E. A. (1996). A guide to constructs of control. *Journal of Personality and Social Psychology*, *71*(3), 549–570.

Terblanche, N. (2018). Revisiting the supermarket in-store customer shopping experience. *Journal of Retailing and Consumer Services*, *40*, 48–59.

Walker, R. H., Craig-Lees, M., Hecker, R., & Francis, H. (2002). Technology-enabled service delivery: An investigation of reasons affecting customer adoption and rejection. *International Journal of Service Industry Management*, *13*(1), 91–106.

Yakhlef, A. (2015). Customer experience within retail environments an embodied spatial approach. *Marketing Theory*, *15*(4), 545–564.

Zhu, Z., Nakata, C., Sivakumar, K., & Grewal, D. (2013). Fix it or leave it? Customer recovery from self-service technology failures. *Journal of Retailing*, *89*(1), 15–29.

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Influence of Haptic Feedback on the Perception of Product Placement in a Virtual Reality Simulation

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Abstract

Virtual reality (VR) simulations provide a new environment for the creative placement of products and brands, which can be experienced by consumers with the senses of sight, hearing and recently – touch. This chapter presents the results of an experimental study that aimed to investigate the relationships between the presence of haptic feedback in a VR simulation and consumers' evaluations of a brand placed in a simulation, the simulation and a fit between a simulation and brand placement. The results indicate that the presence of haptic feedback does not impact the noticeability of brand placement, but it affects the evaluation of the simulation's attractiveness. The evaluation of a brand and the brand–simulation fit depended on the presence of haptic feedback only in the case of male participants.

Keywords: product and brand placement, haptic feedback, virtual reality

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Introduction

Product placement, also known as "brand placement", can be defined as "the intentional, paid inclusion of products, services, brands and/or brand identifiers into media content" (Chen and Deterding, 2013, pp. 42–43). It is an immensely popular marketing communications technique, which became very sophisticated. Nowadays, the popularity of product placement is due to marketers' reaction to increasing clutter, which adversely affects the effectiveness of traditional advertising, audience fragmentation and the availability of advertising – avoiding technologies. Its longevity through re-runs and, currently, retroactive placement in already finished content make product placement a more cost-efficient option. As a result, product placement spending in the US alone exceeded 11 billion dollars in 2019, the ninth consecutive year of double-digit growth, a pattern which is observed worldwide (PQ Media, 2019). Product placement appears in movies, TV shows, games and, increasingly, in online content, and it is typically used to enhance brand awareness, recall and to positively impact brand perceptions. Research shows that product placement is more preferable to advertisements, as it enhances realism, is perceived less irritating and obtrusive, provides context and sense of familiarity, especially when subtly woven into the storyline. As viewers avoid advertising and opt for ad-free possibilities, advertisers creatively adapt to new media formats allowed by innovative technologies, such as streaming services, mobile games and virtual reality. The latter one, being a relative newcomer to the media landscape, is the least researched medium of marketing communications, which offers advertisers unique opportunity to impact multiple senses, such as sight, hearing, and recently – smell and touch. This research focuses on the sense of touch and investigates the impact of haptic feedback on the perception of a brand in a virtual reality simulation.

Literature Review

Product Placement

Product placement constitutes an impressive research stream in marketing literature (Taylor, 2009), yet the process by which placements impact attitudes towards featured brands remains unclear (Balasubramanian et al., 2014). The results of studies of the effects of placements on brand attitudes are mixed, suggesting other variables, such as sensory modality, repetition and perceived intrusiveness or fit (congruency) with the plot might influence recall, attitudes and intentions (Balasubramanian et al., 2006).

A study by Gillespie, Muehling and Kareklas (2017) revealed that product placement congruent with the narrative's story structure and the elicited affective tones produced more favourable brand attitudes. Yet, studies of product placement

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in the new media are still limited, with major findings coming from computer/video and online games. The main variables studied in the context of games are brand recall, brand attitudes, brand recognition and behavioural intentions of consumers. Among the new media, innovations in virtual reality (VR) provide marketers with new opportunities and applications. Global market for virtual environments (virtual and augmented reality in particular) is forecasted to grow from 27 billion U.S. dollars in 2018 to 209.2 billion U.S. dollars in 2022 (Statista, 2018). Although research on VR dates back to the 1990s, there is still a shortage of studies on the application and use of VR in marketing, as indicated in a comprehensive study by Loureiro et al. (2019). Along several research streams identified by these authors, from the perspective of the current study, the most important are located in the area of communications and social media (Loureiro et al., 2019). Of particular significance are studies of the application of VR in advertising, which focus on comparing the effects of traditional brand communications with VR brand communications (Loureiro et al., 2019). Available findings indicate the positive effects of VR use on purchase intentions (Li, Daughert, and Biocca, 2002; Suh and Lee, 2005; Verhagen et al., 2015). The mediating effects are associated with brand attitude (Dobrowolski et al., 2014) and knowledge (Mitra, Raymond, and Hopkins, 2008; Suh and Lee, 2005), which result from the increased affective dimension of the VR experience. VR seems to be a promising technology for communicating experience-based attributes of products, which require touching prior to purchase (Jiang and Benbasat, 2004). Products presented in VR are better evaluated and understood compared to traditional media, such as print and video (Grudzewski et al., 2018). Immersing in VR simulations, consumers enjoy visual and functional control (Jiang and Benbasat, 2004), allowing for the inspection of products and diagnosing their attributes before purchase. VR's functional interactivity and vividness may induce flow (Jiang and Benbasat, 2004; Li et al., 2002). It also provides better perceived product tangibility through cognitive access to extended product cues (Verhagen et al., 2014). When sensory stimulation is considered, the majority of available studies concentrate on sight and vividness (imagery richness) of simulations. It is an important factor allowing for more realistic product presentations (Cheng, Chieng, M.H. and Chieng., W.H 2014). Vividness is associated with more positive and enduring brand attitudes, stimulating purchase intentions and triggering impulse purchases (Cauberghe, Geuens, and DePelsmacker, 2011). Stimulation of other senses is sporadically studied. However, a study by Cheng, Chieng, M.H. and Chieng., W.H (2014) suggests that vividness can be positively affected by the presence of sound.

The Sense of Touch

The role of the sense of touch is sporadically studied in marketing, especially in the context of brand communication. A study by Peck and Wiggins (2006) found

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that messages incorporating a touch element are perceived as more persuasive when touch stimulates neutral or positive sensory feedback. The opportunity to touch an object also induces a stronger sense of its ownership and perception of control (Peck, Berger, and Webb, 2013). Research indicates that the opportunity to touch products had persuasive influence on consumers' attitudes and behaviour (Peck and Wiggins, 2006). Peck and Wiggins (2006) propose that touch can create an affective response, influencing consumers' decision-making. Positive affective responses were found to influence attitudes towards ads and brands (Burke and Edell, 1989).

Individuals differ in their need for touch (NFT), that is, preferences for extracting and using information obtained through touch. The NFT has two dimensions: instrumental and autotelic (Peck and Childers, 2003). Individuals with strong instrumental NFT use touch to gather relevant information about products, when other means are not present. Individuals with strong autotelic NFT are more focused on sensory aspects of touch as an end to itself and a source of pleasure (Peck and Childers, 2003). A study by Peck and Wiggins (2006) indicated that a message incorporating a touch element without a product attribute was more persuasive for people with strong autotelic NFT compared to a message without a touch element. There is a rather limited body of evidence when it comes to the new media, in particular in the context of immersive environments, such as virtual reality. Studies conducted in the area of computer and video games suggest that the more senses are stimulated, especially hearing and touch, the higher the sense of presence (Dinh et al., 1999). Serrano, Banos and Botella (2016) found that stimulation of sense of touch could improve the efficacy in virtual reality, as it provides more sensory information. Despite the popularity of haptic applications and increased interactions of consumers with them through various products and technologies, there is little theoretical discussion and empirical enquiry into the role of haptic stimuli in the consumers' evaluation of products, brands and various forms of marketing communications.

Research Method

The main aim of the study was to test whether the presence of haptic feedback in a VR simulation impacts the noticeability of brand placement, perception of both the brand and the simulation, and the perceived fit between the brand and the simulation. Additionally, we investigated whether variables, such as gender, previous experience with VR, and need for touch differentiate evaluations of simulation, placed brand, and the perceived fit between the brand and the simulation. The following research hypotheses were formulated:

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H1: The presence of haptic feedback in a VR simulation increases the noticeability of a brand placed in this simulation.
H2: The presence of haptic feedback in a VR simulation positively affects the evaluation of the simulation.
H3: The presence of haptic feedback in a VR simulation positively impacts the evaluation of a brand placed in this simulation.
H4: The presence of haptic feedback in a VR simulation positively impacts the perceived fit of a brand placed in the simulation.

In order to achieve the above stated aims of the study, an experiment was conducted, with HTC VIVE PRO VR goggles (AMOLED displays 2880 x 1600 resolution, 1440 x 1600 for each eye), internally built-in headphones, head size regulation, point of focus correction, gyroscope, accelerometer two controllers, two cameras to track movement, and a computer with a i7 processor and GeForce GTX1070 graphic card. An existing VR simulation of cutting vegetables and fruit in a kitchen was adapted for the study. The space was designed to be visually neutral, not to distract the participants and focus them on the task. Movable objects, such as a cutting board, a knife, a bowl, a plate, fruit, vegetables and a shopping bag with a logo of the discount store Lidl (chosen due to very high awareness of it among young consumers), were placed on a centrally located kitchen counter (Figure 1). The fruit and vegetables were programmed to be cut, with an additional copy of each appearing every 30 seconds after its removal from its designated location. The knife was programmed to appear on the counter after 10 seconds every time after falling to the floor (if not picked up). These two mechanisms were programmed to avoid the lack of objects to perform the task. The manual controllers allowed for holding objects and interacting with them. They also provided haptic feedback of programmed interactions in a simulation, as a single vibration signal (≈0,5 seconds) of a HTC Vive Pro controller during interaction (cutting) between objects (fruits and vegetables) and a tool (knife) to arouse a feeling similar to a real activity. Audio stimulation through headphones included peaceful, non-characteristic music, and realistic sounds of cutting objects. The participants were tasked with cutting the fruit and vegetables on the counter. Additionally, they could place them in a bowl, as if they assembled a salad. The simulation was prepared in two variants – with haptic feedback and without it. Prior to entering the simulation, the participants were pretested for their previous VR experiences, shopping for groceries, and need for touch (NFT). After answering and receiving instructions from a researcher, they spent 3 minutes in the VR simulation, performing the task. Having completed it, they responded to a questionnaire concerning the placement of the Lidl brand, evaluated the simulation, the brand and the fit between them.

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Figure 1. Test environment for an experiment in VR (made by author)



63 undergraduate students were randomly assigned to one of two experimental groups – without haptic feedback (32) and with haptic feedback (31). This demographic group is considered to be a suitable subject for the study, as they consume media intensively and constitute the primary target for innovative technologies (Khalbous et al., 2013).

23 males and 40 females participated in the experiment. All participants declared to shop for groceries, 25 had previous experiences with VR technology (18 admitting that it was just a single encounter). Measurement items were extracted from published research. Attitudes towards brands and brand placement were measured with the scale adapted from Mitchell and Olson (1981), and the perceived fit between simulation and brand was measured with a scale adapted from Balasubramanian et al. (2014). The need for touch was measured with the NFT scale by Peck and Childers (2003) (Cronbach's alpha for the sample was 0.93). The participants responded, using the 7-point Likert scale (M = 4.07; SD = 1.13).

Table 1. NFT scale

	Strongly disagree	Disagree	More or less disagree	Undecided	More or less agree	Agree	Strongly agree	Mean
I place more trust in products that can be touched before purchase.	0.00%	11.11%	9.52%	3.17%	34.92%	30.16%	11.11%	4.97
I feel more comfortable purchasing a product after physically examining it.	1.59%	6.35%	7.94%	3.17%	26.98%	41.27%	12.70%	5.22

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If I can't touch a product in the store, I am reluctant to purchase the product.	1.59%	20.63%	20.63%	20.63%	22.22%	12.70%	1.59%	3.86
I feel more confident making a purchase after touching a product.	1.59%	7.94%	11.11%	7.94%	31.75%	28.57%	11.11%	4.90
The only way to make sure a product is worth buying is to actually touch it.	7.94%	30.16%	11.11%	12.70%	19.05%	17.46%	1.59%	3.63
There are many products that I would only buy if I could handle them before purchase.	1.59%	12.70%	20.63%	14.29%	25.40%	19.05%	6.35%	4.32
Walking through stores, I can't help touching all kinds of products.	15.87%	25.40%	17.46%	14.29%	12.70%	11.11%	3.17%	3.29
Touching products can be fun.	4.76%	20.63%	6.35%	19.05%	12.70%	25.40%	11.11%	4.35
When browsing in stores, it is important for me to handle all kinds of products.	4.76%	7.94%	20.63%	14.29%	33.33%	15.87%	3.17%	4.24
I like to touch products, even if I have no intention of buying them.	22.22%	26.98%	11.11%	6.35%	14.29%	15.87%	3.17%	3.24
When browsing in stores, I like to touch lots of products.	6.35%	28.57%	22.22%	7.94%	14.29%	14.29%	6.35%	3.63
I find myself touching all kinds of products in stores.	11.11%	33.33%	22.22%	4.76%	17.46%	7.94%	3.17%	3.21

Results

Among 82% (52) of the participants, who noticed the brand placed in the simulation, 48 correctly identified Lidl, 3 declared that they saw Ikea and 1 identified the brand as Tesco. Confusing Lidl's logo with Ikea's possibly resulted from their similarity (dominated by the same colours). In order to test hypothesis H1 (the presence of haptic feedback in a VR simulation increases the visibility of a brand placed in this simulation), a pivot table for percentage distribution in two groups was prepared (without and with haptic feedback). The relationship between the noticeability of brand placement and stimulus exposure was tested with a chi-squared test.

A null hypothesis of independence between variables and an alternative hypothesis of the lack of independence were formulated. The $\chi 2$ test value was 1.100 ($p = .292$, $df = 1$), allowing one not to reject the null hypothesis and to conclude about the lack of dependence between variables. We checked whether greater sensitivity to touch changes the noticeability of brand placement, dividing the respond-

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ents, according to the NFT results, into two groups: with low-autotelic NFT (N = 31; M = 3.13; SD = .68) and high-autotelic NFT (N = 30; M = 5.03; SD = .62).

Table 2. Noticeability of brand placement and haptic feedback in the context of low and high NFT (Need for Touch scale)

		Low autotelic NPT (M < 4)		High autotelic NPT (M > 4)	
		Have you noticed any brand/product placed in the simulation?		Have you noticed any brand/product placed in the simulation?	
	Group	Yes	No	Yes	No
Stimulus type	without haptic feedback	12	1	14	3
	with haptic feedback	13	4	11	3
Total		25	5	25	6

The differences between the groups with simulation with and without haptic feedback in the case of low and high autotelic NPT were determined as statistically insignificant (M < 4: p = .59, χ^2 = .29, df = 1; M > 4: p = .46, χ^2 = .53). Hence, the hypothesis regarding the positive impact of the presence of haptic feedback on the noticeability of brand placement in a VR simulation was rejected.

Hypothesis H2 (the presence of haptic feedback in a VR simulation positively affects the evaluation of the simulation) was tested by comparing means in two groups (5-item scale with the 7-point Likert scale, with haptic feedback and without haptic feedback).

Across all dimensions, higher means were recorded for participants exposed to haptic feedback. Statistical significance for differences between groups was checked with the t-test for independence, as the distribution of variables was close to normal, and the variance in two groups was assumed to be equal. Statistically significant differences between two groups were found in regard to liking (t = -2.22, df = 61, p = .03) and for finding the simulation interesting (t = -2.49, df = 61, p = .01). For these two variables, effect size was measured with Cohen's d (for liking Cohen's d = .56l; for finding the simulation interesting Cohen's d = .63), indicating considerable and significant differences between the groups. Differences between the groups with simulation with and without the haptic feedback in the case of low and high NFT were reported as statistically insignificant. Hence, hypothesis H2 can be partially accepted. The presence of haptic feedback positively affects the perception of a VR simulation as likeable and interesting.

A similar procedure was run to verify hypothesis H3 (the presence of haptic feedback in a VR simulation positively impacts the evaluation of a brand placed in this simulation) and hypothesis H4 (the presence of haptic feedback in a VR

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simulation positively impacts the perceived fit of a brand placed in the simulation). Although in each dimension higher means were reported for the group exposed to haptic feedback, no statistically significant differences between the groups were observed. Differences between the groups with simulation with and without the haptic feedback in the case of low and high NPT were reported as statistically insignificant. Hence, hypotheses H3 an H4 were not accepted.

Table 3. Evaluation of simulation

Stimulus type		N	Mean	SD	t	p
How do you rate the simulation itself? dislike very much–like very much	Without haptic feedback	32	4.91	1.422	-2.22	.03
	With haptic feedback	31	5.68	1.326		
How do you rate the simulation itself? irritating–not irritating	Without haptic feedback	32	4.06	1.703	-1.94	.05
	With haptic fedback	31	4.87	1.586		
How do you rate the simulation itself? uninteresting–interesting	Without haptic fedback	32	5.00	1.545	-2.49	.01
	With haptic feedback	31	5.84	1.068		
How do you rate the simulation itself? bad–good	Without haptic feedback	32	5.03	1.750	-1.04	.30
	With haptic feedback	31	5.45	1.457		
How do you rate the simulation itself? boring–fun	Without haptic feebdack	32	5.23	1.606	.28	.11
	With haptic fedback	31	5.34	1.696		

Additionally, the impact of gender on the evaluation of the simulation and the brand–simulation fit was studied. Since these two groups were not equal (33 females and 19 males noticing the placement), non-parametric The Mann–Whitney U test was used to verify the significance of differences between the groups. No statistically significant differences were found between the responses of women and men. Earlier experiences with VR did not significantly differentiate the evaluations of simulation, brand or the brand–simulation fit.

Regardless of the exposition to haptic feedback, the participants with higher need for touch (measured with the NFT scale) liked the simulation more ($r = .26$, $p = .03$) and found it less irritating ($r = .33$, $p = .00$).

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Conclusions

From all the hypotheses formulated for this study, only one was partially accepted. The presence of haptic feedback did not impact the noticeability of brand placement in VR simulation. More than 22% of the participants exposed to haptic feedback did not notice the brand at all or identified it incorrectly (12.5% of people in the group not exposed to haptic feedback; one can hypothesize that a possible reason for this could be a higher cognitive load in the case of the group exposed to haptic feedback in simulation). However, no statistically significant difference between the groups was observed. The strongest and statistically significant impact of the presence of haptic feedback was observed in the evaluation of the simulation's attractiveness and whether it was interesting to a participant. Thus, it was not possible to confirm the positive impact of the high NFT level on the persuasiveness of the message indicated by Peck and Wiggins (2006) in relation to brand placement in the VR environment. Low or high autotelic NFT did not affect the perception of the brand placement or its assessment, but it did affect the perception of the simulation itself.

The results above represent a pioneering attempt to explore the impact of the sense of touch on brand placement in VR simulations. Although the direct relationship between the presence of haptic feedback and the brand's noticeability was not found, one can hypothesize that by making VR simulations more attractive to users (which this study confirmed), adding haptic feedback may have a positive influence on a placed brand's image through the halo effect. As for the managerial implications, the current study indicates that brand or product placements in VR simulations are an attractive way to grab the attention of consumers and to create the image of a modern brand. The evaluations of the brand in this study were high, regardless of the participants' exposure to haptic feedback.

The present study has its limitations. The sample consisted of a small group of young participants, and one should investigate reactions of older consumers to haptic feedback. Further research should consider various formats of placement in VR, for instance, verbal vs visual, its location in simulation (foreground vs background), and also account for intersensory modalities. It turns out that just placing a brand in a simulation is not enough to positively impact its image. Hence, further research could investigate whether more creative use of brand in simulations would influence its noticeability and perception, and whether haptic feedback might positively enhance evaluations of a placed brand.

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References

Balasubramanian, S., Patwardhan, H., Pillai, D., & K. Coker, K. (2014). Modeling attitude constructs in movie product placements. *Journal of Product & Brand Management*, *23*, 516–531.

Cauberghe, V., Geuens, M., & De Pelsmacker, P. (2011). Context effects of TV programme-induced interactivity and telepresence on advertising responses. *International Journal of Advertising*, *30*, 641–663.

Burke, M. C., & Edell, J. A. (1989), The Impact of Feelings on Ad-Based Affect and Cognition. *Journal of Marketing Research*, 26 (February), 69–83.

Chen, H., & Deterding, A. (2013). College-aged young consumers' interpretations of product placement in social games. *Young Consumers*, *14*, 41–51.

Cheng, L.K., Chieng, M.H., & Chieng., W.H. (2014). Measuring virtual experience in a three- dimensional virtual reality interactive simulator environment: a structural equation modelling approach. *Virtual Reality*, *18*, 173–188.

Dinh, H.Q., Walker, N., Chang, S., Kobayashi, A., & Hodges, F. (1999). Evaluating the Importance of multi-sensory input on memory and the sense of presence in virtual environments. *Virtual Reality*, *3*, 222–228.

Dobrowolski, P., Pochwatko, G., Skorko, M., & Bielecki, M. (2014). The effects of virtual experience on attitudes toward real brands. *Cyberpsychology, Behavior and Social Networking*, *17*, 125–128.

Gillespie, B., Muehling, D.D., & Kareklas, I. (2018). Fitting product placements: Affective fit and cognitive fit as determinants of consumer evaluations of placed brands. *Journal of Business Research*, *82*, 90–102.

Grudzewski, F., Awdziej, M., Mazurek, G., & Piotrowska, K. (2018). Virtual reality in marketing communication – the impact on the message, technology and offer perception – empirical study. *Economics and Business Review*, *4*, 36–50.

Jiang, Z., & Benbasat, I. (2004). Virtual product experience: Effects of visual and functional control of products on perceived diagnosticity and flow in electronic shopping. *Journal of Management Information Systems*, *21*, 111–114.

Khalbous, S., Vianelli, D., Domanski, T., Dianoux, C., & Maazoul, M. (2013). Attitudes toward product placement: A Cross-cultural analysis in Tunisia, France, Italy, and Poland. *International Journal of Marketing Studies*, *5*, 137–153.

Li, H., Daugherty, T., & Biocca, F. (2002). Impact of 3-D advertising on product knowledge, brand attitude, and purchase intention: The mediating role of presence. *Journal of Advertising*, *31*, 43–57.

Loureiro, S.C., Guerreiro, J., Eloy, S., Langaro, D., & Padma, P. (2019), Understanding the use of Virtual Reality in Marketing: A text mining-based review. *Journal of Business Research*, *100*, 514–530.

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Mackay, T., Ewing, T., Newton, F., & Windisch, L. (2009). The effect of product placement in computer games on brand attitude and recall. *International Journal of Advertising*, *28*, 423–38.

Mitchell, A. & Olson, J.C. (1981). Are product attribute beliefs the only mediator of advertising effects on brand attitude? *Journal of Marketing Research*, *18*, 318–332.

Mitra, A., Raymond, M.A., & Hopkins, C.D. (2008). Can consumers recognize misleading advertising content in a media rich online environment? *Psychology and Marketing*, 25, 655–674.

Peck, J. & Wiggins, J. (2006). It just feels good: Customers' affective response to touch and its influence on persuasion. *Journal of Marketing*, *70*, 56–69.

Peck, J. & Childers, T.L. (2003). Individual differences in haptic information processing: The "Need for Touch" scale. *Journal of Consumer Research*, *30*, 430–442.

Peck, J., Barger, V.A., & Webb, A. (2013). In search of a surrogate for touch: The effect of haptic imagery on perceived ownership. *Journal of Consumer Psychology*, 23, 189– 196.

PQ Media. (2019). Retrieved from https://www.pqmedia.com/wp-content/uploads/2019/11/Global-Advertising-Marketing-Forecast-2019-FINAL-PRW-Sent-Release-10.31.19.pdf (Last accessed: December 3, 2019).

Serrano, B., Banos, R., & Botella, C. (2016). Virtual reality and stimulation of touch and smell for inducing relaxation. *Computers in Human Behavior*, *55*, 1–8.

Statista (2018). *Forecast augmented (AR) and virtual reality (VR) market size worldwide from 2016 to 2022* (*in billion U.S. dollars*). Retrieved from https://www.statista.com/statistics/591181/global-augmented-virtual-reality-market-size/ (Last accessed: December 3, 2019).

Suh, K.S. & Lee, Y.E. (2005). The effects of virtual reality on consumer learning: An empirical investigation. *MIS Quarterly*, *29*(4), 673–697.

Taylor, C. (2009). Product placement: a hot topic gets Hotter. *International Journal of Advertising*, *28*, 753–756.

Verhagen, T., Vonkeman, C., Feldberg, F., & Verhagen, P. (2014). Present it like it is here: Creating local presence to improve online product experiences. *Computers in Human Behavior*, *39*, 270–280.

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Part 2
Engaging Consumers in the Digital Age

"The more you engage with customers the clearer things become and the easier it is to determine what you should be doing."

