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EXPLORING CONSUMER PERCEPTIONS OF DIGITAL MARKETING PRACTICES WITHIN INDUSTRY 4.0: AN EMPIRICAL STUDY ON THE INTERPLAY OF PERSONALIZATION, AUTOMATION, AND TRUST FORMATION

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Abstract. The business of digital transformation involves far more than technology advancement; it is about marketing approaches aimed at meeting the growing expectations of consumers. This research investigates the impact of digital marketing in the context of Industry 4.0, with its emphasis on personalization, automation, and sustainable development. The underlying assumption is that data-based personalization and transparent automated communication improve consumer trust and engagement. This experimental study also followed a mixed-methods design using both quantitative and qualitative techniques to test the hypothesis. This gives us insights about how digital marketing can marry forward-looking technology with the values of trust and transparency found in human existence.

Keywords: digital marketing; personalization; keyword three

JEL: M31, O33, Q01

Introduction

The Fourth industrial revolution (Industry 4.0) is changing not only the way of production but also the way that firm's interface with customers. Digitalization, automation and big data analytics offer new opportunities for organizations to adjust their communication strategies but bring up important issues of trust and transparency and consumer acceptance at the same time. According to this reason, marketing in Industry 4.0 becomes not only more than traditional advertising but is characterized especially by personalized interaction and marketing in automated systems. This paper aims to investigate consumers' views on digital marketing practices in industrial and technology markets. It investigates, in particular, the effect of personalization and automation on trust while evaluating the extent to which sustainability and transparency foster long-term consumer commitment.

Digital Transformation and Industry 4.0

Industry 4.0 is not just a technological revolution but also paradigm shifts in how firms interact with stakeholders. It encompasses cyber-physical systems, big data analytics, IoT (Internet of Things) and artificial intelligence (AI) to establish connected ecosystems (Kagermann et al., 2013; Lee, 2021). In this context, marketing is becoming more dynamic in its engagement approach, from traditional static, bottom-up mass-market campaigns to data-informed tactics of targeting (Porter & Heppelmann, 2019). In Industry 4.0, digital marketing must operate on a comprehensive basis based on the interrelations between technological competences and consumer-centered values like transparency, sustainability and trust (Bauer & Gegenhuber, 2015).

What does digital marketing mean in terms of personalization? This is one of the defining features of digital marketing over the past 10 years. With the help of big data, machine learning and predictive analysis, companies can provide very personalized product recommendations, tailored content and adaptive user experience (Pappas, 2020; Smith & Kumar, 2023). Evidence indicates that personalization improves engagement as well as purchase intention through meeting the unique requests of the consumers (Arora et al., 2020). However, studies also indicate the paradox of personalization-privacy, where consumers may be drawn towards relevance but may react negatively when personalization is perceived as intrusive or based on too much tracking of personal data (Acquisti et al., 2016). In industrial contexts, personalization ranges from advertising to personalized product offers, tailored technical documentation to personal after-sales support such customization has become one of the most salient factors influencing buyer choices (Brown & Singh, 2022).

Marketing and Automation and Artificial Intelligence

This has led to a growth in automation in marketing, with AI-driven tools being developed like chatbots, recommendation engines, voice assistants, as well as automated email workflows (Davenport & Ronanki, 2018). According to the literature, using chatbots also contributes to effective customer service question management, saving time before customers arrive on service, which in turn helps customers in improving their satisfaction (Gnewuch et al., 2017). Aligned with this trend, AI-driven predictive systems enable companies to forecast customer demands and offer preemptive solutions (Huang & Rust, 2021). But an excessive focus on automation can be demotivating of the authentic person in the product, resulting in customer discontent or suspicion (van Doorn, 2020; Jia & Hall, 2022). In B2B and industrial contexts, decision-makers often assume personal presence and expertise, which automation cannot completely satisfy. Therefore, automation should exist to enhance, not replace, human interaction.