– John Russell, President of Harley Davidson

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Consumer Brand Engagement (CBE) in a Digital Environment: An Application to TikTok

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Abstract

This chapter analyses the Consumer Brand Engagement (CBE) phenomenon on social media and its effect on generating interest in a company and its products. This research focuses on TikTok that is especially suitable for marketing strategy due to the viral nature of its contents. Currently, TikTok is the top social media platform that has been adopted by marketers to reach and engage with their target audience, thus fostering consumer "engagement". The research analyses McDonald's digital strategy launched on TikTok for promoting one of its well-known products. This research proposes a conceptual model based on the CBE scale, tested through a quantitative survey, by administering a questionnaire to 181 TikTok users. The PLS approach was employed to test the model for assessing the adequacy of the measurements and for evaluating the structural model. The hypotheses have been confirmed, thus theoretical and managerial implications are provided.

Keywords: consumer brand engagement, social media, digital marketing strategy

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Introduction

Digital media marketing is constantly evolving at the pace of new technologies and users' needs (Ryan, 2016). The rise of the platformisation of video entertainment leads companies to appropriately exploit social media and constantly update their digital marketing strategy. Social media becomes a crucial tool for managing relations with consumers, and companies need to quickly discover new applications that are in line with trends and consumer needs. Web 2.0 engages users in the creative process through collaborative writing, contents creation and sharing (Soegoto & Utomo, 2019). Moreover, it also increases the speed of sharing and enlarges the audience of the contents (De Vries, Gensler, & Leeflang, 2012). Consumers become active participants, engaged in the creation and consumption of valuable offerings (Obilo et al., 2021). Brands need to adapt to the digital environment that represents the "place" in which consumers use to spend their time also for leisure or entertainment activities. In this environment, the consumers become co-creators of contents, even supporting companies' success and promotion. A rising platform is TikTok, an app for short video making and sharing, that provides visual effects for creating contents (Su et al., 2020). A higher number of companies start to exploit this app for encouraging users to create contents and, in the case of a competition/challenge, there could be also economic or reputational rewards. TikTok has acquired a strong position in forming the basis for new digital strategies, trough so-called "hashtag challenges": the platform provides an ad hoc space to companies for launching a competition among their consumers and potential ones. Due to the viral nature of these campaigns, this competition usually involves a wider community of users, allowing for acquiring new consumers. Moreover, on the basis of the number of likes, comments and shares, these videos are able to become a "trending topic", acquiring higher visibility (Zhang, 2021). For this purpose, this chapter builds on consumer brand engagement (CBE) applied in the digital environment and particularly on TikTok. In this regard, we propose a conceptual model that applies the CBE scale of Hollebeek et al. (2014) to a TikTok challenge proposed by McDonald's. The main objective of this chapter is to empirically examine whether the involvement in digital entertainment activity promoted by a company is able to stimulate, as a consequence, interest towards a brand and its products. This enlightens the ability of a social media challenge in transferring the interest from the digital environment to the brand and its products. This research adopts a quantitative method (questionnaire administration) and the PLS-SEM approach to test the hypotheses.

The chapter is organised as follows: a literature review with hypotheses to be tested, methodology explaining constructs and the research approach, results, and finally, conclusion and implications.

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Theoretical Background

This section illustrates the relevant literature that represents the foundation of our proposed model applied to McDonald's TikTok digital strategy. This section is divided into two parts: the first part focuses on social media as a tool for enhancing interaction among consumers and with brands. The second part examines the consumer engagement and its related application in the digital environment. Thereafter, the conceptual model is illustrated.

Social Media

Social media is defined by Kaplan and Haenlein (2010) as "a group of Internet-based applications that build on technological foundations of Web 2.0, and which allow to create/exchange user-generated content". The emergence of social media has changed the communication paradigm (Morra et al., 2018), implying a switch from a passive consumer – as a receiver of product/brand information – to an active one that seeks information and co-creates contents (Kozinets et al., 2010; Batra & Keller, 2016; Whitelock et al., 2013; Thevenot, 2007). The relation between companies and their consumers evolves and businesses are losing full control over communication on social media (Bruhn, et al., 2012). Consumers use social media mainly for socialisation, entertainment, self-status seeking, information searching, discovering new brands, comparing alternative, reading comments/reviews (Yang et al., 2016; Gomez et el., 2019). However, in the literature, Sheldon et al. (2001) state that there are several needs that social media satisfies, such as autonomy, competence, relatedness, physical thriving, security, self-esteem, self-actualisation, pleasure, money-luxury and popularity. All these needs can be satisfied through the main activities that can be conducted on social media: communicating and sharing relevant information/contents, feeling appreciated, participating in social and enjoyable activities. Social media can be classified into four typologies: relationship, self-media, creative outlets, collaboration social media (Zhu & Chen, 2015). The first type is "relationship" social media and consists mostly of customised messages among mainly acquaintances or friends. The second typology concerns the "self-media" social media, on which people connect to profile-based accounts of organisations, products or celebrities, instead of using the traditional communication channels. On this social page, a specific brand can communicate news about products/services, promotions and so on to all the users that decide to "follow" its page. The "creative outlets" social media focuses on enhancing the exchange of interests and creativity by sharing photos, videos or other self-made contents. This type of social media connects people and provides a meaningful "space" for creativity and entertainment. The "collaboration" social media are content-based and customisable on the basis of user demands by finding solutions

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to their questions. Regardless of the typology, the common characteristic of social media is the ability to stimulate social interactions, and this could be enjoyed by both active users (who actively participate in content generation) and passive users (who use social media to read the contents without creating new ones).

However, this definition needs to be redefined, since some emergent social media are placed between different typologies. Indeed, the recent TikTok social media is used by marketers in order to reach their audience by providing social activity, entertainment and creativity. Hence, this social media is especially suitable for marketing strategy due to the viral nature of its contents and the possibility to easily and quickly share short creative videos. Currently, TikTok is the top social media platform that has been adopted by marketers to reach and engage with their target audience, thus fostering consumer "engagement" (Hollebeek et al., 2014; de Valck at al., 2009; Van Laer, et al., 2013). The community of users can create videos or be engaged in "challenges" implying various activities (i.e. dancing, lip-synching, mimicking other users, etc.).

Consumer Engagement

The consumers' engagement is defined by Brodie et al. (2011) as a psychological state that occurs during interactive, co-creative customer experiences with focal products/brands and it is a consequence of the users' active role in the digital environment.

Building Brand Engagement through social media is a pivotal interest of companies (De Vries et al., 2012) since the activities on it allow to extract new metrics for improving brand performance (Bowden 2009; Kumar et al. 2010) due to its consequences on consumers' behaviour and firms' financial performance (Gambetti & Graffigna, 2010).

Consumer brand engagement (CBE) has been studied from multiple perspectives and disciplines (Gomez et al., 2019) representing an important topic for marketing and decision-making (Leckie et al., 2016). Following the definition by Hollebeek et al. (2014), CBE is composed of three dimensions: cognitive, emotional and behavioural that concurrently reflect the nature of the engagement. The cognitive processing refers to "a consumer's level of brand-related thought processing and elaboration in a particular consumer/brand interaction". The affection is "a consumer's degree of positive brand-related affect in a particular consumer/brand interaction". The activation is defined as "a consumer's level of energy, effort and time spent on a brand in a particular consumer/brand interaction".

Even though this is a high debated topic, there is scarce research with empirical validation (Gomez et al., 2019), especially into focusing on social media brands as objects of consumer engagement (Leckie et al., 2021); this is particularly relevant, since social media brand engagement can likely be translated into interest in

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products by potential consumers. Hence, consumer engagement needs to be further explored as strategic business resources (Alvarez-Milán et al., 2018).

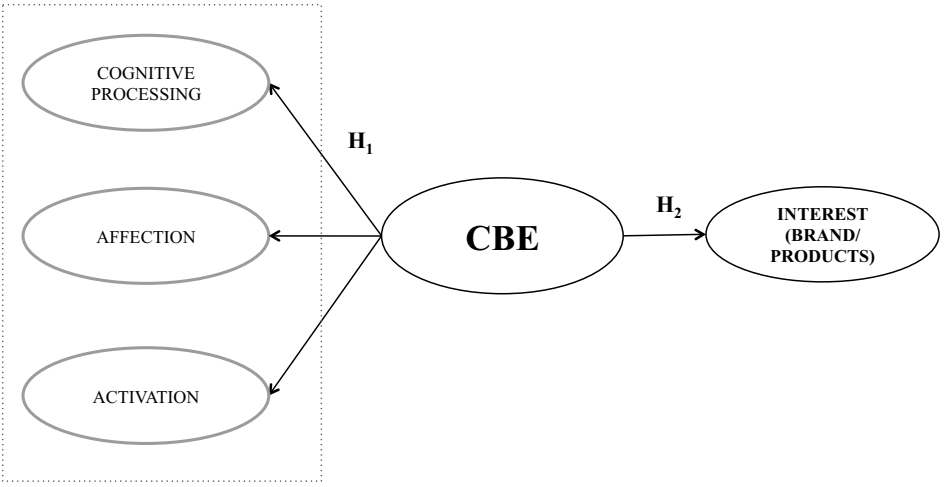
This research aims at filling the gap by analysing the effect of CBE in a digital environment (hashtag challenge) in increasing the interest in brand/products.

On the basis of the above-mentioned literature, here the following hypotheses and the conceptual model are illustrated:

H_1: CBE is a second-order construct measured by cognitive processing, affection and activation,

H_2: CBE positively influences the interest in a brand and its products.

Figure 1. Research model



Research Method

This study adopts a quantitative method by administering a questionnaire. The questionnaire focuses on the case of McDonald's TikTok hashtag challenge. The case of McDonald's has been chosen because of the great success of its TikTok challenge: it lasted 8 days and resulted in 228,000,000 views and 193,000 videos created by 75,000 TikTok users.

The hashtag challenge concerns various activities (especially dancing/action associated with music/sound) that people can carry out on TikTok. Users look at this challenge and are inspired to create specific video contents.

McDonald's launched a hashtag challenge along with strategies that ensured wider visualisation, inviting as many users as possible to participate. This challenge was launched to celebrate the anniversary of one of its well-known products.

In order to achieve our objective, the questionnaire structure follows the CBE scale proposed by Hollebeek et al. (2014), since this scale is the most widely ac-

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knowledged and adopted in this topic (Algharabat et al., 2018; Halaszovich & Nel, 2017; Leckie et al., 2016). CBE is composed of three dimensions measured on the seven-point Likert scale (1 = strongly disagree; 7 = strongly agree): cognitive processing, affection and activation. One single item has been included for measuring the interest in the brand and its products. The sample has been randomly selected with the requirements of being users of the TikTok app.

A pilot survey has been conducted on 30 respondents in order to improve the comprehension of each question and the questionnaire structure. During the survey, a video has been shown about the challenge proposed by McDonald's to the TikTok community.

Once the questionnaires were collected, the PLS approach was employed to test the model and it has been analysed and interpreted in two stages. First, the adequacy of the measurements has been assessed by evaluating the reliability of the individual measures and the discriminant validity of the constructs. Then, the structural model has been appraised to test the hypotheses.

Results

The sample is composed of 181 respondents. In Table 1, there is a summary of the sample characteristics in terms of gender (41% male and 59% female) and age. The sample is composed mainly of young people in the following age ranges: 18–25 (69%), 26–35 (24%), 36–50 (3%) and over 50 (4%).

Table 1. Sample characteristics: gender and age

GENDER		AGE			
Male	Female	18–25	26–35	36–50	over 50
41%	59%	69%	24%	3%	4%

Table 2. Cronbach's alpha, CR and AVE of the reflective constructs

	Cronbach's alpha	AVE	Composite reliability
Cognitive	0.805	0.720	0.885
Affection	0.912	0.919	0.958
Activation	0.850	0.869	0.930

All the respondents are users of the TikTok app and the sample reflects the general users of TikTok. On the basis of the proposed model, the PLS approach was employed to test it. The PLS model is analysed and interpreted in two stages, as explained in the research method section.

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The measurement model was analysed to assess the reliability and validity of the constructs. Table 2 shows the Cronbach's alpha, CR and AVE of the reflective constructs.

The Cronbach's alpha values and the composite reliability values for each construct are above the recommended threshold of 0.7 (Nunnally, 1978; Chin and Marcoulides, 1998). The average variance extracted (AVE) value for convergent validity is above the 0.5 acceptable threshold (Fornell and Larcker, 1981). All the items have item-loading values higher than 0.7. VIF values for all the items of the reflective constructs were below 5, thus multicollinearity is excluded (Hair et al., 2011).

At a later stage, in order to assess the discriminant validity, a double test was performed: the Fornell–Larcker criterion and the heterotrait-monotrait ratio (HTMT) (Henseler et al., 2015). Concerning the Fornell and Larcker (1981) criterion, the square root of the AVE is higher than the correlation between the two constructs in the model, as suggested. Moreover, the HTMT ratio is below 0.90, thus discriminant validity is established. Thereafter, the structural results are presented in Tables 3 and 4. All path coefficients are significant (at the 0.05 levels).

Table 3. Structural results: H_1

H_1 *Second order reflective construct*	*First order reflective constructs*	Coefficient beta	t-value	Hypothesis
CBE	Cognitive	0.911	60.210	H_1 supported ($p < 0.05$)
	Affection	0.906	68.650	
	Activation	0.846	32.624	

Table 4. Structural results: H_2

Path	Coefficient beta	t-value	Hypothesis
H_2 CBE → Interest in brands/products	0.752	22.409	H_2 supported ($p < 0.05$)

According to Hair et al. (2014), the evaluation of the structural model was carried out, observing the adjusted coefficient of determination (R^2 adj.), the effect size (f^2), the predictive relevance of the model (Q^2), the size and significance of path coefficients.

The adjusted coefficient of determination (R^2 adj.) was above 0.4 for all the reflective constructs, highlighting an adequate explanatory power of the model. The effect size was at a high level for all the constructs and they resulted significant after the bootstrapping procedure (1,000 samples). All the Stone–Geisser Q^2 is positive, thus the model has predictive relevance. The path coefficients (Figure 2)

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are high and significant ($p < 0.05$). The results reveal a good overall fit of the structural model. Figure 3 illustrates the model results.

Figure 2. Path coefficients

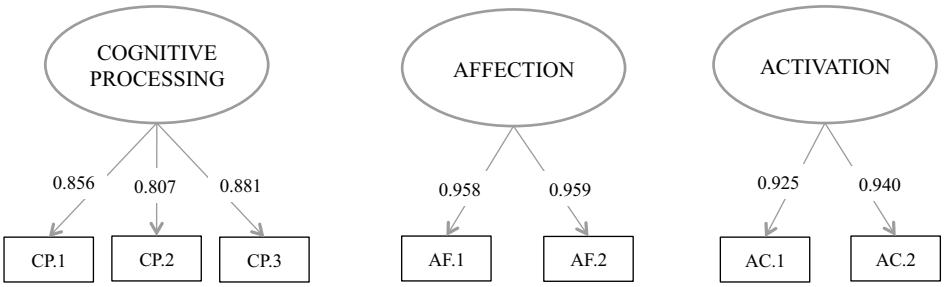
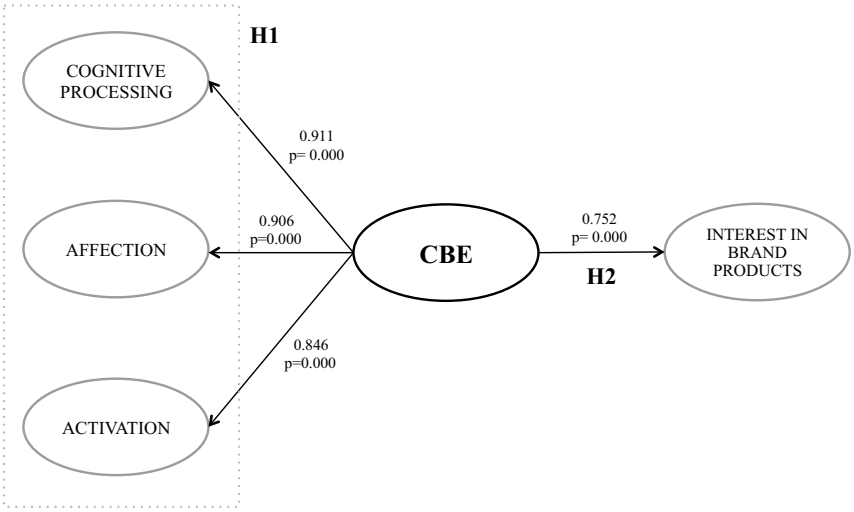


Figure 3. Path coefficients and level of statistical significance



The results confirm hypotheses H_1 and H_2. CBE related to the TikTok "challenge" is strongly measured by the three constructs of cognitive processing (0.830), affection (0.822) and activation (0.716). At the same time, the CBE related to the "challenge" is able to stimulate the interest in a company and its products (0.752). The results show satisfactory insights about the model design and the questionnaire structure.

Discussion

The results confirm the proposed model, hypotheses and the relations among the constructs. Consumer engagement in an activity (the "hashtag challenge") pro-

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posed by a company is caused by cognitive, affective and behavioural aspects, confirming hypothesis 1 (H_1). Furthermore, the "hashtag challenge" – by proposing activities in a digital environment – activates the interest in the products, confirming hypothesis 2 (H_2). In this way, CBE can also have an impact on brand performance due to its ability to increase sales and profitability (Harrigan et al., 2018; Nambisan & Baron, 2007; Sawhney et al., 2005). Indeed, on the basis of the so-called hierarchy-of-effects notion of loyalty (Oliver, 1999), consumers who engage with a brand are likely to develop favourable attitudes which, in turn, should lead to increased brand usage intent (Harmeling, Moffett, Arnold, & Carlson, 2017).

By applying and testing the proposed model through PLS approach, our study has theoretical and practical contributions for what concerns marketing strategies in the digital environment. This chapter is one of the first exploring the CBE related to TikTok hashtag challenges and its effect on brand/products in terms of interest generated. This research contributes to the engagement field of study, filling the gap by proposing empirical validation applied to the social media context. In the context of social media, and particularly in the context of TikTok hashtag challenges, this research confirms that the consumer engagement in an activity (the 'hashtag challenges') proposed by a company is shaped by cognitive, affective and behavioural aspects. At the same time, the CBE related to the "hashtag challenge" is able to stimulate the interest in a company and its products. As the literature suggests, this involvement in this activity, and particularly CBE, is linked to brand performance: highly engaged consumers have higher brand commitment and consumer loyalty.

Conclusion and Managerial Implications

This research applies the CBE scale to the digital environment of TikTok. Moreover, the study is applied to a specific digital strategy that TikTok offers to businesses: the TikTok hashtag challenge.

By analysing the proposed conceptual model, it is possible to state that consumer engagement in an activity related to a 'hashtag challenge' proposed by a company in a digital environment, is caused by cognitive, affective and behavioural aspects. Although the "hashtag challenge" is not directly inviting consumers to buy products, it activates the interest in the products and it has relevant consequences. It implies that the stimulated interest might increase visits in the physical store or requests of on-demand services. In the case of McDonald's, there could be implications in terms of fast-food restaurants visits or in terms of delivery requests. In this way, CBE can also have an impact on brand performance due to its ability to increase interest, number of orders, sales and profitability.

Hence, in terms of digital strategy, a company is encouraged to increase the consumers' engagement on social media by proposing entertainment activities get-

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ting close to the consumers and their needs; this is especially due to the fact that, even though these activities do not directly intend to promote products sale, they, in turn, have an influence on potential sales. Further studies could investigate the actual effects in terms of behaviour caused by the interest generated by CBE. Moreover, the proposed model could be confirmed by enlarging the sample and focusing on cross-country analyses to examine differences according to age and cultural characteristics.

References

Algharabat, R., Rana, N.P., Dwivedi, Y.K., Alalwan, A.A., & Qasem, Z. (2018). The effect of telepresence, social presence and involvement on consumer brand engagement: An empirical study of non-profit organizations. *Journal of Retailing and Consumer Services*, *40*, 139–149.

Alvarez-Milán, A., Felix, R., Rauschnabel, P.A., & Hinsch, C. (2018). Strategic customer engagement marketing: A decision making framework. *Journal of Business Research*, *92*, 61–70.

Batra, R. & Keller, K.L. (2016). Integrating Marketing Communications: New Findings, New Lessons, and New Ideas. *Journal of Marketing*, *80*(6), 122–145.

Bowden, J.L.H. (2009). The process of customer engagement: A conceptual framework. *Journal of Marketing Theory and Practice*, *17*(1), 63–74.

Brodie, R.J., Linda D. Hollebeek, Juric, B. & Ilic, A. (2011). Customer Engagement: Conceptual Domain, Fundamental Propositions & Implications for Research in Service Marketing, *Journal of Service Research*, *14*(3), 252–71.

Brodie, R.J., Ilic, A., Juric, B., & Hollebeek, L. (2013). Consumer engagement in a virtual brand community: An exploratory analysis. *Journal of Business Research*, *66*(1), 105–114.

Bruhn, M., Schoenmueller, V., & Schäfer, D.B. (2012). Are social media replacing traditional media in terms of brand equity creation? *Management Research Review.*

Chin, W. & Marcoulides, G. (1998). The partial least squares approach to structural equation modeling. In: Marcoulides, G. (ed.), *Modern Methods for Business Research*, Laurence Erlbaum Associates, Mahwah, New Jersey.

de Valck, K., van Bruggen, G.H., & Wierenga, B. (2009). Virtual communities: A marketing perspective, *Decision Support Systems*, *47*(3), 185–203.

De Vries, L., Gensler, S., & Leeflang, P.S. (2012). Popularity of brand posts on brand fan pages: An investigation of the effects of social media marketing. *Journal of Interactive Marketing*, *26*(2), 83–91.

Fornell, C. & Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 39–50.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Gambetti, R.C. & Graffigna, G. (2010). The concept of engagement: A systematic analysis of the ongoing marketing debate. *International Journal of Market Research*, *52*(6), 801–826.

Gómez, M., Lopez, C., & Molina, A. (2019). An integrated model of social media brand engagement. *Computers in Human Behavior*, *96*, 196–206.

Hair, J.F., Ringle, C.M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*, 139–152.

Hair, J.F., Hult, G.T.M., Ringle, C.M., & Sarstedt, M. (2014). *A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM).* Sage, Thousand Oaks.

Halaszovich, T. & Nel, J. (2017). Customer–brand engagement and Facebook fan-page "Like"-intention. *Journal of Product & Brand Management*.

Harmeling, C. M., Moffett, J.W., Arnold, M.J., & Carlson, B.D. (2017). Toward a theory of customer engagement marketing. *Journal of the Academy of Marketing Science*, *45*(3), 312–335.

Harrigan, P., Evers, U., Miles, M.P., & Daly, T. (2018). Customer engagement and the relationship between involvement, engagement, self-brand connection and brand usage intent. *Journal of Business Research*, *88*, 388–396.

Henseler, J., Ringle, C.M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135.

Hollebeek, L. D., Glynn, M.S., & Brodie, R.J. (2014). Consumer brand engagement in social media: Conceptualization, scale development and validation. *Journal of Interactive Marketing*, *28*(2), 149–165.

Leckie, C., Nyadzayo, M.W., & Johnson, L.W. (2016). Antecedents of consumer brand engagement and brand loyalty. *Journal of Marketing Management*, *32*(5–6), 558–578.

Leckie, C., Dwivedi, A., & Johnson, L. (2021). Examining drivers and outcomes of social media brand engagement. *Asia Pacific Journal of Marketing and Logistics*, *34*(2), 350–367.

Kaplan, A.M. & Haenlein, M. (2010), Users of the world, unite! The challenges and opportunities of social media, *Business Horizons*, *53*, 59–68.

Kozinets, R.V., De Valck, K., Wojnicki, A.C., & Wilner, S.J. (2010). Networked narratives: Understanding word-of-mouth marketing in online communities. *Journal of Marketing*, *74*(2), 71–89.

Kumar, V., Aksoy, L., Donkers, B., Venkatesan, R., Wiesel, T., & Tillmanns, S. (2010). Undervalued or overvalued customers: capturing total customer engagement value. *Journal of Service Research*, *13*(3), 297–310.

Morra, M.C., Ceruti, F., Chierici, R., & Di Gregorio, A. (2018). Social vs traditional media communication: Brand origin associations strike a chord. *Journal of Research in Interactive Marketing*, *12*(1), 2–21.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Nambisan, S. & Baron, R.A. (2007). Interactions in virtual customer environments: Implications for product support and customer relationship management. *Journal of Interactive Marketing*, *21*(2), 42–62.

Nunnally, J.C. (1978). *Psychometric Theory*, second ed. McGraw-Hill, New York.

Obilo, O.O., Chefor, E., & Saleh, A. (2021). Revisiting the consumer brand engagement concept. *Journal of Business Research*, *126*, 634–643.

Oliver, R.L. (1999). Whence consumer loyalty? *Journal of Marketing*, *63*(4_suppl1), 33–44.

Ryan, D. (2016). *Understanding digital marketing: Marketing strategies for engaging the digital generation*. Kogan Page Publishers.

Sawhney, M., Verona, G., & Prandelli, E. (2005). Collaborating to create: The Internet as a platform for customer engagement in product innovation. *Journal of Interactive Marketing*, *19*(4), 4–17.

Sheldon, K.M., Elliot, A.J., Kim, Y., & Kasser, T. (2001). What is satisfying about satisfying events? Testing 10 candidate psychological needs. *Journal of Personality and Social Psychology*, *80*(2), 325.

Soegoto, E.S., & Utomo, A.T. (2019). Marketing Strategy Through Social Media. In: *IOP Conference Series: Materials Science and Engineering* (Vol. 662, No. 3, p. 032040). IOP Publishing.

Su, Y., Baker, B.J., Doyle, J.P., & Yan, M. (2020). Fan engagement in 15 seconds: Athletes' relationship marketing during a pandemic via TikTok. *International Journal of Sport Communication*, *13*(3), 436–446.

Thevenot, G. (2007). Blogging as a social media. *Tourism and Hospitality Research*, *7*(3–4), 287–289.

Van Laer, T., de Ruyter, K., & Cox, D. (2013). A walk in customers' shoes: How attentional bias modification affects ownership of integrity – violating social media posts. *Journal of Interactive Marketing*, *27*, 14–27.

Whitelock, J., Cadogan, J.W., Okazaki, S., & Taylor, C.R. (2013). Social media and international advertising: Theoretical challenges and future directions. *International Marketing Review*, *30*(1), 56–71.

Yang, S., Lin, S., Carlson, J.R., & Ross Jr, W.T. (2016). Brand engagement on social media: Will firms' social media efforts influence search engine advertising effectiveness? *Journal of Marketing Management*, *32*(5–6), 526–557.

Zhang, Z. (2021). Infrastructuralization of TikTok: Transformation, power relationships, and platformization of video entertainment in China. *Media, Culture & Society*, *43*(2), 219–236.

Zhu, Y.Q., & Chen, H.G. (2015). Social media and human need satisfaction: Implications for social media marketing. *Business Horizons*, *58*(3), 335–345.

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Trust and Loyalty Drivers in Online Subscription Services

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Abstract

The purpose of this chapter is to examine how the relationship marketing effectiveness model should describe the attitudes and behaviors of a subscription service customer. The research is based on three online surveys among users of an online subscription legal information service in three different markets/countries with different competitive positions of the same service in the market. Using multigroup structural equation modeling, we showed that customer exposure to email communication, customer-based reputation and brand credibility have a positive impact on trust, and that trust has a positive impact on loyalty. Theoretical and practical implications of these findings are discussed.

Keywords: mail communication exposure, online subscription service, trust

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Introduction

An online subscription service is a highly relationship-based business arrangement between the subscriber (business customer or consumer) and the subscription provider (vendor). It is a long-term contractual arrangement in which subscribers agree to purchase a pre-selected combination of service units or product assortments at a fixed price (Weinhardt, Anandasivam, Blau, & Stosser, 2009). Relationship marketing (RM) is effective when relationships are critical to customers, and when individuals are involved in the relationships (Palmatier, Dant, Grewal, & Evans, 2006, p. 136).

Among online subscription services, customer behavior in the context of RM is well researched for mobile and telematics subscribers (Calvo-Porral & Lévy-Mangin, 2015; Min & Wan, 2009; Qayyum, Ba Khang, & Krairit, 2013; Sichtmann, 2007; Sultan, 2018; v. Wangenheim, Wünderlich, & Schumann, 2017), for memberships (Garbarino & Johnson, 1999; George & Wakefield, 2018; Marinova & Singh, 2014), and social media platforms (Yahia, Al-Neama, & Kerbache, 2018). For many other subscription services, particularly the fast-growing software-as-a-service (SaaS) subscription business and online professional information subscription services, customer behavior has not been studied in the context of RM.

Communication is the most effective relationship-building strategy and a key determinant of business-to-business (B2B) relationship outcomes (Murphy & Sashi, 2018; Palmatier et al., 2006). Nowadays, email communication channel dominates communication between vendors and customers in online services businesses, however there is a lack of research regarding the role of email communication within the RM effectiveness model.

The purpose of this article is to build a variance model with email communication exposure (ECE), service company reputation, and brand credibility as antecedents, customer trust as a mediator, and loyalty as an outcome. The hypotesized positive impact of antecedents on trust is suported by signaling (Erdem & Swait, 1998), credibility (Sobel, 1985) and social exchange (Blau, 1968; Thibaut & Kelley, 1959) theories, while the commitment-trust theory (Morgan & Hunt, 1994) supports the positive influence of trust on loyalty. The model is verified for the same online legal information subscription service in three different markets. The markets differ in the length of time that the service has been in the market and the degree of competitive pressure exerted on the service.

Conceptual Framework and Research Hypotheses

The selection of the focus construct for our research was influenced by the characteristics of the online content subscription service customers. Most online content subscription companies use a freemium business model. They provide users

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with free basic features of a service and access to premium content and/or features for a subscription fee (Kumar, 2014). In our setting, there are two types of customers: true subscribers who pay a fee to use the service, and registered users of the service who do not consider themselves customers/subscribers because they only use free services. The non-subscribers may deny their commitment or commercial relationship with the service; however, we can assess their level of trust in the service.

Meta-analysis on the effectiveness of RM systematizes antecedents according to their effectiveness. Expertise and communication are most effective, then relationship investment, similarity, and relationship benefits; dependence, frequency, and duration are relatively ineffective (Palmatier et al., 2006). In our opinion, customer-based service firm reputation and customer perception of service brand credibility can be well delineated with customer perceived expertise, customer experience of vendor relationship investment, and the customer perception of vendor expertise. ECE is both seller-focal (i.e., relationship investment) and dyadic (i.e., interaction) antecedent. Customer loyalty is the most commonly used outcome of RM models (Watson IV, Beck, Henderson, & Palmatier, 2015), and it is also the most appropriate for our setting in which loyal subscribers are the firm's most important asset (McCarthy, Fader, & Hardie, 2018).

Marketing practitioners measure the effectiveness of email marketing activities by examining email open rates and engagement with email content (Zhang, Kumar, & Cosguner, 2017). In the marketing literature, the term "email communication exposure" was first used by Janakiraman, Lim, and Rishika (2018) in reference to email communication with customers after a data breach announcement. They also measure exposure by counting only the opening of emails. However, customer behavior towards email communication is only one of the dimensions of email communication exposure. We intend to operationalize email communication exposure by three dimensions, i.e., by two dimensions from the conceptualization of customer engagement with email communication (behavioral and cognitive dimensions) (Hollebeek, Glynn, & Brodie, 2014), and by the dimension of email advertising intrusiveness (Hsin Chang, Rizal, & Amin, 2013). Hollebeek et al. (2014) propose that media engagement should be conceptualized through three dimensions: cognitive, emotional, and behavioral. For customers in a B2B setting (compared to a B2C setting), it is very difficult to exhibit and communicate emotions, and emotions seldom play an important role in customer actions (Pansari & Kumar, 2016). This also holds for the context of our study, which involves analyzing the behavior and attitudes of B2B customers of an online service (online legal information system). In such a setting, engagement depends more on the perceived usefulness and relevance of the media content (cognitive dimension) than on experience and emotions. Therefore, we omit the emotional dimension from the operationalization of email communication exposure.

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Ha (1996, p. 77) defines intrusiveness as "the degree to which advertisements in a media vehicle interrupt the flow of an editorial unit." Intrusiveness is important in forming customer sentiment towards advertising (Gaski & Etzel, 1986; Truong & Simmons, 2010). According to Gruner, Vomberg, Homburg, and Lukas (2019), communication intrusiveness is the degree to which communication interrupts a consumer's task performance. They claim that online advertising is intrusive, and social media advertising is unintrusive (Gruner et al., 2019). We expect that engagement with email communication increases customer exposure to email communication, while email intrusiveness decreases it (or, inverted measure of intrusiveness increases it).

The social exchange theory explains how relationships arise from subjective cost benefit analysis where participants are maximizing benefits and minimizing costs. A customer maintains a relationship for which net benefit exceeds the net benefits of comparable relationships (Palmatier & Steinhoff, 2019, p. 61; Thibaut & Kelley, 1959). Customers perceive exposure to nonintrusive and informative email communication as useful and beneficial, and such communication should strengthen their trust and commitment to a service.

Vivek, Beatty, and Morgan (2012) state that customer engagement has a positive effect on trust and on RM model outcomes. The customer-perceived information quality of emails (i.e., the customer's overall perception of the accuracy and completeness of information) positively affects customer trust and negatively affects customer uncertainty about a service provider's trustworthiness (D. J. Kim, Ferrin, & Rao, 2008); low intrusiveness of email communication also increases loyalty-enhancing relationships. Additionally, Merisavo and Raulas (2004) showed that email marketing has positive effects on brand loyalty. If a service provider's email communication contains testimonials from other customers and credible information from third parties, email communication can be expected to have a positive impact on the reputation of the service provider. Regarding the effect of email communication exposure on a service firm's reputation, brand credibility, and trust, the hypothesis is as follows:

H1: ECE positively affects (a) the customer-based reputation of a service firm that performs the email communication, (b) the customer's perceived credibility of the service brand, and (c) the customer's trust in the service to which the email communication relates.

Walsh and Beatty (2007, p. 129) define the customer-based reputation of a service firm (CBR) as "the customer's overall evaluation of a service provider based on his or her reactions to the service provider's goods, services, communication activities, interactions with the service provider and/or its representatives or constituencies (such as employees, management, or other customers) and/or known corporate activities." In the context of RM, the construct reflects the customer's

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perception of the relationship benefits and expertise of the vendor. It depends on the previous communication and interaction between a service provider and a customer. When a company has a good reputation, trust is established among customers (Groenland, 2002).

The existence of a relationship between a service provider's reputation and customer trust and/or loyalty is well established (Bartikowski & Walsh, 2011; Nguyen, Leclerc, & LeBlanc, 2013). Although the relationship between reputation and RM relational mediators is not always unidirectional (Walsh, Mitchell, Jackson, & Beatty, 2009), for well-established online professional services, a certain level of service provider reputation is a prerequisite for customers to establish a relationship with the service provider, and a number of online services have been found to positively influence reputation on trust and trustworthy behavior (Nguyen et al., 2013; Shamma & Hassan, 2009; Yahia et al., 2018). Therefore, the following hypothesis is proposed:

H2: The customer-based reputation of a service company positively affects (a) brand credibility and (b) customer trust.

The corporate brand and the brand of the service are frequently not identical. The customer's attitude toward the brand may be different from his or her attitude toward the vendor. A brand's credibility is more closely related to the qualities, strengths, and weaknesses of the service than to the overall reputation of the vendor. From the management perspective, it is interesting to compare the impact of a service brand's and vendor's reputation on customer trust. Brand credibility is defined as "the believability of the product information contained in a brand, which requires that consumers perceive that the brand has the ability (i.e., expertise) and willingness (i.e., trustworthiness) to continuously deliver what has been promised" (Erdem & Swait, 2004, p. 192). In our model of RM, the construct of brand credibility is operationalized as one factor, as seen in relevant examples in the literature (Hyun Baek & Whitehill King, 2011; Sichtmann, 2007).

Sobel (1985) claims that credibility is key for maintaining a long-term business relationship. Erdem and Swait (2004) argue in their signaling theory that brand credibility is a product positioning signal and the most important attribute of a brand. Brand credibility is an information signal that increases customer confidence in a brand service. A service provider's trustworthiness and expertise that are reflected in brand credibility lead to the strengthening of positive customer expectations about future service delivery. We hypothesize the following:

H3: Brand credibility has a positive impact on trust.

Trust in the relationship-marketing context occurs "when one party has confidence in the exchange partner's reliability and integrity" (Morgan & Hunt, 1994, p. 23). Following Gefen and Straub (2004), trust is defined as a customer's expec-

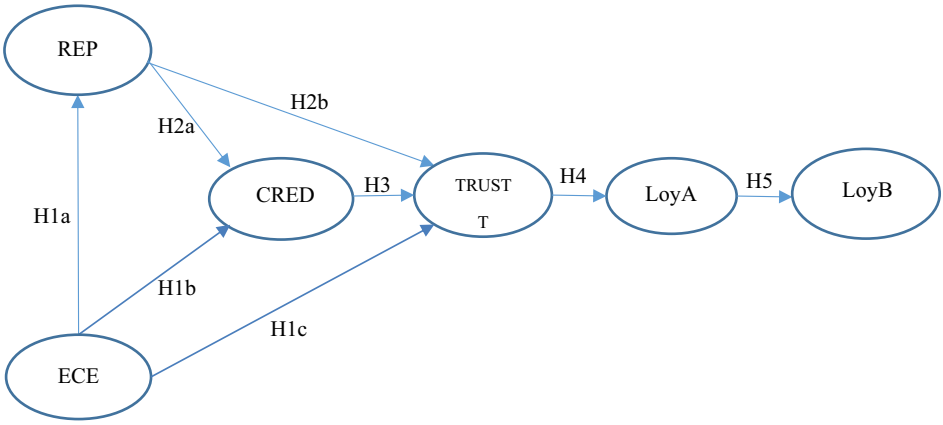
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tation that a service provider is reliable and can be relied upon to deliver on its promises. In an online setting, trust is most often considered a mediator in research models, and loyalty is the most frequently cited outcome (Y. Kim & Peterson, 2017). We hypothesize the following:

H4 and H5: Customer trust in an online service has a positive effect on attitudinal customer loyalty toward the service, and attitudinal loyalty has a positive effect on behavioral loyalty.

The conceptual model with the hypothesized relationships is depicted in Figure 1.

Figure 1. Conceptual model



Legend: **ECE** – email communication exposure, **REP** – customer-based reputation of a service company, **CRED** – brand credibility, **LoyA** – attitudinal loyalty, **LoyB** – behavioral loyalty.

Data Analysis and Results

The measurement scales were adopted according to the literature. For measuring ECE, we adopted behavioral and cognitive dimensions of engagement with email communication from the engagement scale development (Dessart, Veloutsou, & Morgan-Thomas, 2016; Hollebeek et al., 2014) and the dimension of email communication intrusiveness from the model for measuring email advertising effectiveness (Hsin Chang et al., 2013). Reputation was measured by the three dimensions (customer orientation, service quality, and social responsibility) of the established customer-based service company reputation measure (Walsh & Beatty, 2007). To avoid collinearity in the credibility-trust relationship, we used only the expertise dimension as a measure of credibility (Erdem & Swait, 2004). Trust was operationalized by the dimensions of integrity and benevolence, as suggested by Gefen and Straub (2004), and the measures of attitudinal and behavioral loy-

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alty were selected according to the recommendations by Watson IV et al. (2015). All measurement scales were scored, using the seven-point Likert scale. The English questionnaire was translated into Croatian, Slovenian, and Turkish and was pre-tested on a small group of respondents to ensure that all items were understandable, and no difficulties were encountered in responding.

The email invitation to participate in an online questionnaire was sent to contacts (25,000 in Croatia, 15,000 in Slovenia and 15,000 in Turkey) most affected by direct email campaigns from the company in their respective markets. Within one week, 1,926 complete responses were received in Croatia, 819 in Slovenia, and 795 in Turkey. Due to the control over the selection of respondents, we can be sure that relevant entities were included. To conduct the confirmatory factor analysis and test the structural model, we randomly selected 488 respondents from the Croatian sample, 410 from the Slovenian sample, and 397 from the Turkish sample.

Construct internal consistency and discriminant validity were examined, using confirmatory factor analysis. The construct reliabilities and Cronbach's alpha values are well above the value of 0.7 for all constructs. The standardized factor loadings are all highly significant at $p < 0.001$ and exceed 0.68 in all three datasets except for the loadings between ECE and email intrusiveness dimension. The latter standardized factor loadings are 0.375, 0.489 and 0.340 for Croatia, Slovenia, and Turkey, respectively. Moreover, the constructs are internally consistent as the lowest composite reliability scores for ECE are 0.76, 0.71 and 0.728, while the scores for all other constructs are above 0.84 (Table 1). In terms of measurement invariance, the goodness-of-fit statistics with respect to the three-group unconstrained model show excellent fit with $\chi^2 = 406.35$ ($df = 96$; $p < 0.001$); CFI = 0.962; RMSEA = 0.05. Thus, it can be concluded that the model exhibits configural invariance. To test for metric invariance, factor loadings were constrained to be equal across groups. Full metric invariance was not achieved ($\Delta\chi^2_{(10)} = 25$, $p = 0.007$), but the change in CFI between the unconstrained and constrained model is only 0.001, suggesting that the model fit was not significantly reduced by the imposition of factor-loading constraints (Cheung & Rensvold, 2002).

Table 1. Means, Standard Deviations, AVEs, and Correlations among Constructs

	Croatia (N = 488)	Mean	SD	CR	AVE	1	2	3	4	5	6
1.	ECE	4.652	1.389	0.764	0.543	**0.737**					
2.	Reputation	5.383	0.961	0.854	0.663	0.606	**0.814**				
3.	Trust	5.757	0.845	0.886	0.795	0.564	0.678	**0.892**			
4.	Credibility	5.767	0.883	0.892	0.674	0.521	0.739	0.621	**0.821**		
5.	Att. Loyalty	5.727	0.897	0.930	0.727	0.495	0.688	0.719	0.605	**0.853**	
6.	Beh. Loyalty	4.894	1.416	0.861	0.674	0.299	0.445	0.445	0.408	0.684	**0.821**

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	Slovenia (N = 409)	Mean	SD	CR	AVE	1	2	3	4	5	6
1.	ECE	4.551	1.468	0.710	0.470	**0.686**					
2.	Reputation	5.252	1.044	0.846	0.649	0.501	**0.806**				
3.	Trust	5.889	0.889	0.721	0.573	0.481	0.678	**0.757**			
4.	Credibility	5.554	1.003	0.918	0.737	0.515	0.742	0.653	**0.858**		
5.	Att. Loyalty	5.656	1.071	0.947	0.782	0.549	0.639	0.757	0.608	**0.884**	
6.	Beh. Loyalty	4.638	1.633	0.896	0.742	0.446	0.353	0.367	0.366	0.600	**0.861**
	Turkey (N = 397)	**Mean**	**SD**	**CR**	**AVE**	**1**	**2**	**3**	**4**	**5**	**6**
1.	ECE	5.040	1.337	0.728	0.500	**0.707**					
2.	Reputation	5.521	1.062	0.840	0.639	0.663	**0.799**				
3.	Trust	5.689	1.053	0.883	0.791	0.742	0.871	**0.889**			
4.	Credibility	5.590	1.053	0.939	0.795	0.595	0.814	0.762	**0.892**		
5.	Att. Loyalty	5.677	1.141	0.942	0.837	0.708	0.746	0.813	0.692	**0.915**	
6.	Beh. Loyalty	4.929	1.562	0.899	0.748	0.475	0.455	0.489	0.426	0.641	**0.865**

Notes: Bold figures on the diagonal are square root of AVE, correlations are below the diagonal.

The discriminant validity of the constructs was determined by comparing the square root of the average variance extracted (AVE) of each construct with the correlations between the constructs. The results fully support discriminant validity for the Croatian and Slovenian dataset, as the square root of AVE of each construct is greater than its shared variance with other constructs. To meet this strictest criterion of discriminant validity, the correlation between reputation, trust and brand credibility in the Turkish dataset is too high. Our assessment is that due to the shorter duration of the service's existence in the Turkish market, customers have difficulty in distinguishing between the service quality dimension of reputation, the expertise dimension of brand credibility and the integrity dimension of trust. This also confirms the high correlation between these dimensions.

To test our hypotheses, we used SEM in AMOS 27.0 (Table 2). The goodness-of-fit statistics related to the three-group unconstrained model show an excellent fit with $\chi^2 = 549$ (df = 117; $p < 0.001$), NFI = 0.935, CFI = 0.948, RMSEA = 0.053. Therefore, we found that the hypothesized multi-group causal structure model fits well across three markets.

All the hypothesized relationships are confirmed and are statistically significant for all three datasets. The only exception is the hypothesized influence of ECE on brand credibility in the Turkish dataset (H1b Turkey). In Croatia and Slovenia, the influence of ECE on brand credibility is relatively weak. In Turkey, where the brand is less known because it has been in the market for fewer years, and conse-

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quently, consumers were exposed to fewer years of email communication, the relationship has not been established yet.

Table 2. SEM results and results of path invariance test

Paths	Standardized β			Path invariance test	
	Croatia	Slovenia	Turkey	Δχ2(2)	p
H1a: ECE → Reputation	0.587**	0.501**	0.671**	1.678	0.432
H1b: ECE → Credibility	0.142*	0.191**	0.075	2.62	0.27
H1c: ECE → Trust	0.182**	0.241**	0.25**	2.479	0.29
H2a: Reputation → Credibility	0.661**	0.648**	0.817**	6.828	0.033
H2b: Reputation → Trust	0.427**	0.422**	0.558**	9.762	0.008
H3: Credibility → Trust	0.25**	0.276**	0.211*	1.01	0.6
H4: Trust → Att. Loy.	0.765**	0.842**	0.839**	38.6	< 0.001
H5: Att. Loy. → Beh. Loy.	0.684**	0.6**	0.665**	6.59	0.001
Unconstrained model fit: χ2 = 549; df = 117; RMSEA=0.05; NFI = 0.94 Structural weights constrained model fit: χ2 = 1,000; df = 163; RMSEA = 0.06; NFI = 0.89					

Notes: *p <0.05; **p <0.00; RMSEA=root mean square error of approximation; NFI = normed fit index.

ECE has a direct positive impact on trust (H1c) and a strong indirect impact via reputation (H1a and H2b). Reputation has a significant positive effect on trust directly (H2b) and via credibility. The direct impact of credibility on trust is relatively weak in all three markets, but it is statistically significant. The positive chain of effects trust → attitudinal loyalty → behavioral loyalty is, as for many similar variance models, also confirmed for the model presented in this study for all three datasets.

To test the invariance of the model at the structural level, all structural path weights were constrained to be the same in all markets. The constrained model is statistically significantly different from the unconstrained model ($\Delta\chi^2_{(46)} = 451.6$; $p < 0.001$).

When invariance was examined at the single path level, we found that the impact of ECE on reputation, credibility, and trust is invariant across all three markets, which is also true for the impact of credibility on trust, although the latter impact is small and not significant for the Turkey dataset. The difference in the impact of reputation on credibility and on trust is statistically significant. It is the highest for Turkish customers of the online subscription service; however, there is no significant difference for the same relationship between the Slovenian and Croatian markets. The influence of trust on attitudinal loyalty is higher in Turkey and Slovenia than in Croatia. On the other hand, the influence of attitudinal loyalty on behavioral loyalty is the highest in Croatia, followed by Turkey and Slovenia.

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Discussion and Implications

The aim of this research was to investigate the behavior of customers of subscription online services by developing a relationship marketing effectiveness model. We showed that the model, with customer trust in an online subscription service as a focal construct, email communication exposure, service provider reputation, and brand credibility as antecedents, and loyalty as an outcome, adequately models customer behavior in markets that differ according to the service's competitive position in the market.

The online legal subscription service used for our research is very well established in Slovenia, where it is a well-known name for this type of service (25 years in the market with more than 80% market share). In Croatia, the service has existed for 10 years and has also captured more than 70% market share during this time, while in Turkey the same service was established only five years ago and competes with a well-established market leader and several other competitors. The fact that email communication is a strong driver of trust and trustworthy behavior in all three markets is an important finding useful for marketing practitioners, but it is also a challenging phenomenon for future research. How different segments of customers and potential customers respond to email communications, and how to delineate email communications as part of content marketing, marketing automation, and email advertising are both interesting future research questions.

In measuring the reputation of a service firm, we found that the customer reputation, service quality, and social responsibility dimensions of the reputation construct can be used unambiguously in culturally diverse markets. The other two dimensions proposed by Walsh and Beatty (2007), the "reliable and financially strong company" dimension and the "good employer" one, can only be used if customers have some knowledge about the company beyond their experience as users of the service. In our study, this was not the case in the Turkish market, so we omitted these dimensions from our measurement model. The impact of reputation on trust and credibility is the highest in Turkey. In our opinion, this is related to the fact that the service is relatively new in the Turkish market, and for this reason, Turkish customers are more careful in assessing the reputation of the provider. More in-depth research is needed to confirm this assumption.

The lowest impact of attitudinal loyalty on behavioral loyalty in Slovenia can be explained by the fact that most customers in Slovenia have open-ended subscription renewal contracts and are less likely to show loyal behavior. The mean value of behavioral loyalty is also the lowest in Slovenia.

Our research shows that a successful firm in the online subscription market builds its reputation with strong orientation toward customers, social responsibility, and quality of service. Quality content in email communications and low in-

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trusiveness of email communications are very important in building trust and trustworthy behavior. It helps if the service brand reflects the expertise of the company, however, this seems to be less important than the overall reputation of the company and email communication. The managers of online subscription services should pay a lot of attention to email communication to build customer trust and loyalty to their services.

References

Bartikowski, B. & Walsh, G. (2011). Investigating mediators between corporate reputation and customer citizenship behaviors. *Journal of Business Research*, *64*(1), 39–44. doi:10.1016/j.jbusres.2009.09.018.

Blau, P.M. (1968). Social exchange. *International Encyclopedia of the Social Sciences*, *7*, 452–457.