Trust, Ethics, and Transparency

Trust is commonly seen as one of the fundamental elements of digital interaction (Gefen & Pavlou, 2012). In digital marketing, trust is informed by the percep-

tion of data security, communication integrity and reputation of a firm (Urban et al., 2009). Transparency is key: transparency about the processes used to gather data, the purpose of the algorithms or origins of the product helps build reputation and reduces fear of manipulation (Martin & Murphy, 2017). In addition, ethical issues are also now become a concern in the area of AI and personalization: as consumers as well as both regulatory authorities and regulators' requests force the company to increase more and more into a greater position.

Sustainability as a Strategic Marketing Engine

Sustainability has progressed from a corporate social responsibility (CSR) project to a key differentiator in a competitive environment. Researchers claim that consumers are starting to appreciate businesses that exhibit environmental awareness, circular economy operations, and fair sourcing more than ever (Elkington, 2018; Lozano et al., 2022). For B2B and industrial markets, sustainability commitments also lead to procurement decisions, as firms need to comply with environmental regulations and meet stakeholder expectations (Wang & Zhou, 2021).

This situation is amplified by digital marketing, as it helps companies prove their sustainability credentials with the use of certifications, carbon footprint reporting, and digital storytelling (Kapitan & Silverman, 2018). The positive effect of sustainability claims, when coupled with transparency, impacts trust formation and loyal customers (Singh & Pandey, 2020).

Consumer perceptions of Industry 4.0

More importantly, consumer behavior has been taken to expect more personalized, real-time and authentic service to be delivered in the 4.0 world. Research shows that consumers, no longer passive recipients of marketing interventions, are active co-creators of value and participators in driving value creation in digital interaction (Prahalad & Ramaswamy, 2004).

Rational and price competitive at the market segment, whereas industrial consumers have typically gravitated towards experiential dimensions and these are becoming greater in their consumer choice, factors that were previously more experiential based, such as interaction quality, digital interface availability and visibility (communication transparency) and conformity with business ethics (Bauer & Gegenhuber, 2015). And, in the context of industrial markets where trust, commitment and trust will frequently be more important than the short-term profits from the marketplace, this reframing highlights the critical task of adjusting brand marketing strategy.

Research Gap

While there is research on personalization, automation, and sustainability, most studies have focused on consumer markets (B2C) and underexplored industrial and B2B contexts. Very little has examined in depth the way that industrial consumers identify the implications of personalization and automation for digital marketing and how these perspectives relate to sustainability and transparency.

Secondly, empirical data on consumer attitudes in the context of Industry 4.0 environments from Central and Eastern Europe including Bulgaria is scarce, which limits the global understanding of the influence of cultural and regional factors. This study aims to bridge this gap and show empirically the consumer perspective on digital marketing for the industrial industry (specifically, the role of personalization, automation and trust establishing). It adds to both scholarly and managerial literature by providing advice about how to achieve a synergy of technology innovations and human-centered values in digital marketing.

Methodology

Research Model

In order to refine the methodological basis of the study, we propose a research concept that illustrates how personalization and automation are influencing consumers trust in digital marketing in relation to Industry 4.0. The model suggests that personalization and automation are a clear precondition of trust that fosters consumer engagement and loyalty in the long-term and strengthens connection with industrial brands.

Constructs.

Personalization (P): The degree to which digital marketing activities, content, and communications are customized for specific consumer needs and preferences.

Automation (A): AI-enabled tools (e.g., chatbots, automated email systems, recommendation engines) in digital communication and service delivery;

Trust (T): Customers' trust in a company's transparency, ethical use of data, and dependability.

Engagement & Loyalty (E/L): Behavioral and emotional commitment resulting from trusted and satisfactory digital interactions.

Research Design

We used a mixed-methods design, integrating quantitative and qualitative methods to encompass wide and deep insights into consumer behavior. An explanatory sequential approach was adhered to: the survey began with a survey phase and then semi-structured interviews were conducted to locate and elaborate on the survey findings. Mixed methods design suit digital marketing research well as they allow for triangulation and diminish bias and enhance inference (Creswell & Plano Clark, 2018).