Calvo-Porral, C., & Lévy-Mangin, J.-P. (2015). Switching behavior and customer satisfaction in mobile services: Analyzing virtual and traditional operators. *Computers in Human Behavior*, *49*, 532–540. doi:10.1016/j.chb.2015.03.057.

Cheung, G.W. & Rensvold, R.B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, *9*(2), 233–255.

Dessart, L., Veloutsou, C., & Morgan-Thomas, A. (2016). Capturing consumer engagement: Duality, dimensionality and measurement. *Journal of Marketing Management*, *32*(5–6), 399–426. doi:10.1080/0267257x.2015.1130738.

Erdem, T. & Swait, J. (1998). Brand equity as a signaling phenomenon. *Journal of Consumer Psychology*, *7*(2), 131–157.

Erdem, T. & Swait, J. (2004). Brand credibility, brand consideration, and choice. *Journal of Consumer Research*, *31*(1), 191–198.

Garbarino, E. & Johnson, M. S. (1999). The different roles of satisfaction, trust, and commitment in customer relationships. *Journal of Marketing*, *63*(2), 70. doi:10.2307/1251946.

Gaski, J.F. & Etzel, M.J. (1986). The index of consumer sentiment toward marketing. *Journal of Marketing*, *50*(3), 71–81.

Gefen, D., & Straub, D.W. (2004). Consumer trust in B2C e-Commerce and the importance of social presence: Experiments in e-Products and e-Services. *Omega*, *32*(6), 407–424. doi:10.1016/j.omega.2004.01.006.

George, M. & Wakefield, K.L. (2018). Modeling the consumer journey for membership services. *Journal of Services Marketing*, *32*(2), 113–125. doi:10.1108/jsm-03-2017-0071.

Groenland, E.A. (2002). Qualitative research to validate the RQ-demensions. *Corporate Reputation Review*, *4*(4), 308.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Gruner, R.L., Vomberg, A., Homburg, C., & Lukas, B.A. (2019). Supporting new product launches with social media communication and online advertising: Sales volume and profit implications. *Journal of Product Innovation Management*, *36*(2), 172–195.

Ha, L. (1996). Advertising clutter in consumer magazines: Dimensions and effects. *Journal of Advertising Research*, *36*(4), 76–85.

Hollebeek, L.D., Glynn, M.S., & Brodie, R.J. (2014). Consumer brand engagement in social media: Conceptualization, scale development and validation. *Journal of Interactive Marketing*, *28*(2), 149–165.

Hsin Chang, H., Rizal, H., & Amin, H. (2013). The determinants of consumer behavior towards email advertisement. *Internet Research*, *23*(3), 316–337. doi:10.1108/10662241311331754.

Hyun Baek, T. & Whitehill King, K. (2011). Exploring the consequences of brand credibility in services. *Journal of Services Marketing*, *25*(4), 260–272. doi:10.1108/08876041111143096.

Janakiraman, R., Lim, J.H., & Rishika, R. (2018). The effect of a data breach announcement on customer behavior: Evidence from a multichannel retailer. *Journal of Marketing*, *82*(2), 85–105.

Kim, D.J., Ferrin, D.L., & Rao, H.R. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents. *Decision Support Systems*, *44*(2), 544–564. doi:10.1016/j.dss.2007.07.001.

Kim, Y. & Peterson, R.A. (2017). A meta-analysis of online trust relationships in e-commerce. *Journal of Interactive Marketing*, *38*, 44–54. doi:10.1016/j.intmar.2017.01.001.

Kumar, V. (2014). Making 'freemium' work: Many start-ups fail to recognize the challenges of this popular business model. *Harvard Business Review*, *92*(5), 27–29.

Marinova, D. & Singh, J. (2014). Consumer decision to upgrade or downgrade a service membership. *Journal of the Academy of Marketing Science*, *42*(6), 596–618. doi:10.1007/s11747-014-0374-9.

McCarthy, D.M., Fader, P.S., & Hardie, B.G.S. (2018). Valuing subscription-based businesses using publicly disclosed customer data. *Journal of Marketing*, *81*(1), 17–35. doi:10.1509/jm.15.0519.

Merisavo, M. & Raulas, M. (2004). The impact of e-mail marketing on brand loyalty. *Journal of Product & Brand Management*, *13*(7), 498–505. doi:10.1108/10610420410568435.

Min, D. & Wan, L. (2009). Switching factors of mobile customers in Korea. *Journal of Service Science*, *1*(1), 105–120.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Morgan, R.M. & Hunt, S.D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing*, *58*(3), 20–38.

Murphy, M. & Sashi, C.M. (2018). Communication, interactivity, and satisfaction in B2B relationships. *Industrial Marketing Management*, *68*, 1–12. doi:10.1016/j.indmarman.2017.08.020.

Nguyen, N., Leclerc, A., & LeBlanc, G. (2013). The mediating role of customer trust on customer loyalty. *Journal of Service Science and Management*, *06*(01), 96–109. doi:10.4236/jssm.2013.61010.

Palmatier, R.W., Dant, R.P., Grewal, D., & Evans, K.R. (2006). Factors influencing the effectiveness of relationship marketing: A meta-analysis. *Journal of Marketing*, *70*(4), 136–153.

Palmatier, R.W. & Steinhoff, L. (2019). *Relationship marketing in the digital age*: Routledge.

Pansari, A. & Kumar, V. (2016). Customer engagement: The construct, antecedents, and consequences. *Journal of the Academy of Marketing Science*, *45*(3), 294–311. doi:10.1007/s11747-016-0485-6.

Qayyum, A., Ba Khang, D., & Krairit, D. (2013). An analysis of the antecedents of loyalty and the moderating role of customer demographics in an emerging mobile phone industry. *International Journal of Emerging Markets*, *8*(4), 373–391. doi:10.1108/IJoEM-02-2011-0019.

Shamma, H.M. & Hassan, S.S. (2009). Customer and non-customer perspectives for examining corporate reputation. *Journal of Product & Brand Management*, *18*(5), 326–337.

Sichtmann, C. (2007). An analysis of antecedents and consequences of trust in a corporate brand. *European Journal of Marketing*, *41*(9/10), 999–1015. Retrieved from http://www.emeraldinsight.com/doi/abs/10.1108/03090560710773318.

Sobel, J. (1985). A theory of credibility. *The Review of Economic Studies*, *52*(4), 557–573.

Sultan, A.J. (2018). Orchestrating service brand touchpoints and the effects on relational outcomes. *Journal of Services Marketing*.

Thibaut, J.W. & Kelley, H.H. (1959). *The social psychology of groups*. New York: John Wiley & Sons. Inc.

Truong, Y. & Simmons, G. (2010). Perceived intrusiveness in digital advertising: Strategic marketing implications. *Journal of Strategic Marketing*, *18*(3), 239–256.

von Wangenheim, F., Wünderlich, N.V., & Schumann, J.H. (2017). Renew or cancel? Drivers of customer renewal decisions for IT-based service contracts. *Journal of Business Research*, *79*, 181–188. doi:10.1016/j.jbusres.2017.06.008.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Vivek, S.D., Beatty, S.E., & Morgan, R.M. (2012). Customer engagement: Exploring customer relationships beyond purchase. *Journal of Marketing Theory and Practice*, *20*(2), 122–146.

Walsh, G. & Beatty, S.E. (2007). Customer-based corporate reputation of a service firm: Scale development and validation. *Journal of the Academy of Marketing Science*, *35*(1), 127–143. doi:10.1007/s11747-007-0015-7.

Walsh, G., Mitchell, V.-W., Jackson, P.R., & Beatty, S.E. (2009). Examining the antecedents and consequences of corporate reputation: A customer perspective. *British Journal of Management*, *20*(2), 187–203. doi:10.1111/j.1467-8551.2007.00557.x.

Watson IV, G.F., Beck, J.T., Henderson, C.M., & Palmatier, R.W. (2015). Building, measuring, and profiting from customer loyalty. *Journal of the Academy of Marketing Science*, *43*(6), 790–825.

Weinhardt, C., Anandasivam, A., Blau, B., & Stosser, J. (2009). Business Models in the Service World. *IT Professional*, *11*(2), 28–33. doi:10.1109/mitp.2009.21.

Yahia, I.B., Al-Neama, N., & Kerbache, L. (2018). Investigating the drivers for social commerce in social media platforms: Importance of trust, social support and the platform perceived usage. *Journal of Retailing and Consumer Services*, *41*, 11–19. doi:10.1016/j.jretconser.2017.10.021.

Zhang, X., Kumar, V., & Cosguner, K. (2017). Dynamically managing a profitable email marketing program. *Journal of Marketing Research*, *54*(6), 851–866.

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Adoption of Virtual Dressing Room Technologies

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Abstract

The apparel industry has gradually adopted virtual dressing room (VDR) technologies, aiming to reduce the risk associated with online purchases and increase customers' satisfaction. In this chapter, we analyze how the adoption of VDR changes consumers' preferences for offline or online stores and decreases returns. The analysis is based on a conceptual microeconomic model of the adoption of technologies. Our main findings are: (1) Larger retailers are more likely than smaller ones to adopt VDRs. (2) The higher the retailer's share of online trade, the earlier the adoption.

Keywords: adoption, VDR, returns, retailers, online channel

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Introduction

Retailing has changed in the last two decades due to the adoption of new technologies and increasing digitalization (Verhoef, Kannan, & Inman, 2015). The online channel has become dominant in retail fashion. The growth of the online channel and the decline in in-person services is forcing retailers to adapt their existing strategies and practices and adopt innovative technologies. Delay in adapting and adopting business practices may result in businesses' collapse (Zilberman, Zhao, & Heiman, 2012). With the rapid adoption of mobile trade applications, the growth in online services and the decline in in-person services have accelerated (Xu, Forman, Kim & Van Ittersum, 2014). The rising usage of mobile applications and the great extent of the diffusion of social networks allow consumers to search for information anytime, anywhere, and to simultaneously try on items and pay in a convenient way. Consumers can unbundle the buying cycle and take each step through a different channel. These changes have led to the development of omni-channel retailing (Gensler, Neslin, & Verhoef, 2017; Verhoef et al., 2015), which allows consumers to search online and offline at the same shopping stage, regardless of their location. The digitalization of retailing and the adoption of artificial intelligence (AI) and augmented reality (AR) applications in online retail channels affect the three purchase stages: pre-purchase (search), purchase (choice and transaction), and post-purchase, which includes evaluation, satisfaction, recommendations, repeat purchase intentions, and returns of unwanted products. More convenient and lower-cost online pre-purchase search and purchase stages have increased the appeal of the online channel. Buying online (without the adoption of VDRs) has its shortcomings, in particular consumers' inability to try garments on. The lower quality of pre-purchase information that results from this inability and the lack of interactions with store staff and other shoppers increase the likelihood of consumers' disappointment, regret, and dissatisfaction and, in turn, returns of purchased items.

The main reason for returning a garment is poor fit (Heiman, McWilliams, Zhao, & Zilberman, 2002). Product demonstrations are effective in reducing pre-purchase risk and thereby inducing the growth of innovations (Heiman & Muller, 1996). The higher share of online shopping coupled with poor quality pre-purchase information increases the proportion of products returned to retailers. The proportion of products purchased online and returned seems to be increasing. More than a decade ago, Ofek, Katona, and Sarvary (2011) reported that the proportion of online purchases that are returned is in the range of 18% to 35%, two to three times more than returns of brick and mortar sales, which were estimated at 8.5%. In 2018, Abbey, Ketzenberg, and Metters (2018) estimated that about 30% of online purchases are returned. Returns are costly for retailers. The salvage value of the returned products is low (Gray, 2019). In 2021, the total volume of returns to retail-

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ers in the US was $761 billion, a large increase from the $428 billion in returns in 2020 (Manayiti, and Edgecliffe-Johnson (2022), and the numbers are expected to continue rising unless retailers change their strategy. Retailers can make return policies less lenient, increase hassle costs, or charge customers for returns (sharing risk, reducing the problem of moral hazard). These tactics shift customers to the offline channel (Mandal, Basu, & Saha, 2021) and lower perceptions of service quality and loyalty (Mollenkopf, Rabinovich, Laseter, & Boyer, 2007; Xu & Jackson, 2019). Alternatively, the retailers may take pre-emptive measures and allow customers to try garments on online (Gustafsson, Jonsson, & Holmström, 2021).

The growing share of online sales has led online apparel retailers to adopt virtual "try before you buy" software that allows customers to screen products and identify items that are most likely to fit or will not fit to substitute for offline dressing rooms (Heiman, Reardon, & Zilberman, 2022). Trying on items before making a purchasing decision is a sort of demonstration that reduces fit risk and decreases product returns (Heiman, McWilliams, & Zilberman, 2001). Virtual dressing room software solutions have existed in the market for almost a decade, but their adoption is still in its infancy (Lee, Xu, & Li, 2020). Only approximately 30% of businesses are considering the adoption of innovative AI products and services (McKinsey Global Institute, 2018). The slow diffusion rate of virtual dressing room (VDR) technologies, despite their contribution to reducing returns and increasing demand, is surprising. Adopters of VDR report remarkable reductions in product returns – from 38% to just 2% (Bahur, 2020). In addition to the lower proportion of product returns, the adopters reported sizeable increases in sales. Macy's sales rose 43% after the adoption of Zeekit VDR technology. Other adopters are Walmart, ASOS, Zalando, Adidas, and Tommy Hilfiger. Amazon is introducing its in-house developed AI-based VDR solution. This list of adopters refers to giant online retailers and large-scale dual channel retailers. Small- and medium-sized retailers seem to be slow in their acceptance of the VDR technology despite their greater need to reduce the cost of returns, as they are exposed to the diseconomies of scale that characterize the logistics of handling returns (Heiman et al., 2022).

In this chapter, we focus on why and how a retailer decides to adopt VDR technologies. We analyze and explain the paradoxical situation in which mainly giant retailers adopt an available technological solution to the problem of the growing proportion and quantity of returns, while smaller retailers who cannot afford to wait have not yet done so. To explore these issues, we present two models, one that relates to consumer demand for the new technologies, and one that relates to retail adoption of them. The first model explores consumers' decisions regarding where to try garments on and where to buy them. The second model, retail adoption, shows the adoption of VDRs as a function of the following: the availability of the technology to retailers and the retailer's demand (willingness to adopt at a given

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clothing price and software cost). Demand and supply depend on each other; retailers who adopt these software innovations consider the current and future supply of the innovations. Likewise, the software suppliers integrate the rate of the retailer's adoption of the technology at a given time into their profit functions to decide on software supply. The demand and supply of innovations are, in turn, functions of the heterogeneous characteristics of consumers and firms.

Modeling the Decision Whether and When to Adopt VDR

Consumers' Choices Regarding Where to Try On and Buy

The decision modeled is whether the retailer adopts VDR technology that enables consumers to preview unfamiliar products online. Our model is based on a conceptual framework for the diffusion of technologies in sectoral supply chains (Zilberman, Lu, & Reardon, 2017). The micro adoption model, also termed the threshold model, is based on two elements: (1) heterogeneous consumers and firms; (2) adopters' choices that are based on maximization (profit or benefit).

Consumers' choices regarding where to try on clothing and where to buy it affect retailers' choices regarding whether and when to adopt the VDR technology. The availability of VDR services affects consumers' choices of where to try garments on. Consumers' and retailers' choices affect the quantity of apparel returned. The latter choice affects the consumers' costs of returning unwanted products. Consumers and retailers are assumed to be risk-neutral and to maximize benefits (profits) that are adjusted to risk. The time of adoption is determined when a key parameter, such as uncertainty, information, changes in regulations, demand, or contribution to profit, exceeds a certain threshold (hurdle rate) (Carey & Zilberman, 2002). Uncertainty regarding the demand or the quality of the technology may delay the adoption, but as the cost of the technology declines and learning about it improves, its diffusion increases. Potential adopters will delay the timing of the adoption if the economic value of the delay is greater than the benefits of early adoption (Farzin, Huisman, & Kort, 1998; Hoppe, 2002; Reinganum, 1981). Technology providers are aware of this fact and target the most likely adopters (Zilberman et al., 2012).

Consumers can try on, purchase, and return items at offline or online stores, or split these activities between the two channels. We assume that the product (brand) quality, assortment, and price are identical in both channels. The consumer's choice process begins with the decision regarding where to try on the product and continues with the decision regarding whether to buy or to stop searching. After purchasing and trying on the item at home, the third decision is whether to keep or return it. If return is necessary, the consumer decides whether to return it to a store or by mail (or to a return center).

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The benefit of the product (brand) if it fits is denoted by *V*. *kV* denotes the benefit of poor fit, where $0 \leq k < 1$. The item's price is *p*. Consumers' cost of return is denoted by $R^i{}_{i=s,0}$ where *s* indicates an offline store and *o* indicates an online store. The choice of which channel to return unwanted items to does not affect the choice of where to try on items and where to buy them, which are the key factors that affect the retailer's decision regarding whether and when to adopt the VDR technology. The retailer's choice regarding whether to enable returns only offline, only by mail (or at a specialized collection point), or both offline and by mail, affects the cost of handling returns. This choice is beyond the scope of this study, and for the sake of simplicity, we assume that (1) $R^o = R^s = R$, and (2) consumers return the unwanted products only to offline stores. The probability of fit when unfamiliar products are purchased is denoted by $1 \geq q \geq 0$. Consumers are heterogeneous with respect to *q* and are assumed to be uniformly distributed over the range [0,1]. A consumer will return an item to a store when $kV - p < -R$. We assume that *k* is low enough to justify returns and, for convenience, let us assume that $k = 0$.

A consumer's choice to buy at an offline store versus an online one involves comparing the cost and benefits of undertaking the transaction cycle (trying on, buying, and, if necessary, returning the item). Buying costs are the sum of the cost of trying on and the cost of buying, i.e., $T^i = T^i_D + T^i_B$, where $i = S,O$ indicates the channel, subscript *D* indicates the cost of trying on, and subscript *B* denotes the cost of buying. Let $\gamma_D = \frac{T^S_D}{T^o_D}$ denotes the ratio of offline to online trying-on costs and $\gamma_B = \frac{T^S_B}{T^o_B}$ the ratio of offline to online buying costs.

The population is divided into four segments that are characterized by different ratios of γ_D and γ_B. Specifically, when $\gamma_B \leq 1$, a consumer will buy offline, regardless of where he or she tried on the item. Let β denote the proportion of consumers whose ratio of buying cost is $\gamma_B \leq 1$, and δ is the proportion of consumers whose ratio of trying-on costs is $\gamma_D \leq 1$.

After trying on an item at a store, G^S of the customers will discover whether or not the product fits. $1 - G^S$ will not discover whether or not the product fits, and will try it on at home. After trying on an item online, G^O of the customers will discover whether the product fits. We assume that prior to the adoption and utilization of the VDR technology, $G^O = 0$. Following the adoption of the VDR software, $G^O > 0$, and it is possible that with the VDR technology, $G^O > G^S$.

The difference in the expected benefit between buying offline and online is a function of the difference between the offline and online probabilities of discovering whether or not the product fits and the differences in the transaction cost. While the probability of discovering whether or not the item fits after it is tried on offline, G^S, is assumed to be unrelated to the adoption of VDR, the probability of discovering whether or not the products fit after trying it on online, G^O, depends on whether VDR technology services are available.

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Verhoef, Kennan, and Inman (2015) and Gensler, Neslin, and Verhoef (2017) identified four different buying cycles, which are termed the customer's journey in omni-channel retailing. The difference between buying offline and showrooming is the location where the item is purchased, while the difference between webrooming and buying online is the location where the product is tried on. The proportion of consumers who try the item on at a store (offline and showrooming shoppers) defines the demand for offline dressing rooms. Before retailers adopt the VDR technology, consumers who try on items at home (online and webrooming consumers) are more likely to return the purchased items. In addition, there is a greater likelihood that unwanted products will be returned. The greater likelihood of unwanted products being returned multiplied by the number of customers who try items on online is the key argument for adopting the VDR technology.

The expected benefit of buying offline is given by:

$$q(V-p)-(1-G^S)(1-q)R-T_D^S-T_B^S.$$

The expected benefit of buying online is given by:

$$q(V-p)-(1-G^O)(1-q)R-T_B^O-T_D^O.$$

The expected benefit of showrooming, i.e., trying on items offline and buying them online, is given by: $q(V-p)-(1-G^S)(1-q)R-T_D^S-T_B^O$, and the expected benefit of webrooming is given by: $q(V-p)-(1-G^O)(1-q)R_i-T_2^D-T_1^B$.

A consumer will choose to try on, purchase, and return items, if necessary, offline if:

$$\begin{cases} q(V-p)-(1-G^S)(1-q)R-T_D^S-T_B^S \geq q(V-p)-(1-G^O)(1-q)R-T_B^O-T_D^O \\ q(V-p)-(1-G^S)(1-q)R-T_D^S-T_B^S \geq q(V-p)-(1-G^S)(1-q)R-T_D^S-T_B^O \\ q(V-p)-(1-G^S)(1-q)R-T_D^S-T_B^S \geq q(V-p)-(1-G^O)(1-q)R-T_D^O-T_B^S \end{cases} \quad (1)$$

The first inequality represents the preference for buying in-store relative to buying online. The second inequality represents the preference for buying in-store relative to showrooming. The third inequality represents the preference for buying offline relative to webrooming. Consumers' decisions regarding where to try on items and shop are calculated in a similar manner. The conditions for preferring each of the four types of shopping cycles are presented in Table 1.

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Table 1. Segmentation based on consumers' choices regarding where to try on items, whether to purchase them, and where to shop

	Decision Rule	Selection of the location where items are tried on as a function of q
Trying on and buying offline	$\left(G^S - G^O\right)(1-q)R \geq T_B^S - T_B^O + T_D^S - T_D^O$ $T_B^S - T_B^O \leq 0$	$1-q \geq \frac{T_D^S - T_D^O}{\left(G^S - G^O\right)R}$
Trying on and buying online	$\left(G^S - G^O\right)(1-q)R < T_B^S - T_B^O + T_D^S - T_D^O$ $T_B^S - T_B^O > 0$	$1-q < \frac{T_D^S - T_D^O}{\left(G^S - G^O\right)R}$
Showrooming: Trying on offline, buying online	$\left(G^S - G^O\right)(1-q)R \geq T_D^S - T_D^O$ $T_B^S - T_B^O \leq 0$	$1-q \geq \frac{T_D^S - T_D^O}{\left(G^S - G^O\right)R}$
Webrooming: Trying on online, buying offline	$T_1^D - T_2^D \geq \left(G^S - G^O\right)(1-q)R$ $T_B^S - T_B^O > 0$	$1-q < \frac{T_D^S - T_D^O}{\left(G^S - G^O\right)R}$

Calculating the Proportion of Consumers Who Will Not Purchase the Product

Consumers will not purchase a product when they discover that it does not fit. The likelihood of revealing whether the product does not fit is $G^O(1-q)$ if the consumer tries on the product online, and $G^S(1-q)$ when the consumer tries on the product offline.

Calculating the Demand for Offline and Online Dressing Rooms (VDR)

The threshold probability of fit, q, which leaves the marginal consumer indifferent to trying on online or offline, is calculated by equalizing the expected benefit of trying on online with the expected benefit of trying on offline, regardless of the choice of the purchase location. Consumers who prefer buying online and those who prefer the webrooming cycle comprise the potential market for the service of VDR technology. The choice rule of these two segments suggests that the threshold probability for trying on online is $1-\frac{T_D^S - T_D^O}{\left(G^S - G^O\right)R} = q$. Recall that $1-\beta$ defines the proportion of consumers whose offline buying costs are lower than their online buying costs, i.e., $T_B^S - T_B^O < 0$.

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The proportion of consumers who try on items and buy online is given by: $(1-\beta)\int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1} dq$. The proportion of webroomers is given by: $\beta\int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1} dq$. Multiplying theses proportion by the size of the market N yields the number of consumers in each segment. Summing up the size of these two segments yields the number of consumers who try on online, i.e., $Q^{VDR} = N\int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1} dq$. The proportion of consumers who try items on and buy them at the brick and mortar store is given by: $\beta\int_{0}^{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}} dq$, and the proportion of consumers who prefer the showrooming buying cycle is given by: $(1-\beta)\int_{0}^{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}} dq$. The demand for offline dressing rooms consists of consumers who try on items offline and then either purchase them or exit the market, and if they do purchase the items, they buy them offline or at home (showrooming), i.e.,

$Q^{PD} N \cdot \int_{0}^{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}} dq.$

Calculating the Demand

The (gross) demand for the product is lower than the net demand, since after trying on an item, some consumers will discover that it does not fit. The number of consumers who do not go on to purchase the product after trying it on offline or online is given by: $G^S(1-q)$ and $G^O(1-q)$. The number of consumers who reveal that the item does not fit them is given by:

$G^S(1-q)N \cdot \int_{0}^{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}} dq + NG^O(1-q)\int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1} dq$, which is equal to

$(1-q)N\left(G^S \cdot \int_{0}^{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}} dq + G^O \int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1} dq \right)$. The number of consumers who discover that the product fits after trying it on either online or offline is given by:

$qN\left(G^S \cdot \int_{0}^{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}} dq + G^O \int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1} dq \right)$. Note that prior to the adoption of VDR technology, $G^O = 0$. A consumer who does not discover whether or not the item fits needs to decide whether to purchase it and try it on at home or exit the market. A consumer will purchase and try on the item at home if $q(V-p)-(1-q)R-T_B^S > 0$. We assume that the threshold probability of purchasing after not discovering whether or not the product fits is lower than the threshold probability of trying it on on-

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line, i.e., $\frac{R+T_B^S}{V-p+R}+\frac{T_D^S-T_D^O}{\left(G^S-G^O\right)R}<1$. All the shoppers whose probability of fit is lower than $q<\frac{R+T_B^S}{V-p+R}$ will exit the market if they do not discover that the product fits. The likelihood of purchasing an item after trying it on in brick and mortar store and not discovering whether it fits is given by: $q\int_{\frac{R+T_B^S}{V-p+R}}^{1-\frac{T_D^S-T_D^O}{\left(G^S-G^O\right)R}}dq$, and the expected net demand of the offline channel is given by: $qNG^S\cdot\int_0^{1-\frac{T_D^S-T_D^O}{\left(G^S-G^O\right)R}}dq+qN\left(1-G^S\right)\int_{\frac{R+T_B^S}{V-p+R}}^{1-\frac{T_D^S-T_D^O}{\left(G^S-G^O\right)R}}dq$. The demand after trying on online is given by: $qN\int_{1-\frac{T_D^S-T_D^O}{(G^S-G^O)R}}^{1}dq$.

The net demand, which is the aggregation of net demand after trying on the product offline and online, is given by: $qN\left(G^S\cdot\int_0^{\frac{R+T_B^S}{V-p+R}}dq+\int_{\frac{R+T_B^S}{V-p+R}}^{1}dq\right)$.

Calculating Returns

The likelihood of returning an item is the probability that a potential customer does not discover whether or not it fits after trying it on offline or online multiplied by the probability that the item will not fit, (1 – q). Returns after trying on products offline are given by: $Q_R^S=\left(1-q\right)N\left(1-G^S\right)\int_{\frac{R+T_B^S}{V-p+R}}^{1-\frac{T_D^S-T_D^O}{\left(G^S-G^O\right)R}}dq$, and returns after trying on items on online are given by: $Q_R^O=\left(1-q\right)N\left(1-G^O\right)\int_{1-\frac{T_D^S-T_D^O}{\left(G^S-G^O\right)R}}^{1}dq$. The total number of returns, Q_R is the sum of returns after trying an item on offline and online, i.e., $Q_R=Q_R^S+Q_R^O$. We identify the quantity of returned products when VDR services are available as Q_R^{VDR} and before adopting the VDR technology as .

Demand and Returns Prior to the Adoption of VDR Technology

The net demand without VDR services, i.e., the demand after trying on items and then experiencing them at home, is equal to the demand after the adoption of VDR technology. The difference between the profit after and before the adoption of the VDR technology is an outcome of the larger proportion of online shoppers and the lower quantity of returns. A higher proportion of offline shoppers increases the cost of operation, and without the VDR technology, the quantity of returns in-

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creases. The likelihood of an item being returned is the number of consumers who did not discover whether or not the product fits after trying it on multiplied by the probability that the item will not fit, $(1 - q)$. Returns after trying on items offline are given by: $Q_R^S = (1-q)N\left(1-G^S\right)\int_{\frac{R+T_B^S}{V-p+R}}^{1-\frac{T_D^S-T_D^O}{G^S R}} dq$, and returns after trying on items online are given by: $Q_R^O = (1-q)N\int_{1-\frac{T_D^S-T_D^O}{G^S R}}^{1} dq$. The total number of returns before the adoption of VDR, Q_R^N, is the sum of returns after trying on items offline and online, i.e., $Q_R^N = Q_R^S + Q_R^O = (1-q)N\left(1-G^S\right)\int_{\frac{R+T_B^S}{V-p+R}}^{1-\frac{T_D^S-T_D^O}{G^S R}} dq + (1-q)N\int_{1-\frac{T_D^S-T_D^O}{G^S R}}^{1} dq$.

Retailers' Decision Regarding Whether and When to Adopt VDR Technology

The annual profit of a retailer before the adoption of VDR technology is given by: $\pi^N = (p-c)qN\left(1-\frac{R+T_B^S}{V-p+R}\left(1-G^S\right)\right) - c^R\left(Q_R^N\right) - f_1\left(Q^{PD,N}, Q^{B,N}\right) - f_2\left(Q^{O,N}\right) - C$

$Q^{PD,N}$, $Q^{B,N}$ denotes the demand for offline dressing room services, which affect rental, cost of staff and materials, and the demand for offline cashier services when the retailer does not offer VDR services.

The annual profit of a retailer who leases VDR is given by:

$$\pi^{VDR} = (p-c)qN\left(1-\frac{R+T_B^S}{V-p+R}\left(1-G^S\right)\right) - c^R\left(Q^R\right) - f_1\left(Q^{PD}, Q^B\right) - f_2\left(Q^O\right) - rk\left(Q^{VDR}\right) - C$$

The cost of handling return is represented by c^R, while C denotes the fixed cost, and C^{VDR} represents the fixed cost of the adoption of VDR technologies. The cost of operating offline and online stores is indicated by f_1 and f_2. We assume that the marginal cost of operating an offline store is greater than that of operating an online store, i.e., $f'_1 > f'_2$. The cost of operating an offline store is a function of its sales and the quantity of demonstrations (try-ons). The cost of acquiring (or leasing) VDR is represented by $rk(Q^{VDR})$. The retailer compares the profit before and after adopting the VDR technology. The retailer is expected to adopt the VDR technology when the expected profit after adoption is larger than the current profit. The difference in profit following the adoption of VDR technologies is the saving of returns and operating costs minus the cost of the VDR technology. The most notable saving is the lower cost of returns. The difference in quantity of returned items $Q_R^N - Q^R$ is represented by: $(1-q)N\frac{G^O\left(T_D^S - T_D^O\right)}{\left(G^S - G^O\right)G^S R}$. Assuming that $c'\left(Q^R\right) > 0$ and $c''\left(Q^R\right) > 0$ suggests that the larger the quantity of returns, the greater the saving that results from the adoption of the VDR technology. In addi-

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tion to saving the costs of handling returns, the retailer benefits from the lower operation costs of the online channel. The saving in the costs of operation and handling returns must be greater than the cost of buying or leasing the VDR technology. Better access to credit, lower cost of credit, or lower price per use when the pay-per-use plan is chosen all reduce the cost of financing VDR technologies.

The theoretical model presented above suggests two hypotheses regarding the adoption of VDR technologies. It predicts, consistently with the threshold model of adoption, that the first to adopt VDRs will be firms that have the most to gain from adoption. Several factors may affect the decision regarding whether to adopt. Among these are retailers' costs of operating dressing rooms and handling returns. When retailers' marginal costs of operating dressing rooms and handling returns increase, the gain from adopting VDR is greater for large retailers and retailers whose share of the online channel are larger. These variables are consistent with the study of Heiman, Reardon, and Zilberman (2022), who analyzed the timing of the adoption of VDR technologies. Hypotheses (1) and (2) summarize the discussion above.

Hypothesis (1): Larger retailers are more likely to adopt VDRs before smaller ones.

Hypothesis (2): The greater the retailer's share of online trade, the earlier the adoption.

Conclusion, Future Research Directions, and Limitations

In this study, we did not analyze the effect of the shift to online and multi-channel retailing and the adoption of VDR technologies on perceptions of service quality. Some customers may perceive the technology as promising a better quality of service, while others may see it as a threat. Replacing in-person with online and AI agent communication is expected to decrease consumers' satisfaction with service merely because of their impersonal nature. Twenty years ago, consumers perceived that ATM machines reduced the quality of banking. Today, consumers use electronic wallet applications to carry out transactions. The world is undergoing digitalization and consumers are becoming used to replacing in-person services with software applications. It will be interesting to explore changes in satisfaction levels and perceptions of the quality of retail services over time.

The reduction in returns of unwanted fashion products reported in this study are impressive, but they are based on anecdotes. Retailers and the academic community will benefit from a comprehensive study that compares the change in returns and sales following the adoption of VDR technologies. We encourage empirical research that documents the adoption of the VDR technologies in the fashion industry and other online categories in which the ability to try on items is important.

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Finally, buyers of low-cost fashion items may not exercise the return option, since the cost of returning an unwanted product may be greater than its price. It is not clear whether VDR services are needed in product categories such as ultra-fast fashion.

References

Abbey, J., Ketzenberg, M., & Metters, R. (2018). A more profitable approach to product returns. *MIT Sloan Management Review*, *60*(1), 1–6.

Bahur, N. D. (2020, 31.05.20). Zeekit's virtual fitting rooms replaced Asos's fashion shoots during Covid-19 crisis. *Calcalist*, p. CTECH. Retrieved from https://www.calcalistech.com/ctech/articles/0,7340,L-3828775,00.html.

Carey, J. M., & Zilberman, D. (2002). A model of investment under uncertainty: Modern irrigation technology and emerging markets in water. *American Journal of Agricultural Economics*, *84*(1), 171–183.

Farzin, Y. H., Huisman, K. J., & Kort, P. M. (1998). Optimal timing of technology adoption. *Journal of Economic Dynamics and Control*, *22*(5), 779–799.

Gensler, S., Neslin, S. A., & Verhoef, P. C. (2017). The showrooming phenomenon: It's more than just about price. *Journal of Interactive Marketing*, *38*, 29–43.

Gray, A. (2019). US retail Retailers grapple with $100bn returns problem. *Financial Times*. Retrieved from https://www.ft.com/content/5bafd9c0-235f-11ea-92da-f0c92e957a96.

Gustafsson, E., Jonsson, P., & Holmström, J. (2021). Reducing retail supply chain costs of product returns using digital product fitting. *International Journal of Physical Distribution & Logistics Management*.

Heiman, A., McWilliams, B., Zhao, J., & Zilberman, D. (2002). Valuation and management of money-back guarantee options. *Journal of Retailing*, *78*(3), 193–205.

Heiman, A., McWilliams, B., & Zilberman, D. (2001). Reducing preurchase risk with demonstratios and money-back-guarantees. *Marketing Management Journal*, *11*(1).

Heiman, A., & Muller, E. (1996). Using demonstration to increase new product acceptance: Controlling demonstration time. *Journal of Marketing Research*, 422–430.

Heiman, A., Reardon, T., & Zilberman, D. (2022). Adoption of virtual dressing room technologies. *Service Science*.

Hoppe, H. C. (2002). The timing of new technology adoption: Theoretical models and empirical evidence. *The Manchester School*, *70*(1), 56–76.

Lee, H., Xu, Y., & Li, A. (2020). Technology visibility and consumer adoption of virtual fitting rooms (VFRs): A cross-cultural comparison of Chinese and Ko-

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

rean consumers. *Journal of Fashion Marketing and Management: An International Journal*.

Mandal, P., Basu, P., & Saha, K. (2021). Forays into omnichannel: An online retailer's strategies for managing product returns. *European Journal of Operational Research*, *292*(2), 633–651.

Mollenkopf, D. A., Rabinovich, E., Laseter, T. M., & Boyer, K. K. (2007). Managing internet product returns: a focus on effective service operations. *Decision Sciences*, *38*(2), 215–250.

Ofek, E., Katona, Z., & Sarvary, M. (2011). "Bricks and clicks": The impact of product returns on the strategies of multichannel retailers. *Marketing Science*, *30*(1), 42–60.

Reinganum, J. F. (1981). On the diffusion of new technology: A game theoretic approach. *The Review of Economic Studies*, *48*(3), 395–405.

Verhoef, P. C., Kannan, P. K., & Inman, J. J. (2015). From multi-channel retailing to omni-channel retailing: introduction to the special issue on multi-channel retailing. *Journal of Retailing*, *91*(2), 174–181.

Xu, X., & Jackson, J. E. (2019). Investigating the influential factors of return channel loyalty in omni-channel retailing. *International Journal of Production Economics*, *216*, 118–132.

Zilberman, D., Lu, L., & Reardon, T. (2017). Innovation-induced food supply chain design. *Food Policy*.

Zilberman, D., Zhao, J., & Heiman, A. (2012). Adoption versus adaptation, with emphasis on climate change. *Annual Review of Resource Economics*, *4*(1), 27–53.

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Gamified Market Research: Increasing Respondents' Engagement

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Abstract

Gamification is considered an important tool in the modern market research. It helps to understand the consumers' motivations and obtain deeper data by creating more enjoyable conditions and increasing engagement in the research process. Elements of games are used both in the quantitative and qualitative research. Many studies in this field focus on the analysis of the dropout rate, completion rate or completion time in the surveys. This chapter presents a review of the research aimed at the analysis of different measure of the respondents' engagement – their productivity. The results of the experiments in various fields of market research are coherent – the use of gamified tasks makes people write more – they give more elaborate answers. Such results have vast practical implications. This review could be used as a toolbox for market researchers who want to amplify the survey tasks as well as focus group experience and obtain more thorough data.

Keywords: gamification, market research, projective techniques

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Introduction

Recent years have brought a rapid development of online methods of conducting marketing research. In 2019, computer-assisted web interviews (CAWI) in Poland accounted for over 57% of total number of contacts with the respondents, while face-to-face quantitative interviews made up only 16.4%. CAWI's turnover also increased compared with 2018 by 12.9% (PTBRiO, 2020). Online quantitative research is faster and cheaper than its f2f alternatives, and it also offers much wider possibilities than computer-assisted telephone interviews (CATI). On the other hand, CAWI research gives much less control over the respondent, which can result in decreased motivation to fill out unexciting quantitative forms (Schillewaert, 2011). The researchers understood that it is critical to engage participants of the online surveys and keep their interest levels up throughout the entire process. It leads to a development of advanced techniques, also utilizing gamification, that increase respondents' engagement which is considered crucial to improve enjoyment and, therefore, completion rate in the market research process (Puleston & Sleep, 2011; Triantoro, Gopal, Benbunan-Fich, & Lang, 2020; Zichermann & Cunningham, 2011).

In the qualitative research, gamification is also being used to engage the participants and obtain deeper information. Numerous research studies show the positive effect of the use of narrative and interactive elements of games on participants' engagement and motivation (Kapp, Blair & Mesch, 2013; Mader, Heller & Bry, 2019; Villagrasa, Fonseca, Redondo & Durán, 2014; Wood & Reiners, 2015).

The simplest definition of gamification is "the use of game design elements in non-game contexts" (Deterding, Dixon, Khaled & Nacke, 2011). These elements comprise a wide list: Reeves & Read (2009) refer to them as "[t]en ingredients of great games" and distinguish the following: self-representation with avatars, three-dimensional environments, narrative context, feedback, reputations, ranks, and levels, marketplaces and economies, competition under rules that are explicit and enforced, teams, parallel communication systems that can be easily configured, time pressure. One can easily recall encounters with these elements outside the typical gaming situations in everyday life in various touchpoints: school, work or brands' marketing activities.

The studies on gamification in marketing research are inspired by the research in the education field – it is proved that turning the process of learning into a game improves students' engagement and motivation (da Rocha Seixas, Gomes & de Melo Filho, 2016; Homer, Jew & Tan, 2018; Seaborn & Fells, 2015). Aslawaier (2017) provides a thorough literature review on the effects of gamification on motivation and engagement, indicating at the same time an existing gap between theory and practice. The topic needs further examination to provide implementation guidelines for the gamified designs for the learning processes.

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Research on gamified surveys focuses mainly on the analysis of the dropout rate, completion rate and completion time (Bailey, Pritchard & Kernohan, 2015; Brownell, Cechanowicz & Gutwin, 2015; Downes-Le Guin, Baker, Mechling & Ruylea, 2012). Hartenveld et al. (2018) propose a survey design methodology based on gamified, narrative tasks to provide a non-obtrusive and engaging experience for the participants.

My field of interest is the effect of the gamified tasks on the market research participants' performance, which reflects increased engagement in the entire process. This chapter presents an overview of the empirical data proving that the use of game elements, such as an extra rule or storyline, makes the respondents more productive in various fields of market research.

Gamifying Market Research

Market research is usually not an exciting experience for the participants – the survey questionnaires are filled out in a mechanical manner, the answers to open-ended questions are frequently superficial and it is a challenge for the moderator to maintain a high level of engagement during the group discussions. The use of gamification increases intrinsic motivation (Ryan & Deci, 2000; Hartenveld et al., 2018) and transforms the neutral or even boring activity into a rewarding experience. Paharia (2013) distinguishes five motivational factors that could be delivered by well-designed gamification programmes: being autonomous, mastering the skills and feeling of constant development, having influence in the alternative reality of the game, being aware of the progress and finally, feeling the bond with the others while cooperating, competing or just interacting in the world of the game – social interaction boost triggers engagement in the common task. A clever choice of the above-mentioned factors might be the solution to an often emotionally flat market research process experience.

Depending on the defined objectives, market research can be gamified on different levels of depth. Researchers distinguish two main variants of the application of game elements in this category (Bailey, Pritchard & Kernohan, 2015):

– Soft gamification uses the game mechanics elements, such as feedback, narration, challenge and competition, to make the participants more engaged and willing to put in maximal effort in the process of sharing their thoughts.
– Hard gamification transforms market research into a specially designed game. This immersive experience not only boosts the respondents' engagement but also stimulates them to get much deeper into the context of the study and share more detailed and normally unavailable information.

Apart from the use of game elements, the survey designers also improve the graphical aspects of the questionnaires to enhance the respondents' experience of

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the market research process. It is called surveytainment and belongs to the market researchers' gamification toolbox (Gorączka & Protasiuk, 2021).

Gamification in market research is an ongoing trend – a path followed by many companies that want to use the newest and the most effective tools of boosting the respondents' engagement and to collect data of greater value.

Impact of the Gamified Tasks on the Way How People Answer the Questions

The initial, simple experiments focusing on the use of gamified tasks applied in the surveys were carried out by Puleston and his associates (Puleston & Sleep, 2011; Puleston & Rintoul, 2012). The main idea behind this enterprise focused on improving the design and the flow of the surveys to increase the respondents' productivity and limit the dropout rate. One of the experiments was designed to turn simple questions into "quests" with an extended context: a kind of storyline. The participants in the control group were asked to evaluate any number of artists from a given list. They got a standard questionnaire question: "How much do you like each of the following music artists?" The experimental groups were given a "quest" task: *"Imagine you are in charge of your own private radio station, where the DJs play just the music you like. You will be shown a series of artists, and we want you to build up a play-list by deciding how much each artist should be played."* When creating the playlist, the participants were asked to evaluate selected artists as well. The experiment outcome shows that adding a storyline made participants more productive: the control group evaluated total of 83 artists compared to 148 in the experimental group (Puleston & Sleep, 2011). Simple gamification used in the question resulted in the almost doubled effect of the regular approach.

Another proof that gamification methods work comes from the outcome of an experimental study of Puleston & Rintoul (2012). Participants from the control group were naming their favourite Olympic disciplines. The gamified group was asked to imagine that they were responsible for TV broadcasting of the Olympic Games in London in 2012 and their job was to plan the broadcast based on the disciplines they would like to watch. The results pattern was similar to the previously described study and valid for different countries in which the experiment was carried out: in most of them, the average word count was doubled in the case of the gamified task compared to the control group: e.g. in India, the participants with a standard question wrote down slightly more than 3 disciplines, whereas the experimental, "storyline" group came up with over 7 disciplines on average.

I replicated this experiment using p-value to access the statistical difference between control and experimental groups (Ścibor-Rylski, 2019). There were three

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conditions: the control group was asked this question: "What are your favourite Summer Olympics disciplines?"; the experimental group had an extra rule: *"List at least 3 of your favourite Summer Olympics disciplines."* Additionally, the experimental, storyline group had to: *"Imagine you are responsible for the next Summer Olympic Games broadcast. You can include all of your favourite disciplines. Which ones would you broadcast?"*

I also put forward a hypothesis that a higher number of ideas would be generated in the experimental group with an extra rule than in the control group. Adding the principle (write down at least 3 words) to a regular instruction should result in a higher number of ideas named by respondents. Participants are motivated to exceed researcher's requirements. Even if they do not find the topic captivating, they try to deliver the required minimum. This is a simple technique of boosting effectiveness, yet it is not frequently used in questionnaire construction. Its effectiveness was presented in an experiment by Puleston & Sleep (2011) – an extra rule (using exactly 7 words while describing oneself) increased the average number of words used from 2.4 to 4.5.

The analysis of the replication of the "Olympics" experiment revealed statistically significant difference and large effect size. Experimental group 2 listed significantly more disciplines (M = 4.13) than the control group (M = 2.07) and the extra rule group (M = 2.63). The additional hypothesis has not been confirmed: using an additional rule was not more effective than not employing any facilitating technique.

The results of these two experiments study proved that adding context increased average number of listed disciplines when compared to the regular approach, and in the case of the latter study, also with a group with an extra rule.

One of my experiments (Ścibor-Rylski, 2018) also proved that the extra rule might be more effective than a standard question. Like in case of "Olympic" experiment, three groups of participants were asked to answer to list different pizza ingredients. Extra rule added the requirement to list "exactly 10 different ingredients" and the storyline group's instruction was worded: *"Imagine that you are about to open a pizzeria and you are creating a list of ingredients available for your guests to compose their own pizzas. You want to satisfy different tastes and reach different types of customers. List the ingredients you would put in your menu."* All group means were significantly different: the control group listed M = 6.83 ingredients, the extra rule group named M = 9.94 and the storyline group listed M = 12.89 pizza ingredients. Once again, simple gamification applied to the survey questions boosted people's productivity.

The described series of simple experiments could be treated as an introduction to more complex studies on the role of gamification in different branches of market research. A similar approach was used in the brand research, which is described in the following chapter.

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Gamification in the Brand Market Research

Qualitative brand market research focuses on different techniques facilitating the way how people talk about their relationship with the brands. A variety of projective techniques is used to reach beyond obvious statements referring to the look and taste. Gamification can also be applicable in this field in a "hard" version. There are different research games on the market that are used to create a narrative context around the brands and understand deeper consumers' associations and emotions in an enjoyable environment of playing and interacting with the others. Such games are usually based on a personification followed by the storyline: e.g. a deserted island setup in the case of Brand Secret game developed by Kantar or a ship cruise in Brand Odyssey – a game designed in the Polish market research company Minds & Roses.

The effectiveness of the personification as a projective technique was proved by Puleston and Sleep (2012). The researchers asked the participants to check the traits fitting a given brand. In the gamified (personification) approach, the task was worded: *"We would like you to try and turn some brands into people, using these human characteristics. Which of these characteristics would you use to describe this brand?"*. In the control group, an average of 3 characteristics were selected and people spent 12 seconds on the task, whereas in the experimental group participants checked twice as many traits, spending over three times longer doing it.

My own research was aimed at replicating the experiment comparing standard and personification-based tasks and it also added a third group with a personification task followed by some narrative, storyline-based questions: the respondents not only had to imagine the three beer brands as people but they also put pictured them on a desert island confronted with different tasks and threats. The first experiment (Ścibor-Rylski, 2018) included a matrix with 40 traits and the participants were marking the traits that fit the given three brands of beer. The list of attributes contained standard traits used in the brand image market research, e.g. "friendly", "modern", "fun". The analysis of the results indicated significant differences between the groups: the group based on the storyline gamification chose significantly more attributes for all the three brands (M = 30.00) than the personification group (M = 22.72) and the control group (M = 18.72). At the same time, the personification group was not more effective than the control group.

My second experiment (Ścibor-Rylski, 2019) replicated the above-mentioned result with a slightly different approach – instead of choosing the traits from a predefined list, the participants were supposed to come up with spontaneous answers (both ways of exploring brands' images are commonly used in the market research). In this case, statistical differences between all groups were observed: the group based on the storyline gamification came up with a higher number of attributes for all three brands (M = 21.54) than the personification group (M = 17.58) and the

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control group (M = 10.06). The qualitative analysis of the spontaneously attributed traits showed that adding narrative, storyline-based elements not only increases the number of the attributes, but it also influences their depth. The answers in the gamified group were much deeper and complex than in the personification and control groups.

The results presented in this chapter prove that gamification in the brand research might be used as a very effective projective technique. It makes people more engaged, causing the answers to be deeper, but it also creates a nice and friendly setup for the respondents who spend time, enjoying the social task of playing a game.

Gamification in the Marketing Communication Research

Measuring first reactions to the stimuli is another important challenge in market research – especially during the qualitative assessments, when the respondents fill out the individual questionnaire before the group discussion. Written down first impressions make people hold to their opinions, avoiding yielding to group pressures (Ash, 1951; Crutchfield, 1955). For that reason, the design of such tasks seems so important – market researchers struggle to obtain extensive and elaborate statements. In this case, gamification also can be an aid.

The first simple experiment in this field was carried out by Puleston & Sleep (2011). One group of respondents were shown a commercial and asked simply what they thought of it. The experimental group received such a task: *"Imagine you work for an advertising agency. One of your key client's rival brands has just released a new ad, and you are about to see a sneak preview before anyone else. You have to report back to the agency what you thought of it."* The results showed a huge increase in the number of words used in the answers in the case of the storyline group: their average was 53 words per respondent and over 85% of the respondents wrote over 20 words. The control group was much less productive, with only 14 words per viewer.