Research Objectives

Analyze consumer preferences for digital marketing channels, in the context of Industry 4.0. Evaluate views on personalization and automation and its impact on trust. Assess the impact of sustainability and transparency on consumer loyalty and purchase decisions.

Quantitative Data Collection

Between March and May 2025, we completed an online survey and constructed a total of four thematic blocks:

1. Demographics: age, gender, education, profession, purchase experience in industrial/technology markets.

2. Digital channel usage: frequency and preferences across corporate websites, digital catalogs, social media (LinkedIn, Facebook), webinars, and video content.

3. Personalization and automation - Likert-scale items on personalized recommendations, chatbot interaction, and automated email campaigns.

4. Trust, transparency, and sustainability: - items on the relationship between transparent communication and environmentally responsible practices in purchasing decisions.

An instrument included 28 items (24 closed-ended and 4 open-ended). The responses were taken at the five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree), allowing to investigate the central tendency and the associated correlation.

Sampling strategy

A purposive sampling method was utilised in order for respondents to have firsthand and relevant experiences in the target field. Eligibility criteria included:

– Age between 20 and 55 years.

– At least one purchase of a product, industrial or technology-related in the last two years.

The survey link was shared via:

– Professional networks and groups in LinkedIn for technology and engineering.

Industrial associations' mailing lists. – Corporate contacts in supply chain and procurement departments. Following screening of completeness and eligibility, a total of 367 responses were received, 320 of which were established as valid. The sample comprised 52% men and 48% women, and was from several professional industries (engineering 34%, procurement 27%, IT 21%, and others 18%). Qualitative Data Collection. In addition to the survey results, 20 semi-structured interviews were carried out from June to July 2025. Respondents were identified that were willing to participate in a related discussion. Format: Zoom or Teams online interviews.

Length: 30 – 45 minutes each. Interview questions explored themes such as perceptions of personalization, reactions to automated tools, expectations of transparency, and views on sustainability practices in marketing communication. Recording and transcription: All interviews were recorded with participants' permission and transcribed verbatim for thematic coding. Data Analysis. Quantitative analysis: Data were processed in SPSS v.28.

Descriptive statistics of means, percentages, standard deviations were computed for every item. Cross-tabulations and chi-square tests were conducted to test associations between demographic factors (e.g., age, profession) and perceptions of digital marketing practices.

Reliability of survey scales was examined by Cronbach's alpha and acceptable results were obtained ($\alpha > 0.75$ for all major constructs). Qualitative analysis: Thematic coding was applied to interview transcripts in NVivo.

Themes emerged directly from the data through an inductive coding process. Codes were collated into categories as related to three main themes personalization, automation, and trust/sustainability.

Themes were compared with survey findings on the basis of consistencies and divergences. Triangulation: For strengthening validity, findings collected from the quantitative phase were integrated with the qualitative. Negative reactions to automated email campaigns identified in the survey, for instance, were articulated in interviews by consumers' frustrations over irrelevant or too often delivered messages. Ethical Considerations. The study was done in accordance with ethical research standards. All participants were asked for informed consent and provided the reasons for the research, the right to withdraw at any time and to keep all data confidential. Participation was anonymous and voluntary. Data were securely stored under GDPR. Limitations. The research considers several methodological constraints within the study: This set of studies only included Bulgarian consumers, whose findings may not be transferable elsewhere.

There could be biases, such as social desirability or selective recall, in self-reported data. While combining experimental methods boosted the soundness of the results, further longitudinal data might deepen our understanding of long-term levels of trust in Industry 4.0 settings. This methodological design, on the other hand, was adequate to create a solid empirical foundation for exploring perceptions of consumers on digital marketing in the industrial sector. The methodological design ensures soundness to be honest, it allows for the measurement of the consumer's thoughts, emotions, and behaviors at every stage. The results show that the research was systematic and systematically carried out. Digital Channel Preferences. Survey results indicate that digital channels are centrally positioned in guiding consumer activity in the industrial field:

58% of people said that they depend mostly on company webpages and digital catalogs to search and shop or make buying decisions.