This result inspired me to replicate it with an additional independent variable: online vs offline environment (Ścibor-Rylski, 2020; Ścibor-Rylski, 2021). In this case, the task also included playing a role of an advertising agency employee who has sneaked a peek at the latest commercial designed by the competitor. The participants watched a TV commercial of Castorama – a DIY retailer (Castorama Polska, 2018). The exact storyline in the experimental group was formulated as follows: *"Imagine you work for an advertisement agency and you are working on a new campaign. Your biggest rival working for a competitor's brand has just created a new ad – somehow you managed to watch it before the official release. You need to react as soon as possible to design a relevant commercial as a response and not to fall behind. You want to share your thoughts with the creative team and*

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your management. Watch the commercial and write down what you think about it." The control group received a simple, standard market research instruction: *"Watch the commercial and write down what you think about it."*

In the offline environment, the experimental group was more effective than the control group with a standard task. The average number of words written by the control group was M = 37.77, while the participants from the experimental group wrote nearly 48 words on average (M = 47.79). The difference was statistically significant. The online variant of this study was a kind of surprise: although the control group performed on the same level as in the offline condition (M = 38.97), the experimental group's result has spiked to almost 100 words (M = 96.82). The reason for such differences between the offline and online conditions might be the fact that the participants of the offline variant were asked to fill out the form during a lecture in a lecture room, which probably has limited the facilitation of the role-playing, storyline experience.

Contextually gamified tasks help to receive more elaborated answers. People are more engaged and hence productive when describing their first impressions after watching a TV commercial if the question is enhanced with a storyline allowing participants to do a little role-play exercise.

Conclusion

Gamification has proved to be a handy tool for market researchers. Using different game elements makes the participants more engaged, which influences several factors crucial for the positive assessment of the market research process. Not only it reduces the dropout rate and increases participants' enjoyment, but it also, as stated in this chapter, influences the productivity. Both in the case of simple "soft" gamification tasks and complex narrative games defined as "hard" gamification, respondents give more elaborate answers. Sometimes the difference is really vast, as in the online experiment regarding the first impression in the creative development research: gamified, storyline-based task made the participants write almost 100 words on average compared to less than 40 words in the standard condition.

The research review presented in this chapter is composed of experiments utilising regular tasks used in the market research and therefore, it carries important practical implications. The researchers receive a toolbox that can be applied both to quantitative surveys and qualitative projects based on focus group discussions.

Future research planned in the field of gamification in market research covers the verification of other gamification techniques: using points collection, achievements, badges, leaderboards and competition (Alabbasi, 2017; Gorączka & Protasiuk, 2021). People vary when it comes to reactions to different game elements: some prefer hard competition and some are motivated by social aspects of playing

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a game. Achievements and competition as a way of rewarding might not be an effective motivational tool in every situation (Hanus & Fox, 2015). Bartle (1996) created a taxonomy of players, and utilising this segmentation to create more effective market research tasks targeting specific groups of people is definitely a next step in the exploration of the fascinating world of gamification in this category.

The last topic that is worth mentioning in this summary relates to the type of data obtained in the presented series of experiments. I used a word count as an indicator of the dependent variable – participants' engagement. It is a quantitative measure and another step would be the application of some qualitative analysis of the content of the respondents' answers. There are some first attempts described in this chapter – the initial analysis shows that the gamified tasks improve the depth of the brand image statements, but this topic definitely needs further examination and thorough qualitative analysis.

References

Alabbasi, D. (2017). Exploring Graduate Students' Perspectives Towards Using Gamification Techniques in Online Learning. *The Turkish Online Journal of Distance Education*, *18(3)*, 180–196. doi: 10.17718/tojde.328951.

Alsawaier, R. (2018). The Effect of Gamification on Motivation and Engagement. *International Journal of Information and Learning Technology*. Vol. 35, No. 1, 56–79. doi:10.1108/IJILT-02-2017-0009.

Asch, S.E. (1951). Effects of Group Pressure Upon the Modification and Distortion of Judgments. In: H. Guetzkow (ed.). *Groups, Leadership and Men.* Pittsburgh, PA: Carnegie Press.

Bailey, P., Pritchard, G. & Kernohan, H. (2015). Gamification in Market Research: Increasing Enjoyment, Participant Engagement and Richness of Data, But What of Data Validity? *International Journal of Market Research*, 2015, *57*(1), 17–28. doi: 10.2501/IJMR-2015-003.

Bartle, R. (1996). *Hearts, Clubs, Diamonds, Spades: Players Who Suit MUDs.* https://mud.co.uk/richard/hcds.htm (Accessed: 12 February 2022).

Brownell, B., Cechanowicz, J. & Gutwin, C. (2015). Gamification of survey research: empirical results from gamifying a conjoint experiment. In: Reiners T, Wood L.C. (eds.), *Gamification in education and business.* Springer, Cham, 569–591.

Crutchfield, R. (1955). Conformity and Character. *American Psychologist*, *10*, 191–198.

da Rocha Seixas, L., Gomes, A.S. & de Melo Filho, I.J. (2016). Effectiveness of Gamification in the Engagement of Students. *Computers in Human Behavior*, *58*, 48–63. doi: https://doi.org/10.1016/j.chb.2015.11.021.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Deterding, S., Dixon, D., Khaled, R. & Nacke, L., (2011), From Game Design Elements to Gamefulness: Defining Gamification. In: *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9–15). ACM.

Downes-Le Guin, T., Baker, R., Mechling, J. & Ruylea, E. (2012). Myths and Realities of Respondent Engagement in Online Surveys. *International Journal of Market Research*, *54*, 613–633.

Gorączka, A. & Protasiuk, M. (2020). *Gamification. Jak wygrać zaangażowanie respondenta?* Warszawa: Wydawnictwo Naukowe PWN.

Hanus, M. D. & Fox, J. (2015). Assessing the Effects of Gamification in the Classroom: A Longitudinal Study on Intrinsic Motivation, Social Comparison, Satisfaction, Effort, and Academic Performance. *Computers & Education*, *80*, 152–161. doi: 10.1016/j.compedu.2014.08.019.

Hartenvald, C., Hart, J., Snodgrass, S. Corwin, T., Mohaddesi, O. & Rodriquez, G.R. (2018). The Development of a Methodology for Gamifying Surveys. *CHI PLAY'18 Extended Abstracts*, Oct. 28–31, 2018, Melbourne, Australia.

Homer, R., Hew, K.F. & Tan, C.Y. (2018). Comparing Digital Badges-and-Points with Classroom Token Systems: Effects on Elementary School ESL Students' Classroom Behavior and English Learning. *Educational Technology and Society*, *21*(1), 137–151.

Kapp, K.M., Blair, L. & Mesch, R. (2013). *The Gamification of Learning and Instruction Fieldbook: Ideas into Practice*, John Wiley & Sons.

Mader, S., Heller, N. & Bry, F. (2019). Adding Narrative to Gamification and Educational Games with Generic Templates. *Proceedings of 18th European Conference on e-Learning*, Copenhagen. doi: 10.34190/EEL.19.119.

Paharia, R. (2013). *Loyalty 3.0: How to Revolutionize Customer and Employee Engagement with Big Data and Gamification.* New York: McGraw-Hill.

PTBRiO (2020). *Badania Marketingow*e, edycja XXV.

Puleston, J. (2011). Conference Notes: Online Research: Now & Next 2011. *International Journal of Market Research*, *53*(4), 557–562.

Puleston, J. & Rintoul, D. (2012). *Can Survey Gaming Techniques Cross Continents? Examining Cross Cultural Reactions to Creative Questioning Techniques.* ESOMAR Congress, Shanghai.

Puleston, J. & Sleep, D. (2011). *The Game Experiments: Researching How Game Techniques Can Be Used to Improve the Quality of Feedback From Online Research.* ESOMAR Congress, Amsterdam.

Reeves, B. & Read, J.L. (2009). *Total Engagement: Using Games and Virtual Worlds to Change the Way People Work and Businesses Compete.* Harvard Business School Press, Boston.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Ryan, R.M. & Deci, E.L. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist*, *55*(1), 68–78. doi:10.1037/0003-066X.55.1.68.

Seaborn, K. & Fels, D.I. (2015). Gamification in Theory and Action: A Survey. *International Journal of Human-Computer Studies*, *74*, 14–31.

Ścibor-Rylski, M. (2018). Gamification as an Effective Method in the Modern Market Research. *Marketing i Rynek*, *10/2018*, 36–44.

Ścibor-Rylski, M. (2019). Gamification – The Key to In-Depth Exploration of Consumer Behaviour in Market Research. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *53*(1), 119–128. doi: 10.17951/h.2019.53.1.119-128.

Ścibor-Rylski, M. (2020). Gamifying Questions by Adding Context in the Creative Development Marketing Research. *Journal of Marketing and Consumer Behaviour in Emerging Markets*, *1(10).* doi: 10.7172/2449-6634.jmcbem.2020.1.4.

Ścibor-Rylski, M. (2021). The Effectiveness of Gamification in the Online and Offline Qualitative Marketing Research. *Journal of Marketing and Consumer Behaviour in Emerging Markets*, *2*(13). doi: 10.7172/2449-6634.jmcbem.2021.2.4.

Triantoro, T., Gopal, R., Benbunan-Fich, R. & Lang. G. (2020). Personality and Games: Enhancing Online Surveys Through Gamification. *Information Technology and Management*, *21*, 169–178 (2020). doi: https://doi-1org--10000b5k606c6.han.buw.uw.edu.pl/10.1007/s10799-020-00314-4.

Villagrasa, S., Fonseca, D., Redondo, E. & Durán, J. (2014). Teaching Case of Gamification and Visual Technologies for Education. *Journal of Cases on Information Technology*, *16*(4), 38–57. doi: 10.4018/jcit.2014100104.

Wood, L.C. & Reiners, T. (2015). Storytelling to Immersive Learners in an Authentic Virtual Training Environment. In: T. Reiners & L. Wood (eds.). *Gamification in Education and Business*, 315–229, Springer, Cham.

Zichermann, G. & Cunningham, C. (2011). *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*, CA: O'Reilly Media.

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Part 3
Digital Transformation From a Consumer to an Industry

"Technology is nothing. What's important is that you have a faith in people, that they're basically good and smart, and if you give them tools, they'll do wonderful things with them."

– Steve Jobs

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Personal Marketing in the Digital World

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Abstract

The development of information and communication technologies causes a number of consequences observed both on the macro and micro scale. This is reflected in the development of the information society, the network society as well as the digital economy. The multifunctionality and application potential of new information and communication technologies make them applicable in many areas of enterprise management. This also concerns personal marketing, which in the era of the development of digital media gains new opportunities and tools for implementing the assumptions of this concept. The purpose of the chapter is to present the premises, determinants, and possibilities of using innovative technologies in the area of personal marketing. The findings resulting from the conducted research indicate that the use of the internet and artificial intelligence in personal marketing requires considering several conditions, including psychological as well as sociocultural ones related to the observed generational changes. At the same time, it should be noted that the coronavirus pandemic accelerated the processes of the virtualization of work and resulted in new challenges for personal marketing in terms of creating hybrid work solutions that will be adequate for the post-pandemic reality.

Keywords: personal marketing, new media, virtualization of work

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Introduction

The great importance of technology in shaping the social and business reality is reflected in the concept of technological determinism, which appears in soft and hard versions (Smith, Marx, 1994; MacKenzie, Wajcman, 1999). The first type means that technology is one of many determinants of changes taking place in the enterprise, its management and in the economy. On the other hand, according to the technological determinism of the hard type, the ongoing changes mainly result from the development of technology, while other development factors are less important. At the same time, it should be noted that regardless of which form of technological determinism is considered the leading one, it should be agreed that the implementation of new technologies causes changes that considerably go beyond the scope of its functioning. This also applies to personal marketing, which in the era of digital media development gains new instruments to achieve its goals. They are used at individual stages of one's personal cycle.

The purpose of the chapter is to present the premises, determinants, and possibilities of using innovative technologies in the area of personal marketing. The implementation of the purpose of the study required a research procedure based on a literature review and identification of the role of the internet in personal marketing. The considerations presented in this chapter of the monograph concern the phases of the virtualization of work and the resulting implications for personal marketing, as well as competences for employees, which are key in the digital economy and in the network society.

Conceptual Framework of Personal Marketing in the Context of the Development of New Media

Presenting the assumptions of the concept of personal marketing requires showing the changes taking place in the area of models of personal function in the enterprise. The conducted review of the literature on the subject allows for the identification of four models of the personal function, including the traditional model, the model of interpersonal relations, the model of human resources as well as the model of human capital. The traditional model of personal function is dominated by such categories as: division and efficiency of work and its physical conditions, discipline, control, wage incentives, social welfare, specialization of managerial work, cooperation, or authority. On the other hand, in the model of interpersonal relations, special attention is paid to the social needs of employees, job satisfaction, communication processes, management styles, as well as managerial features. The development of the concept of human resources management in the organization is also expressed in the creation of subsequent models of the personal function, including the model of human resources, which focuses on the issues of em-

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ployee and organization development, participation in management, employees' impact on results, fair treatment of employees, extending the scope of autonomy as well as the systemic nature of organization and personal activities. On the other hand, introducing new values to the discourse on human resources and bringing to the fore such categories as: the improvement, development and measurement of human capital, the impact of human capital on the value of the organization, talent and knowledge management, outsourcing, the virtualization of the personal function, corporate social responsibility, leadership, and the internationalization and development of information technology is typical of the human capital model (Listwan, 2011, p. 236).

It should be emphasized that the evolution of the personal function proves the growing importance of the employee in the organization. It involves moving away from thinking about employees only through the prism of costs and moving towards the approach in which employees are perceived as human resources, or, increasingly often, human capital that, according to the OECD definition, is defined in terms of knowledge, skills, and abilities that enable an individual to create their own, social and economic well-being.

This means that the concept of personal marketing is applied in the enterprise as part of the implementation of the personal function. Personal marketing is defined in the context of the entirety of internal and external activities related to the management of the social potential of the organization, especially with shaping its size and structure as well as development thanks to the creation of favorable conditions for employees to engage in the company's activities and building its permanent competitive advantage (Penc, 1997, p. 239). The concept and activities in the field of personal marketing are focused on both the intra-organizational and extra-organizational aspects of functioning of the market entity, as they are addressed to employees and potential employees operating on the labor market. This means that personal marketing is a broader concept than internal marketing, which focuses only on social aspects of an intra-organizational nature (Baruk, 2005, pp. 211–218). According to the relational approach, personal marketing is based on the creation and strengthening of emotional ties that allow an employee whose needs are met by the organization to feel satisfaction and loyalty. Moreover, it should be noted that in personal marketing, people are a value in themselves that determines the value of an organization and its market position, and the perspective of a job position is replaced by an organizational role performed by an employee. Activities implemented as part of personal marketing should be comprehensive and consistent. They should create a system with two basic subsystems which include the subsystem of internal personal marketing and the subsystem of external personal marketing (Baruk, 2012, pp. 107–125).

An important condition for the implementation of the concept of personal marketing is the holistic perception of an employee, or a potential employee, and con-

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sidering the spectrum of their needs, motivations, or emotions affecting their behavior and relations with other employees as well as the entire organization.

At the same time, it should be stated that the implementation of personal marketing goals, both of primary and secondary character, increasingly depends on the proper use of the internet at various stages of one's personal cycle. There are several applications of the internet within the external and internal subsystems of personal marketing (see Figure 1). Research on the labor market needs, communication with potential employees, as well as their recruitment, is increasingly often conducted online. This requires considering many conditions, including legal ones. Due to the fact that the employer is obliged to counteract discrimination in employment, computer illiteracy during remote recruitment should not be a reason for the rejection of a candidate if the job does not require computer skills.

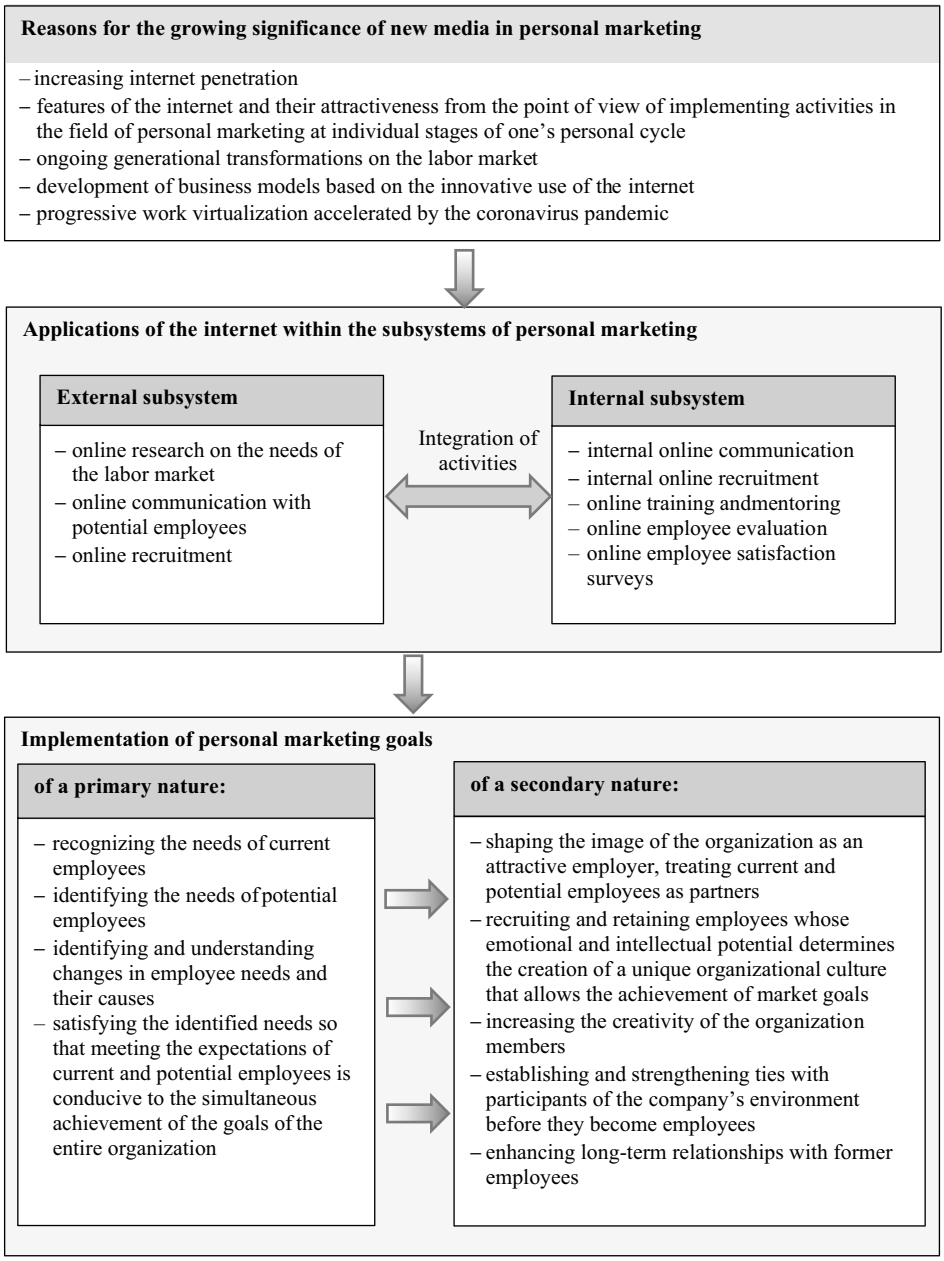
On the other hand, in the context of the internal subsystem of personal marketing, apart from being used for internal recruitment, the internet is also used in training, mentoring, employee satisfaction surveys and at the stage of employee evaluation. The internet also plays a significant role in the processes of internal communication. The role of internal communication based on new media should be seen in the context of providing employees with access to information they need, stimulating them to submit ideas and developing creative potential, as well as facilitating the diffusion of knowledge in the enterprise.

It should be mentioned that the reasons for the growing role of new media in personal marketing include, among others, the attractiveness of the internet from the point of view of the implementation of personal marketing activities, the development of business models based on the use of the internet in an innovative way, the progressive virtualization of work accelerated by the coronavirus pandemic, as well as the ongoing generational changes in the labor market.

This is even more important because Generation Y is distinguished by a wide scope of internet use and a positive attitude toward new technologies that create (though it may be relative) a sense of freedom and independence. It is accompanied by the disappearance of authorities. The speed of decision-making, which is frequently characteristic of this generation, often replaces independent thinking. Generation Z, separated from Generation Y, is characterized by an even greater range of internet use in various spheres of life, and it perceives internet communication as the most adapted to its needs. It should be added that among the factors of influence, opinions expressed by the users of internet communities play a vital role. At work, this generation strives to pursue its own passions and participate in interesting projects rather than to achieve stability. At the same time, it should be emphasized that for representatives of this generation, participation in online communities is frequently a chance for self-expression and self-presentation (Aniszewska, 2015, pp. 2–7).

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Figure 1. The role of the internet in personal marketing



Source: own elaboration based on: (Baruk, 2005, p. 217).

Considering the generational differences requires shaping such a job offer that would meet the needs and expectations of employees belonging to particular types of generations. This is related to the conscious management of generational differ-

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ences and building the employer's brand considering technological trends, as well as the use of the forms of internal communication and communication with potential employees preferred by each generation.

Considering the ongoing generational changes and the increasing range of the virtualization of social and economic life, it should be noted that acquiring employees frequently requires conducting innovative recruitment campaigns, which apply new media and related activities based on search engines, AdWords and AdSense advertising, as well as referral programs integrated with social networks and employee databases.

Phases of Work Virtualization and Their Implications for Personal Marketing

It is worth looking at personal marketing and its application from the perspective of the phases of the virtualization of work. Work virtualization, related to technological progress, has gone through several phases. The first wave of work virtualization that was a consequence of the emergence of computers and email, contributed to the formation of a new form of communication between companies and people providing remote work. This led to situations in which losing a formal relationship with the employer and the associated sense of team participation, allowing for the satisfaction of one's social needs was the price for independence and autonomy. In turn, the second wave of changes, which was closely related to the development of mobile technology, meant that the teamwork of full-time employees could be performed anywhere and at any time, without breaking ties with the company. Furthermore, the essence of the third wave was the creation of shared office spaces. On the one hand, they guarantee the freedom and flexibility characteristic of the first wave. On the other hand, they ensure functioning in a shared work environment, inspiring and stimulating creativity and enabling meeting the needs of social interactions with other people who have great creative potential. (Johns, Gratton, 2013, pp. 88–97). At the same time, it should be emphasized that while accelerating the virtualization of work, the coronavirus pandemic gave it new dimensions and was often an impulse to introduce innovations in the field of work organization.

The implementation of the personal function in accordance with the assumptions of personal marketing in the period of a pandemic requires creating favorable conditions for efficient work in the new reality and, consequently, it also represents the need to create opportunities to meet the social needs of employees with the use of modern communication tools. Meeting the need for agency, i.e., influencing the reality, is also important because taking agency from employees reduces their well-being. This is facilitated by delegating powers and establishing new rules of cooperation in the conditions of remote work. It cannot be ignored that in the period

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of uncertainty, employees reveal a serious need to be informed, also about the role that they are to play in the conditions of remote work. It is also vital to show them the meaning of work, because during a pandemic, employees may experience a kind of chaos, which translates into frequently occurring fundamental questions of an existential nature (Roczniewska, Puchalska-Kamińska, 2021, pp. 35–46).

It is also important to introduce new rituals supporting the development of attitudes based on creativity and enabling the improvement of the results of remote and hybrid work, as well as those conducive to building a community and ties in a team that consequently strengthen collective identity. It is all the more important because the strongest cultures and communities were deeply ritualistic, and the ritual is an instrument of creating organizational culture (Koprowska, 2021, p. 27).

When building scenarios concerning the optimal work environment in the new reality created by the coronavirus pandemic, the diversity of employees' needs and behaviors should be considered. This means that creating the possibility to choose the type of work is becoming more important for companies because the choice that an employee can make translates into their job satisfaction, commitment and responsibility for the achieved results. Considering the personality type, it should be indicated that remote work is attractive to introverts who are more creative and make decisions after thorough analysis of the situation. They value a work environment that offers them peace and quiet. In addition, introverts prefer online meetings, as they are less likely to interrupt each other and speak at the same time. The attractiveness of online meetings for employees with an introvert personality type also results from the fact that meetings held in this way give them a greater chance to express themselves. It needs to be added that the culture of online conversations makes extroverts less dominant in a virtual space than in a physical one (Płomień-Dolacka, 2022, pp. 58–63).

Using the potential of hybrid work requires the development of such a solution, within which it will be possible to use the advantages of remote work as well as on-site work. The benefits for the company resulting from hybrid work include access to talents from outside the company's headquarters and cost optimization. On the other hand, for employees, hybrid work provides greater flexibility in terms of choosing a place and working time, as well as better well-being thanks to the reduction of commuting time. When implementing the hybrid work model, it is worth finding answers to questions about:

– employees' competences developed thanks to hybrid work
– changes in the company's organizational culture caused by hybrid work
– the possibility of delegating tasks and increasing the scope of employees' independence
– forms of building employee engagement
– the scope of online recruitment
– holding online trainings (Sobocińska, 2022, pp. 48–51).

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The need to use hybrid work is an impulse to redesign office spaces in such a way as to create not only a safe working environment in the face of the pandemic, but also one that supports the generation of ideas and stimulates creativity. Considering that 74% of CFOs intend to shift some employees to remote work permanently, this means that the office will play the role of headquarters and places where remote employees will be able to satisfy their social needs without persistent bonds with a specific desk (Kostro, 2021, p. 5).

At the same time, it should be noted that the creation of an effective model of hybrid work should translate into an increase in the company's competitiveness on the labor market as well as facilitate the acquisition and retention of employees who expect an attractive and healthy work environment that enables the satisfaction of a wide range of their needs in the post-pandemic reality.

Key Competences in the Digital Economy and Network Society

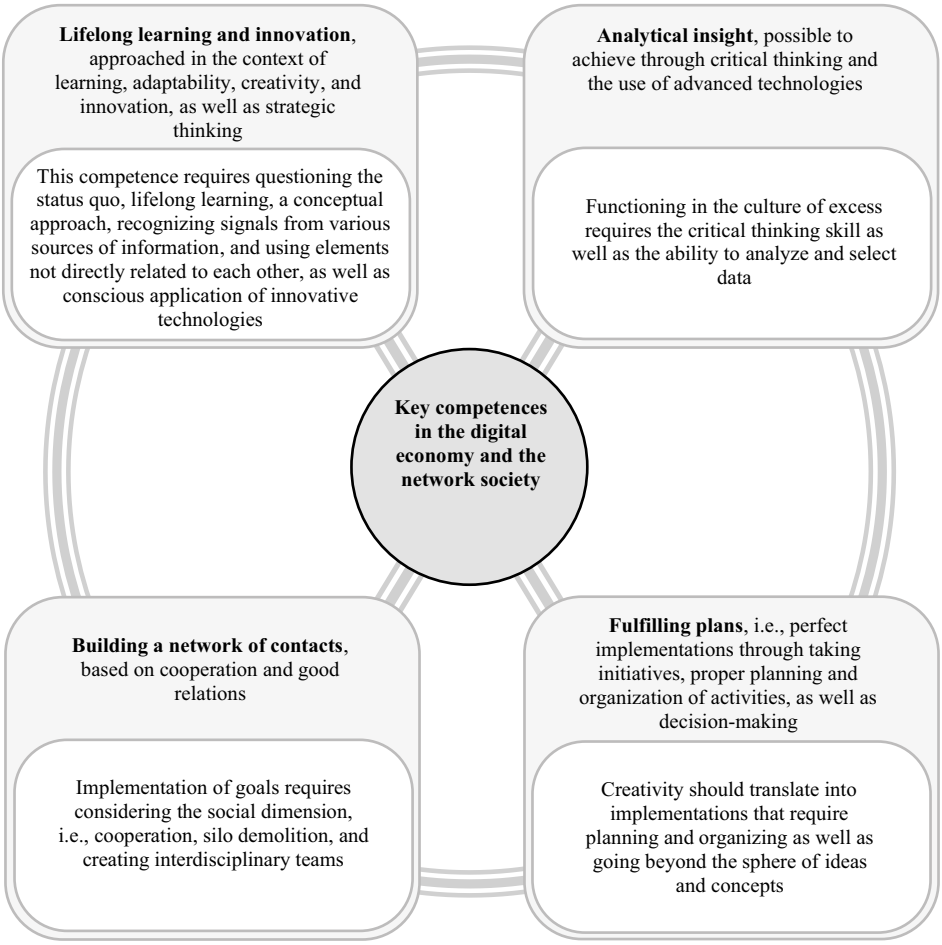
Technology that leads to significant changes in the labor market and the digitalization of many processes result in many new challenges for people implementing the concept of personal marketing and those responsible for defining and shaping the desired employee competencies. It should be emphasized that the implementation of new business models and digital business strategies, based on a deep knowledge of customer behavior, changes the way in which work is performed and gives it new contexts. The high dynamics of changes in the scope of the desired employee competences is illustrated by the fact that one in three skills that were needed in 2018 becomes useless in 2022. This means that it is even more desirable to implement the idea of lifelong learning that allows employees to acquire new competences enabling them to function well in a changing reality. As a consequence, in the digital world, such competences as continuous learning and innovation, planning and organizing, which translate into perfect implementation of specific concepts, as well as building a network of contacts and analytical insight are becoming increasingly important (Ostrowska, 2022, pp. 20–24). The understanding of these key competences is shown in Figure 2.

The desired employee competences, determining the use of market opportunities, should also be viewed from the perspective of the implementation of artificial intelligence by enterprises. Its features include the automation of capabilities that are characteristic of human thinking, including decision-making, problem-solving, and learning (Syam & Sharma, 2018, pp. 135–146; Mazurek, 2019, p. 154).

Using the anthropomorphization concept, it is possible to identify four models of application of artificial intelligence in various areas of business management. Artificial intelligence can play the role of an autonomous strategic advisor, an in-

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Figure 2. Model of key competences in the digital world



Source: own study based on: (Ostrowska, 2022, p. 24, and SHL, 2019, p. 5).

dependent outsourcer, an autonomous employee, or a decision-making supervisor. The role of an autonomous strategic advisor is expressed in the fact that autonomous algorithms are used for data-based evaluation and issuing recommendations; however, the decision on what to autonomize and how to implement these decisions depends on the employees who supervise the algorithms. In this model, data analysts function as an intermediary between senior management supervising the autonomous software and those areas of the company where algorithms have been implemented. The independent outsourcer model means that algorithmizing takes the form of business process outsourcing, whereas data analysts are project managers. In the case of the autonomous employee model, artificial intelligence is per-

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ceived as a "colleague", providing the right solutions thanks to the use of machine learning. In this case, the role of data analysts is to reduce the tensions that arise at the human-machine interface. On the other hand, the model of the decision-making supervisor assumes that in some areas of organization management, human competences give way to the strength of algorithms, and the role of employees is to expand the limits of the effective autonomy of algorithms. In enterprises implementing this model of artificial intelligence, machines implement processes and produce justifications and narratives that explain people the decisions that are made (Schrage, 2017, pp. 100–105).

Although the impact of artificial intelligence on changes in the labor market and the expected employees' competences is considerable, and even comparable to the invention of the computer as a breakthrough innovation, the more unique competences (i.e., talents that a given employee has) and the less routine the person's work is, the less vulnerable to being replaced by artificial intelligence that person is.

Conclusion

When formulating a conclusion, it should be emphasized that the processes of digital transformation, accelerated by the coronavirus pandemic, are changing not only the business models of enterprises, but also the labor market and the functioning of employees on it. They determine new opportunities of implementing the assumptions of the personal marketing concept.

The implementation of the concept of personal marketing, which is based on satisfying the diverse needs of employees, becomes important because remote work which is a response to the coronavirus pandemic means that, on the one hand, people who are internally motivated gain more autonomy and independence, but on the other hand, employees experience overload and problems with maintaining work-life balance. Some people also experience a lack of direct interpersonal relationships.

Bearing in mind that modern business models and work organization systems are increasingly based on the synergy of human talent and new technologies, the key skills today include, in particular, the ability of employees to add individual values to the project and communicate with other team members, as well as partners. Creating new, flexible models of work organization requires building a culture of trust so that employees have autonomy but also a sense of responsibility for the performance of their tasks.

It should also be added that companies that invest in the development of digital competences of employees usually achieve better results than companies that do not undertake such activities. In this context, the role of people responsible for implementing personal marketing is to find a balance between the digitalization

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of work and the development of digital competences of employees. Furthermore, the skills that are essential in the era of artificial intelligence, i.e., meta-skills, include lifelong learning, storytelling involving people, and not just presenting information, project thinking, or pattern recognition in large data sets. This is accompanied by the growing importance of soft skills (Dublanka, 2022, pp. 32–35). In this context, increasing the scope of using the possibilities offered by technology, and on the other hand, establishing deep relationships between employees and a sense of unquestionable participation in the life of the company are challenge for personal marketing.

References

Aniszewska, G. (2015). Zmiany pokoleniowe a decyzje i wybory konsumenckie. *Marketing i Rynek*, *1*, 2–7.

Baruk, A.I. (2005). Rola marketingu personalnego we współczesnym przedsiębiorstwie. *Annales Universitatis Mariae Curie-Skłodowska. Sectio H*, *Oeconomia*, *39*, 211–218.

Baruk, A.I. (2012). Rola marketingu personalnego w kształtowaniu wizerunku organizacji naukowej. *Marketing Instytucji Naukowych i Badawczych*, *3*(4), 107–125.

Dublanka, D. (2022). Człowiek i technologia – HR przebudzenie mocy. *Wydanie specjalne HR Personel & Zarządzanie*, 1, 32–35.

Johns, T., Gratton, L. (2013, July–August). Trzecia fala pracy wirtualnej. *Harvard Business Review Polska*, 88–97.

Koprowska, J. (2021). Sekretna moc rytuałów biznesowych. Jak ją wykorzystać, by zintegrować zespół? In: *Praca zdalna. Jak zarządzać wirtualnym zespołem?* Warszawa: ICAN Institute.

Kostro, P. (2021). Praca hybrydowa wyzwala produktywność i chęć do współpracy. In: *Praca zdalna. Jak zarządzać wirtualnym zespołem?* Warszawa: ICAN Institute.

Listwan, T. (2011). Rozwój badań nad zarządzaniem zasobami ludzkimi w Polsce. In: S. Lachiewicz, B. Nogalski (eds.), *Osiągnięcia i perspektywy nauk o zarządzaniu*, Warszawa: Wolters Kluwer Business.

MacKenzie, D.A., Wajcman, J. (1999). *The Social Shaping of Technology*. Buckingham: Open University Press.

Mazurek, G. (2019). *Transformacja cyfrowa. Perspektywa marketingu*. Warszawa: Wydawnictwo Naukowe PWN.

Ostrowska, I. (2022). Cyfrowe strategie. Czy firmy i działy HR są na nie gotowe w 2022 roku? *HR Personel & Zarządzanie*, *1*, 20–24.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Penc, J. (1997). *Leksykon biznesu*. Warszawa: Agencja Wydawnicza Placet.

Płomień-Dolacka, A. (2022). Introwertyk i ekstrawertyk w online. *HR Personel & Zarządzanie*, *1*, 58–63.

Roczniewska, M., Puchalska-Kamińska, M. (2021). Czego potrzebują Twoi pracownicy w nowej rzeczywistości? In: *Praca zdalna. Jak zarządzać wirtualnym zespołem?* Warszawa: ICAN Institute.

Schrage, M. (2017). Wykorzystaj algorytmy do podejmowania decyzji. *Harvard Business Review Polska*, *6*, 100–105.

SHL (2019). *Talent in the Digital Era*.

Smith, M.R., Marx, L. (1994). *Does Technology Drive History? The Dilemma of Technological Determinism*. Cambridge: The MIT Press.

Sobocińska, T. (2022). Kreślenie nowych map. Jak dobrze wdrożyć pracę hybrydową? *HR Personel & Zarządzanie*, 1, 48–51.

Syam, N., Sharma, A. (2018). Waiting for a Sales Renaissance in the Fourth Industrial Revolution: Machine Learning and Artificial Intelligence in Sales Research and Practice. *Industrial Marketing Management*, *69*, 135–146.

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Digital Transformation in Railway Transport

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Abstract

Digital transformation is a comprehensive way of moving to the new ways of operating, new business models using digital technologies. This also applies to rail transport, which itself can gain a lot from the introduction of new solutions. Digital transformation in rail transport can have a positive impact on existing customers and generate the interest of new customers in this mode of transport – by creating new opportunities as a result of digitalisation, thus increasing the comfort zone of customers within the transport services offered. Technological development and digitalisation lead to the improvement of rail transport, allowing this mode of transport to develop, increase its competitiveness in relation to other forms of transporting people and goods. The aim of this chapter is to discuss the directions of the digital transformation of rail transport. The research method was the analysis of available indications within the literature, and the analysis of practical experiences in the introduction of solutions related to the areas of the digitalisation of rail transport. The conclusions indicate the importance of the digitalisation of rail transport and processes ensuring digital support for the transport process.

Keywords: rail transport**,** digital transformation, digitalisation of rail transport

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Introduction

Contemporary business has been constantly changing, evolving and transforming due to the development of cutting-edge digital technologies and new business ideas. Transformation, according to Mazurek (2019, p. 21), is the evolution of a particular system, often a large-scale one. Transformation related to the impact of digital technologies on social and economic systems may be called digital transformation. Digital transformation refers to the processes and strategies where the use of digital technologies serves to radically change the way the businesses operate and serve their consumers. The core of digital transformation is the introduction and effective implementation of digital technology-based solutions. It is closely related to the idea of digitalisation. Digitalisation means the adaptation and increased employment of digital or computer technologies by organisations or economic sectors (Pieriegud, 2016, p. 12). It is caused by the fact that each organisation or sector is relying more and more on data and technologies in order to increase the effectiveness of its operations and to ensure value for their consumers. This also refers to transport. The 2020 European Strategy for Sustainable and Smart Mobility (European Commission, 2020) defines the future of transport in the European Union as a system which is effective, smart and accessible for all the interested potential users. Some of the key actions that are expected to support transformation in this area, are the rigorous cut-down on a negative impact on natural environment as well as combining different modes of transport into one coherent system. Therefore, the tasks which the European investment and regulatory policy face today do not only mean the redevelopment of infrastructure or promotion of new environmentally-friendly energy carriers. They also imply actions oriented at the improvement in the effectiveness and integration of different modes of transport. It is thanks to them that the European transport is expected to transform into a common, competitive, affordable, safe and smart system. Additionally, the expected results of the announced transformations are to be seen already towards the end of this decade. The European Commission states that by 2030, the European transport will be characterised by:

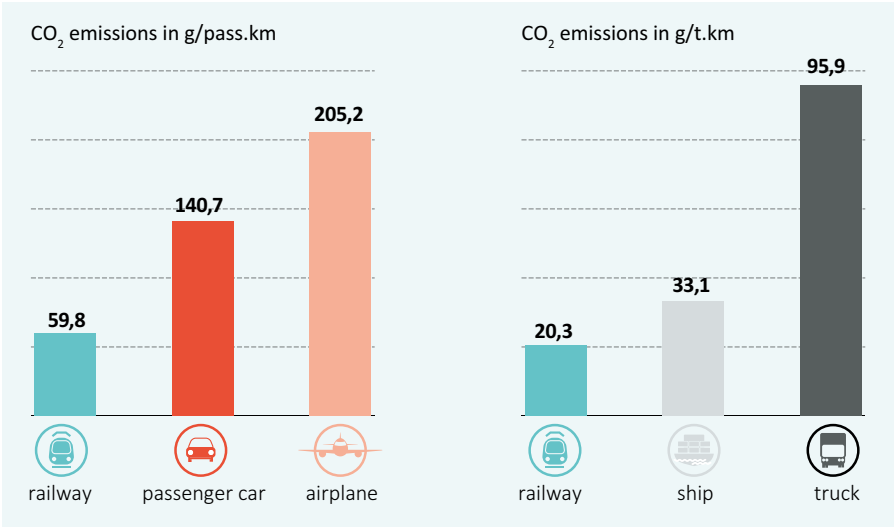
- fully digitised information in logistic chains
- wide use of integrated ticket systems
- general automation of transportation operations (European Commission, 2020).

The rail transport is to be an integral part of the thus defined transformation of the transport sector, mainly thanks to its ecological advantages which are presented in Figure 1.

Railway transport, for ecological and other reasons, is supposed to improve its competitiveness and attractiveness on the market as well as considerably increase its share of it. Research (IBRIS, 2021) shows that the railway clients want the rail-

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Figure 1. Carbon dioxide emission in the EU transport, by specific modes of transport for 2016



Source: *Railway Transport in Numbers*, ProKolej Foundation, Warsaw (2021); see also: Report *The Rail for Climate – Climate for the Rail*, ProKolej Foundation, Warsaw (2021).

way transport to be climate-neutral. If this happens, the respondents declare to increase the use of the railway transport. This is closely connected with the programme of green railway, which means the transition of transport towards the low-emission (UN Global Compact Network Poland, 2021) transport. The digitalisation of the railway transport operations and its relations with the client is supposed to facilitate this transition and be the backbone for electromobility in Poland (Jagiellonian Institute, 2017). This chapter presents the directions of digital transformation in railway transport.

Railway Transport in Digital Economy

Digital economy, as indicated by Śledziewska and Włoch (2020, p. 9), is developing before our very eyes. This development is fuelled by intensified digitalisation processes, i.e. the widespread adoption of digital technologies by various businesses. According to Schallmo and Williams (Mazurek, 2019, pp. 22–23), digitalisation means changes in the way businesses operate and in the functioning of business models; changes which are introduced on the basis of newly acquired knowledge and through digitalisation activities. New technologies, such as the Internet of Things, cloud computing, artificial intelligence, etc., speed up the datafication process (Śledziewska, Włoch, 2020, p. 9), i.e. the creation of digital spheres of the real world, intensify the networking process, thus facilitating personalisa-

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tion. Digitalisation appears as the tool which not only ensures the necessary connection between the real and virtual worlds, but it also becomes the prime engine of innovation and changes that affect all sectors of economy.

Under the influence of progressing digitalisation, there is more and more competition on the market between traditionally operating businesses and the ones that employ new business models, and thus can offer:

- new products and services
- joint offers which combine sectors and suppliers that have been unrelated so far
- extra services and products offered along with a transaction
- shared offers and models.

According to the report by Deloitte (*Digital Marketing Newsletter*, 3/2021), digital transformation requires the transformation of business models and products, the optimisation of corporate governance, the creation of digital work environment and engagement of clients in a variety of communication channels. Information and communications technology has been used in the railway since the 1970s. In 2016, the following areas were identified as primary for the adoption of digital technologies in the railway transport (CER, UIC, EIM, 2016):

- creation of networked railway which uses reliable connectedness, ensuring the safety, efficiency and attractiveness of the railway services
- increased customer satisfaction thanks to added value for passengers
- increased railway capacity, reliability and efficiency through the automation of processes
- improved competitiveness of the railway through the optimal use of data.

In the case of the railway transport, it did not only mean organisational transformations but also comprehensive remodelling of the structure and business processes of whole organisations. By this, mobility-related services, as well as the whole logistic-transportation chains, have been reshaped. With regard to this, the implementation and development of digital technologies result in the redefinition of customer relations, organisation of work, the exploitation of resources and marketing. This is explicitly highlighted in the document entitled *Digital Trends in the Rail Sector*, prepared by the Association of the European Rail Industry, or in the Strategy for 2021–2024, adopted by the regulators of the railway transport market (IRG) of the EU member states (*IRG-RAIL Strategy Document 2021–2024*, 2021), or in the prospect of the railway by 2030, offered by the International Union of Railways (UIC, 2021). The IRG Strategy states, among other things, that "digitalization should not be limited to infrastructure managers or railway undertakings, but should also be directed to end users. This means having powerful internet hubs, offering accurate location information on phones and the ability to receive real-time updates. Infrastructure managers and railway undertakings need to work together to provide trav-

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elling information seamlessly integrated and suited to users' needs in reaching their destination regardless of the chosen provider or mode of transport. Agents in the railway sector need to work together to exchange the necessary timetable and real-time data under open standards to improve the end-users' travel experience" (*IRG-RAIL Strategy Document 2021–2024*, p. 12) and to carry out the orders to deliver the freight to their destination points. Here also, five main trends of digitalisation in the railway transport (Poliński, Ochociński, 2020, pp. 137–148) are worth noting, i.e.:

- connected commuter – access to the internet during the journey
- preventive maintenance of the rolling stock – maintenance dependant on the data transferred on an ongoing basis by data electronic systems without the wear and tear of particular components, which adds to the reliability of the rolling stock
- mobility as the service related to the easier planning of a journey
- automation and interoperability of the traffic management systems, i.e. the systems in which the vehicles are started with no participation of the operative personnel at all
- the Internet of Trains – increased safety of the railway traffic, decreased operative costs and improved quality of the offered services.

Information and communications technologies are widely applicable in the networking of all the operation areas of the railway transport: designing and planning, production of the rolling stock and the elements of infrastructure, implementation of projects, management and railway traffic operations control, maintenance of the assets, organising the transportation process, contacting business partners and implementation of the internal business processes.

Solutions offered by modern technologies are becoming a component included in the creation of new business models and market strategies because they have the key role in performing tasks in the new economic conditions – in digital economy.

Furthermore, they do not only permeate all the spheres of the current railway businesses, but they are also engaged in the preparation and implementation processes for further innovations. Digital transformation affects the vast majority of spheres where the railway transport entities operate, among others in (Sobczak, 2016; Gajewski et al., 2016):

- structure and business model
- operation processes which form the organisation and the work environment; also, mechanisms of management and monitoring of effectiveness
- forming customer relations, including research on the market needs, forming communication channels and provision of tools for self-service.

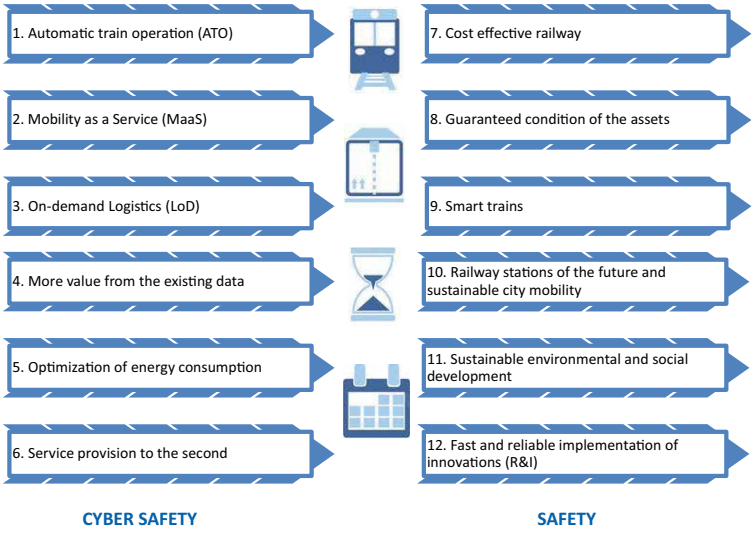
Apparently, the potential of digital solutions in the railway transport turns out to be very big – from the smart infrastructure and rolling stock, through the supervision over the operations and management on a daily basis and interactions

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with clients, to designing one's own innovations. Railway businesses develop and implement digitalisation programmes for their operations through the innovation-supporting projects which they initiate in collaboration with researchers and experts from the railway sector.[3]

An excellent example of such cooperation comes from the Europe Horizon 2020 programme which was designed for execution and within the financial framework forecast for 2021–2027. The basis of the Europe Horizon programme has been defined as the so-called 12 key capabilities (see Figure 2) which cover most areas related to broadly defined passenger and freight transport.

Figure 2. 12 key capabilities of the railway, according to the Europe Horizon for 2021–2027



Source: own materials of PKP S.A., Warsaw (2021).

From the railway transport perspective, the biggest potential lies in digital technologies and information and communications technologies concerning the following:

- Internet of Things

[3] Transformation in this area is also aided by such initiatives as the research and innovations programme Shift-2Rail, which helps the cooperation of the public and private sectors or the sectors' platforms, conducted by, among others, UIC or PKP S.A., effective innovative partnerships with other corporations, railway entities, and European entities from other sectors of economy and with Polish subcontractors, such as PKP Informatyka or the Railway Research Institute, to conduct international projects: Shift2Rail, In2Stempo and MaaSive – subsidised from the EU funds within the Horizon 2020 programe. PKP S.A. participates in these projects in the consortium EUROC (European Railway Operational Community Consortium), which comprises entities from the railway sectors of Austria (ÖBB), Finland (FTA), the Netherlands (ProRail), Portugal (CP and IP), Slovenia (SŽ), Switzerland (BLS and SBB) and Turkey (TCDD).

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- cloud computing
- Big Data recording and analysis
- robotisation, autonomous vehicles
- new digital products and services that are becoming integrated with the transporters' operations
- employment of autonomous and near-autonomous vehicles.

New digital products and services are now becoming an integral part of the carriers', infrastructure administrators', producers' and service providers' operations. Thus, they add value for all the participants of the transportation process, from production companies, through the construction sector, infrastructure administrators, carriers and their subcontractors, to the clients – varying from institutions and transport organisers to public administration. During the designing phase, digital tools allow for the optimisation of the processes, such as the preparation of investment, selection and configuration of particular elements and their parameters, as well as for the planning of the development processes. This enables the optimisation of the financial outlays, work and time, not only at the preparation and development stage, but also during the subsequent operation stage.

Digitalisation of the External Relations and Communication Channels

Social and economic digitalisation processes prove to be crucial in the formation of transportation services. Contemporary mobility demands effective time usage and functioning in two parallel worlds: metaspace and cyberspace – both at work and at home. Therefore, expectations rise about the analogous internet accessibility during the journey. Thus, cutting-edge mobile devices as well as expanded communication networks, which ensure the exchange of digital, vocal and visual data between the users and the resources stored in the cyberspace, are becoming the part and parcel of the transportation service.