43% reported using social networks such as LinkedIn and Facebook as sources of professional and product-related content.

35% are in favour of video-based formats (i.e., webinars, product demonstrations, tutorials). These results underscore that the importance of multimedia engagement within Industry 4.0 is increasing while also indicating that corporate-managed channels remain key. Perceptions of Personalization. Personalization turned out to be a major driver of consumer trust and decision-making:67% said that they were more likely to trust companies that gave personalized recommendations. 29% acknowledged that they actively disregarded generic ads they felt were irrelevant or impersonal. This trend was supported by interview data. Respondents described

custom offers as “a sign of respect for my needs,” and evidence that the business understands its customers. But others warned about overly invasive personalization, worrying at times about privacy and excessive data tracking. Attitudes toward Automation. Consumer views of automation were mixed: 51% of them looked to chatbots with fondness: it is quick and available to them.

24% had negative sentiments towards automated email campaigns, calling them repetitive and intrusive. The interview findings showed that automation enhances efficiency but is not, at least in some cases, seen as genuine. One respondent observed a preference for “human contact in complex decisions,” particularly in industries where transactions are high-value and technical complexity of the purchase. Trust, Transparency and Sustainability. Consistently trust and sustainable processes were cited as major determinants in consumer choice: 72% expressed a preference for companies practicing environmentally responsible sustainability. 60% said transparency in relation to product origin and certifications was “extremely important” to build trust. Interviews further uncovered that transparency and sustainability function as trust-evoking cues to lower uncertainty in high-risk buying contexts.

Discussion

The findings emphasize that digital marketing in the context of Industry 4.0 needs to balance technological innovation with human-centric values.

Trust: Personalization as an enabler

• Research findings concurred with findings from (Pappas, 2020; Smith & Kumar, 2023) that personalization is crucial for building consumer trust and engagement.

• But the research also emphasizes the privacy paradox: while personalization is appreciated, consumers are still wary of data collection practices.

Efficiency vs. authenticity: automation

– Automation is widely accepted when efficiency is improved (e.g. chatbots for FAQs), but consumers are unwilling to engage in too mechanized communication.

– This is consistent with van Doorn (2020), who asserts that automation should enhance, not replace human communication.

Transparency and sustainability as differentiators

Results confirm that sustainability and transparent communication are important to industrial buyers (Johnson, 2024; Lozano et al., 2022). Ethical and environmental commitments in Industry 4.0 are not just something for reputation’s sake; they become strategic levers of competitive advantage.

Value-sensitive decision makers in industry

Despite some assumption that industrial consumers are price and technical specifications motivated, our study demonstrates that trust, ethics and transparency play an important role as well.

Conclusion

This research is a result of the empirical insight that in the context of Industry 4.0, consumers' attitudes toward digital marketing are defined through a dynamic relationship among individualization, automation and trust formation.

– Personalization is one of the most effective trust and engagement drivers but also requires responsible use to alleviate privacy concerns.

– Automation increases efficiency, but it can alienate people if used too much or when used impersonally.

– Sustainability and transparency are decisive to consumer loyalty and should be built into digital communication strategies.

The results imply that firms in industrial markets should plan integrated digital marketing strategies integrating information-driven personalization and selective and context-dependent automation, transparency on sustainability-related communication, and transparency of the sustainability story.

This not only meets the expectations of consumers in the current marketplace, but builds long-term trust and loyalty.

Implications.

– Managers can balance technology with authenticity, give due importance to transparent digital strategy.

– For researchers: Increase analysis across countries and sectors to capture cultural and sectoral differences.

– And for policy-makers: Create frameworks that secure an ethical approach to personalization and automation, and encourage sustainable practices.

Future Research0.

Further research could:

– Assess cross-cultural differences in perceived automation and personalized experiences.

– Perform longitudinal studies to examine the evolution of trust in an Industry 4.0 context.

– Explore how AI-driven personalization (such as generative recommendations) is transforming industrial consumer decision-making.

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