At the first stage of digitalisation in the railway sector, substantial progress could be observed in regard to communication with clients due to the following factors:

- expanded and reinvented websites of carriers
- mobile applications with access to the information about the train timetables in real time and the possibility to buy a ticket and extra services
- ultra-modern systems of dynamic information for passengers on a train, at train stations and stops, which use tools to forecast the development of the situation on the basis of the timetable, information about the current traffic and train parameters.

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Gradually, more and more carriers, especially in the long-distance traffic, have already added to this list by starting their own digital platforms which are available for passengers on the trains. They are offering a broader and broader range of services and entertainment which raise the standard of a journey. These include, among others, real-time information about the journey, a range of extra services, such as a virtual library of books (e-books), music, audiobooks, films, newspapers and magazines, computer games, social communicators (discussion groups and chat groups).[4] Table 1 presents examples of digitalisation in the railway transport of passengers.

Table 1. Digitalisation areas in the passenger railway transport

Technology	Digital idea	Examples of use
– Broadband access to the internet – Mobile internet – Big Data – Cloud computing	– Connected commuter – Intelligent stations – Smart ticketing – Mobility as a service	– Access to the internet during journey (3G/4G/5G) – Mobile applications with real-time information about trains and the option to buy a ticket – Infotainment systems on board of trains and at the stations – A variety of applications integrated into one system through the inter-operable product service interface – Real-time Passenger Information Systems – Automation of the ticket selling and information providing processes – Applications to plan an intermodal journey

Source: J. Pieriegud (2019). *Transformacja cyfrowa kolei*, p. 52.

Access to Wi-Fi and extra services to accompany the journey are also available at the train stations. Systems of virtual information provide the train timetables, the platform to buy train tickets, the maps of train stations with shopping and service zones, maps of the surrounding areas, information about sports and cultural events (Radzikowski 2018). The need for continuous access to the internet and various communication channels, the use of social media, among others, gives rise to the ever more individualised needs regarding personal mobility and macrologistics – such as, for instance, supply systems and courier deliveries or smart contracts in the transport of freight. This trend is met with the rising need for new products and services. This also refers to the needs and communication behaviour of consumers and consignees of cargo. The transport of passengers realises so-called smart mobility via the pursuit of optimal configuration, connection and exploitation of different modes of transport, i.e. the inter-modality of the transport system.

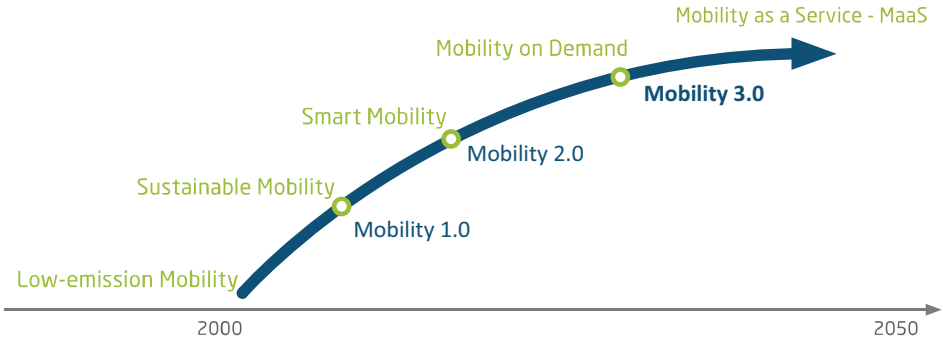
To successfully meet the said expectations, certain new concepts of mobility have been offered and they adopt a variety of formulas: on-demand mobility, mobility at any time, network mobility, shared mobility, integrated mobility and e-mobil-

[4] The fee and access to particular packages is subject to the travel class.

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ity. Each of the new models is connected, which means it offers access to the internet, as well as information and communications systems. This allows for fast planning of the most convenient journey, bookings and paying the fare, and eventually travelling, with the up-to-date information about the journey. What is more, the mobility-on-demand model does not only provide for the transportation service, but it also has an economical component by which the users only pay for the services that they actually use (pay-as-you-go). In different configurations, they constitute further stages of the advancing revolution in transport, illustrated in Figure 3.

Figure 3. Stages of transport revolution



Source: J. Pieriegud (2019). *Transformacja cyfrowa kolei*, p. 26.

Contemporary mobility, i.e. the idea of mobility as a service is the model of distribution of transport services which assumes the fulfilment of individual transport needs through the complex and universal digital platform (Zawieska, Pieriegud, 2018).

Digital solutions are also implemented in the railway freight transport. There is growing eagerness to develop technical and technological innovations which improve transportation processes (e.g. organisational and legal) in situations such as border crossing. Examples of digitalisation areas in the railway freight transport are presented in Table 2.

Table 2. Digitalisation areas in the railway freight transport

Technology	Digital idea	Examples of use
– Internet of Things – Big Data – Cloud computing – Automation and robotics	– Logistics 4.0 – Freight as a service (FaaS) – Intelligent freight car – Logistics platforms	– Real Time Train Tracking System – Electronic consignment notes, e.g. digital CIM/SMGS consignment note and e-invoices – Digital cargo booking platforms – New business models to organise transportation – Smart contracts (blockchain technology)

Source: J. Pieriegud (2019). *Transformacja cyfrowa kolei*, p. 52.

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The POLSUW system is an example of such a technological innovation. It is involved in the production of railway trucks which can automatically change the wheelbase, according to the width of the track gauge, while the train is running; see Picture 1. This system will considerably shorten the proceedings and will cut transportation costs on the borders with different railway systems and different widths of the railway gauge.

Picture 1. POLSUW model of the railway truck



Source: own elaboration.

One example of innovative implementation from the organisational and legal area is the common consignment note CIM/SMGS (Gajewski et al., 2018). This document is a uniform consignment note issued to carry freight and it is used by countries which have different regulations regarding international transport (SMGS and CIM) (Antonowicz, 2021). This consignment note is one for the whole route and there is no necessity for repeated registration wherever the transport law changes. It is recognised as the customs document and it simplifies the procedures related to the transportation of freight by rail across borders. Currently, CIM/SMGS is used by railways in 18 countries. The implementation of this consignment note has brought positive results for the railway transport, among others, the following (Antonowicz, 2021):

- considerably shorter stoppage time of trains at border stations
- improved quality of service and lowered costs
- time saving as no re-registration of documents on borders is necessary
- lowered costs as there is no need for renewed issuance of documents to continue transportation in the areas under a different transport law
- avoidance of documentation inaccuracies and errors committed as a result of renewed registration of shipping documents; ensuring a high level of concordance with legal norms during transportation for its participants
- faster delivery due to shortened stoppage time of the freight at renewed shipment sites.

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In July 2019, the electronic version of the consignment note CIM/SMGS was implemented as exploitation practice in international transport. Railway organisations are cooperating over its introduction into cross-border container transport along the China-Europe-China route. A concrete example of digitalisation is smart contracts. A smart contract is a digital representation of principles or processes which function in a given business organisation. They regulate the way and course of making business deals (Wodnicka, 2009, pp. 43–54).

A good example is offered by the Russian Railways, which started testing the product called "on-platform monitoring of smart contracts for railway transport of freight. Distributed ledgers are based on the technology of blockchain for business processes in transport and logistics" back in 2019. This service ensures support in making contracts for the main operations of transport and logistics activity and for mutual financial settlements between the participants of the transport process. The platform obtains essential data from 7 cooperating information systems. These systems generate data regarding the main operations with train carriages and containers, including applications, formation and inspection of train carriages, freight and clearing of carriages, departure and tracking the freight on the way to its destination. Parallelly, the relations that develop between the operator and the carrier are regulated by the existing laws and bylaws. Should a party fail to comply with a contractual obligation, the system will automatically impose the stipulated fine. By this, a non-standard, mutually acceptable mechanism of working is ensured.

Digitalisation of Organisations and Operation Processes

The use of digital data for diagnosing and monitoring, obtained from big databases, changes the approach not only to offers for external clients, but also to offers for maintenance and management of operations. More and more systems and subsystems are integrated with elements of infrastructure, machines and vehicles. By this, the operated rolling stock[5] becomes a source of information about the condition of infrastructure and vice versa, the infrastructure makes use of the elements which enable diagnosis of the rolling stock running along this infrastructure. More and more perfect digital tools, including information systems which make use of the parameters that report about particular units and indicate their subsequent level of wear and tear, lead to the development and implementation of the preventive maintenance models. Making use of the effective integration of databases and busi-

[5] An example of such a solution is ASDEK systems which detect failures in the rolling stock. They monitor the running vehicles' sets of wheels, they automatically check, via non-contact detection, the dynamic reaction on the track, the temperature of bearings and the elements of the brake. This helps to automatically detect and eliminate the cases of damaged or overloaded rolling stock. As a result, they help to eliminate failures, raise the security level and prevent damage to the elements of the infrastructure and the rolling stock.

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ness processes of the infrastructure administrators, carriers and logistic and IT systems operators, the rolling stock manufacturers may offer their customers such digital services as:

- monitoring of the condition and the location of the vehicles and their components in real time
- remote diagnostics
- analysis and definition of causes of malfunction
- preventive algorithms and detection of breakdowns.

Digital access to data redefines the processes of the infrastructure and the rolling stock maintenance. The analysis of data read by the diagnostics machines and sensors, located in the key system nodes, can power the computer centres and help to detect potential breakdowns. Thanks to the access to big databases and the tools of a mathematical model, potential problems are detected in time for early intervention. Detailed information with prediction enables one to indicate the elements which may go out of order and thus prevent potential malfunction. As a result, the system guarantees high reliability which decreases the need for operation reserves and increases the effectiveness of the system.

Table 3. Areas of digitalisation in the railway system operations

Technology	Digital idea	Examples of use
– Internet of Things – Cloud computing – Big Data – Automation and robotics	– Infrastructure 4.0 – Self–aware infrastructure – Self–aware rolling stock	– Infrastructure monitoring systems – Predictive maintenance – PM – Monitoring of the condition of the infrastructure and the rolling stock

Source: J. Pieriegud (2019). *Transformacja cyfrowa kolei,* p. 53.

Generation of the added value of new digital services is possible thanks to the cloud-based platform to analyse data and the Internet of Things, which allows for the direct communication of particular parts and resources of an organisation.

In the railway transport, the development of the autonomous systems has become common in the traffic management on a particular infrastructure dedicated to the passenger traffic. For some time now, there have operated automatic underground lines and light rail transit. They function on the basis of automation which accounts for the integrated process of the traffic management and its operation.[6]

[6] International standard IEC 62290-1 defines four grades of automation (Grade of Automation – GoA) in the rail transport. The highest, fourth grade refers to the system in which the vehicles are set into motion without any crew onboard.

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The most prevalent implementation of this model is autonomous systems employed in underground trains.[7] Innovative solutions regarding the railway automation bring about an array of benefits for the railway system:
- increased level of the infrastructure trafficability
– improved punctuality
– increased level of traffic safety
– increased energy efficiency
– reduction of operating costs
– reduced impact on the environment and the surroundings.

Areas of digitalisation in railway traffic control are presented in Table 4.

Table 4. Areas of digitalisation in railway traffic control

Technology	Digital idea	Examples of use
– Broadband access to the internet – Mobile internet – Internet of Things – Cloud computing – Big Data	– Connected trains – Internet of Trains	– Infrastructure monitoring systems – Automated Train Operation – Implementation of standards regarding cybersecurity (NIS Directive)

Source: J. Pieriegud (2019). *Transformacja cyfrowa kolei*, p. 53.

It is worth emphasising that the implementation of the automated train operation on the underground lines results in savings in regard to the number of the onboard crew, but, above all, in the improved security resulting from the elimination of human error. Even more, there is better capacity performance and consequences of trains. Another stage of the development of this model consists of the combination of three systems: that of dispatcher, security and communication into one complex and smart system of traffic management, which aids real-time decision-making. This solution allows for the ultimate introduction of automated train operation to regional, long-distance and freight trains. Due to the integrated information about the infrastructure and the condition of the vehicle, the engine driver gets left out of direct train driving. The train operating system calculates and sets the appropriate characteristics of the train running, optimises it in line with the defined timetable and energy consumption.

[7] According to the UITP data, in 2018, in 41 cities all over the world, there were 62 fully automated subway lines of nearly 1,000 km length, compare M. Darowska, J. Grzeszak, D. Sipiński, *Autonomiczny transport przyszłości*, Polish Economic Institute, 2020.

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Digitalisation in the Railway Transport on the Example of the Russian Railways Strategy

The Russian Railways belong to the biggest railway organisations in the world.[8] In 2019, they approved the digital transformation strategy of the company by 2025 and they implemented the Digital Railway project. The Digital Railway project run by the Russian Railways means digital environment in which the information is the resource which defines processes, management model and available services. Its aim is to improve the quality of transport and logistic services rendered with the use of digital technologies. The structure of digital railway is presented in Picture 2. Special attention in the project has been paid to digitalisation and information technologies. The project includes key directions of information system development in the Russian Railways and they are:

- creation of information space for freight transport and logistics in order to increase their profit-earning capacity
- creation of information space for passenger transport to increase its profit-earning capacity
- creation of complex digital technologies to organise the transportation process (Digital Railway) in order to improve effectiveness of the railway transport and infrastructure
- creation of one integrated and automatised operation system, optimisation of corporate systems of company management, analysis and development of reporting in order to increase profit-earning capacity of its overseas activity, increased effectiveness of the social sphere and governance.

The strategic document related to the digital transformation describes the conceptual foundation and principles of company transformation in digital economy. It sets priority spheres for digitalisation, such as the substitution for imported IT as well as resources and technologies, which are essential for making changes.

Pursuing the strategy of digital transformation is not only supposed to aid the introduction of innovations and breakthrough technologies in the Russian Railway Holding. It is also expected to change the corporate culture, increase performance and start new business processes, as well as extend the range of services offered on the market by entities from the Russian Railways Holding.

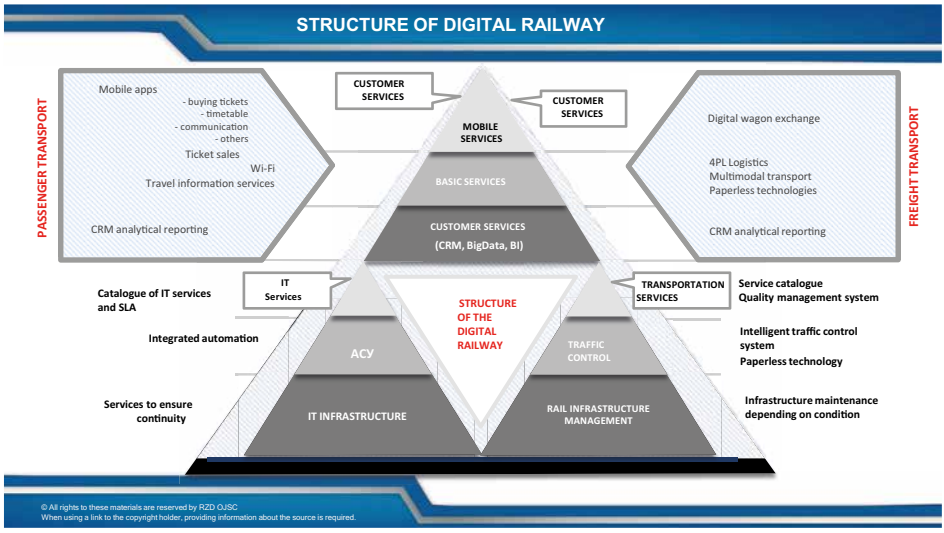
One of the main principles of the strategy will be to establish eight digital platforms – sets of related technological solutions intended to facilitate the interaction of the transport market participants. They include:

- multimodal passenger transport

[8] Essential information about the Russian Railways can be found, e.g. in the Report of the Activities of the Organisation for Co-operation between Railways for 2020, OSJD, Warsaw (2021).

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Picture 2. Structure of digital railway



Source: Charkin (2019).

- multimodal freight transport
- transport and logistic nodes
- line infrastructure operator
- logistic and e-commerce operator
- management of the transportation process
- railway rolling stock
- non-production processes.

The strategy provides for running over 50 projects in these areas as well as the use of domestic advanced innovative solutions based on such digital technologies as the storage and management of Big Data, distributed ledgers, quantum computing and others. These digital platforms are interconnected technological solutions serving the participants of the transport market to interact. What is more, basic platforms are created as structures of interconnected technological solutions which ensure support of information technologies such as the Internet of Things, Big Data, smart systems which implement, among others, machine learning methods, virtual reality, as well as new technologies for data transmission such as quantum communication. Tentative calculations by the Russian Railways show that, only due to the introduction of digital technology, the volume of freight will have increased by 70 million tonnes by 2025. Customer Relations Management system (CRM) will help to translate into electronic form up to 90% of the correspondence with freight dispatchers. The electronic trade platform will become "the window" to render services of freight delivery, smart contracts will accelerate and improve

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the effectiveness of business processes. CRM and the system of managing customer data are the basis to introduce better B2C services via the organisation website. When it comes to the management of the rolling stock, it is switching from the accounting systems to smart management that poses a challenge for digital transformation. The introduction of IT will accelerate the planning of the transportation process thanks to the operation update. This will also decrease dependency on the human factor, for instance, at the railway station dispatch area. The bases of railway engines will turn into "digital locomotive depots" where smart train engines will be serviced within trusted IT environment. The Russian Railways, together with their adviser, have launched a project which consists in the use of IT solutions to make a machine see in order to collect data from the sensors located on the rolling stock and to analyse these data in real time. In order to manage the life-cycle of the whole railway infrastructure, the Russian Railways have created a special line infrastructure operator which will employ methods of building information modelling (BIM). The following ultimate digitalisation level is planned to be gained by 2025:

- introduction of platform solutions integrated with production systems of the Russian Railways, their coordination and interaction with digital solutions of the whole transport system and the possibility to make digital services on this basis
- establishment of electronic channels of interaction with the market (passengers, freight forwarders, service agents), federal executive bodies and the participants involved in transportation along the transport corridors across borders
- integration of technological processes of the Russian Railways with the Internet of Things, processing Big Data, distributed ledgers, digital modelling and artificial intelligence
- creation of new generation mobile job offers and electronic management of documents in production and management processes
- modernisation of the information and communication infrastructure to ensure the guaranteed accessibility of information services
- introduction of centralised security measures, based on independent solutions, to ensure the information is secure
- formation of sustained culture of work with the use of new technologies (searching, approving, prototyping, implementation) and the development of high-tech business in the holding.

Conclusion

The growing importance of digital economy is mostly resultant from innovative technologies and consumers' growing expectations regarding the quality of service. Digital transformation is unavoidable, on the one hand, to maintain the attractiveness of the transport offer and vital, on the other hand, to maintain operating capac-

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ity and competitive advantage in view of increasingly digitalised communication channels with the environment. Due to the progressive digitalisation, there is growing integration of technologies and business processes between the market operators. This corresponds with the objectives regarding the inter-modality of the European transport system. One example of inter-modality is the idea of the "door-to-door" supply regarding the transport of freight or the idea of the single ticket in the railway passenger transport for the whole route, irrespective of the railway or the carrier who actually covers a given piece of route. In railways, solutions related to digitalisation are made within the railway systems of particular companies and railway networks. Ultimately, there must be global integration of solutions between particular railway systems, both from legal and from technical perspectives. The integration and dynamics of processes carried out by railway organisations lead to the development of a new model of their functioning which is based on the fast flow of information, ensured security for clients and the high quality of service. Moreover, it facilitates the development of new business models based on the integration and management of the competencies of cooperating entities.

References

Antonowicz M. (2021). *Innovations in the railway transport*, presented at the conference *Innovative Technologies in Logistics Transport and Education*. Academy of Logistics and Transport, Almaty, Kazakhstan, 25–26 November 2021.

Antonowicz, M. (2021). 65 lat działalności OSŻD w przestrzeni euroazjatyckiej. *Railway Report*, 192 (September 2021), Railway Institute, Warsaw, 7–16.

A Roadmap for Digital Railways (2016). CER, UIC, EIM, Brussels.

Charkin, E. (2019). Presentation at TAdviser SummIT Conference, Moscow.

Darowska M., Grzeszak J., Sipiński D. (2020). *Autonomiczny transport przyszłości*. Warsaw: Polish Economic Institute.

Digital Marketing Newsletter, 3/2021.

European Commission (2020). *Sustainable and Smart Mobility Strategy – putting European transport on track for the future*. European Commission, COM/2020/789 final, Brussels.

Gajewski J., Paprocki W., Pieriegud J. (eds.). (2016). *Cyfryzacja gospodarki i społeczeństwa*. Gdańsk: Institute of Market Economy Research, Gdansk Banking Academy.

.IRG-RAIL Strategy Document 2021–2024, November 2021. *Railway in 2030* (2021). UIC, Paris.

Majewski J. (2016). Analiza doktryn współczesnej polityki transportowej. *The Research Journal of the University of Gdańsk: Transport Economics and Logistics*, *59*, 467–481.

Own materials of the Organisation for Co-operation between Railways, Warsaw 2021.

Pobrano z https://www.wir.ue.wroc.pl / Downloaded from Repository of Wroclaw University of Economics and Business 2024-01-28

Own materials of the Russian Railways, Moscow 2021.
Own materials of the PKP Group, Warsaw 2021.
Mazurek, G. (2019). *Transformacja cyfrowa*. Warsaw: Wydawnictwo Naukowe PWN.
Pieriegud J. (2019). *Transformacja cyfrowa kolei*. Warsaw School of Economics, Siemens, ProKolej Foundation, Warsaw.
Pieriegud J. (2016). Cyfryzacja gospodarki i społeczeństwa – wymiar globalny, europejski i krajowy. In: J. Gajewski, W. Paprocki, J. Pieregud (eds.). *Cyfryzacja gospodarki i społeczeństwa*. Gdańsk: Institute of Market Economy Research, Gdansk Banking Academy, Gdansk, 11–38.
Poliński J., Ochociński K. (2020). Digitalization in railway transport. *Railway Report*, Issue 188, Railway Institute, 137–148.
Radzikowski, T. (2018). Możliwości zastosowania cyfryzacji w zarządzaniu kolejowymi przewozami pasażerskimi na przykładzie Holdingu DB i grupy PKP. *Technika Transportu Szynowego*, 6/2018, 44–47.
Report: *Green Railways – A Potential of Ecological Transport* (2021). Institute of Social and Market Research (IBRiS), ProKolej Foundation, Warsaw.
Report: *Green Railways in Poland – Climate, Energy Technology, Transport* (2021). UN Global Compact Network Poland, Warsaw.
Report: *Electromobility in Poland* (2017). Jagiellonian Institute, Warsaw.
Report: *Railway Transport in Numbers* (2021). ProKolej Foundation, Warsaw.
Report: *The Rail for Climate – Climate for the Rail* (2021). ProKolej Foundation, Warsaw.
Sobczak A. (2013). *Koncepcja cyfrowej transformacji sieci organizacji publicznych*, *"Annals" of the Collegium of Economic Analysis*, *29*, SGH Publishing House, Warsaw 2013, pp. 279–293.
Śledziewska K., Włoch R. (2020). *Gospodarka cyfrowa. Jak technologie zmieniają świat*. Warsaw: Wydawnictwo Uniwersytetu Warszawskiego.
Wodnicka, M. (2019). Technologie blockchain przyszłością logistyki. *The Małopolska School of Economics in Tarnów Research Papers Collection*, *41*, 43–54.
Zawieska J., Pieriegud J. (2018). Smart city as a tool for sustainable mobility and transport decarbonisation. *Transport Policy*, *63*, 39–50.
Zawieska, J. (2018). Perspektywy implementacji Mobility-as-a-Service w polskich aglomeracjach. In: J. Gajewski, W. Paprocki, J. Pieriegud (eds.), *Mobilność w aglomeracjach przyszłości*, Publication of the European Financial Congress, Sopot, 30–49.

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As the title of the publication indicates, the content contained in it broadens the boundaries of the reader's knowledge with interesting examples of the digital world penetrating into the world of consumers and entrepreneurs. The book is a collection of innovative articles in which the authors analyse with great erudition (that is based on rich, well-selected and up-to-date bibliographic sources, as well as their own empirical research) a selected number of problems related to interactions between consumers and tech, the influence of technology on marketing practices and the consequences of digitalisation in selected industries. The result of their work deservers a special distinction.

Prof. Magdalena Jaciow, PhD,
Department of Research on Digital Economy, University of Economics in Katowice

The digitalisation of society and its impact on social behavior is a constantly important trend of modern times. There have been many books and much research on the subject so far. However, we are constantly interested in an intriguing approach to this issue. The book *Extending Boundaries...* is a perfect example. The authors present various levels of perception of digitalisation. We used to divide the world into online and offline. Currently, both planes appear to integrate more and more. This convergence is visible around influencing consumers, marketing activities, and technological interactions. The valuable aspect of the publication is the authors' presentation of different views on how digital technologies affect contemporary consumers, marketing, and industry. The publication makes a significant contribution to discussing important problems related to consumer technologies and the consequences of digitalisation in specific sectors of the economy.

Jacek Kotarbiński, PhD, Eng.,
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