THE IMPACT OF GENERATİVE AI–ENABLED REAL-TİME CONVERSATİONAL MARKETİNG ON DİGİTAL HEALTH EDUCATİON PROCESSES: AN EDUTAİNMENT FRAMEWORK USİNG NO-CODE PLATFORMS

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Abstract

Advances in digital technologies have fundamentally reshaped health communication and education, giving rise to innovative, interactive, and user-centered learning approaches. In this evolving environment, the edutainment paradigm, which integrates educational content with engaging and entertaining elements, has gained increasing importance as a strategic tool to increase attention, engagement, and sustainable behavioral change in digital health education. In the post-pandemic context, the increased emphasis on health literacy has further intensified the need for timely, reliable, and accessible health information, positioning digital platforms as critical agents for the dissemination of health information. In this process, generative artificial intelligence (AI) technologies, particularly those integrated into real-time conversational interfaces such as chatbots, have become personalized and adaptive. This study has presented new possibilities for delivering responsive health education content. This review article examines the role of generative AI-powered conversational marketing in digital health education processes through an edutainment education and entertainment framework, with a particular focus on the use of no-code platforms. Synthesizing recent interdisciplinary literature encompassing digital health, educational technology, marketing communications, and human-AI interaction, this study conceptualizes how no-code environments facilitate the rapid development and deployment of AI-powered conversational applications without requiring advanced programming expertise. Leveraging example application scenarios integrating commonly used no-code tools (e.g., Glide, Landbot, Tidio) with large language models like ChatGPT, this review evaluates the functional capabilities of educational-entertainment-focused chatbot systems in terms of interaction design, response quality, content personalization, and real-time interaction. Rather than relying on primary user data collection, the analysis is supported by observational assessments and scenario-based testing documented in previous empirical and applied studies. The findings highlight the potential of educational-entertainment-focused, generative AI-powered conversational systems to improve digital health education outcomes, as well as to serve as innovative tools for conversational marketing in health-related contexts. This article contributes to the literature by presenting a structured conceptual synthesis, clarifying the intersection of educational entertainment, generative AI, and no-code development in digital health education. The study provides theoretical insights and practical implications for health educators, digital health designers, and policymakers seeking scalable, ethical, and user-centered solutions for health communication in increasingly data-driven environments.

Keywords: Generative Artificial Intelligence, Edutainment-Based Digital Health Education, Conversational Marketing, No-Code Platforms, Health Communication Technologies

1. Introduction

Rapid advancements in digital technologies are fundamentally transforming how individuals access information, their learning practices, and their communication habits. This transformation necessitates a reassessment of the effectiveness of traditional methods in the context of health education and health communication, areas with high societal impact. Traditional health education approaches, particularly those based on one-way information transfer and limited user interaction, may fall short in terms of critical learning outcomes such as attention, participation, and behavioral change. In this context, the need for user-centered, interaction-focused, and sustainable digital health education models is steadily increasing. The edutainment approach offers an innovative pedagogical framework that integrates educational content with entertainment elements and encourages active participation of learners. Including components such as gamification, storytelling, and interactive media, this approach has the potential to increase the accessibility, comprehensibility, and memorability of health education content, especially in digital environments. In this respect, edutainment stands out as an effective strategy in improving digital health literacy. In recent years, the development of generative AI technologies has opened up new possibilities in the field of digital health education. Large language models like ChatGPT, thanks to their advanced natural language processing capabilities, can communicate with users in real-time, contextually sensitive, and interactively; and generate personalized responses to their health information needs. Such chat-based systems are not limited to simply providing information; they are also considered digital tools that increase user interaction and learning motivation. The main focus of this study is the delivery of digital health education content designed within the framework of edutainment through a generative AI-based chat system developed via no-code platforms. No-code approaches allow the development of digital applications without requiring advanced programming knowledge, enabling the rapid, flexible, and scalable dissemination of health education content. In this context, integrating chat-based applications with digital marketing strategies offers a significant set of tools that increase health information dissemination and user interaction. Within the scope of

this study, the developed AI-powered chat application was developed without collecting surveys or primary user data; The study was technically evaluated in terms of response quality, content flow, and scenario-based user interactions. In this respect, the study adopts a conceptual and application-oriented perspective rather than empirical analysis; it aims to reveal the integrated potential of edutainment, generative artificial intelligence, and no-code technologies in the field of digital health education and health communication.

1. The Concept of Edutainment and its Educational Use

The term "Edutainment" is derived from the combination of the words "education" and "entertainment," and refers to a learning approach that aims to transfer knowledge through entertaining content. This concept is used, particularly in digital media and technology-based educational environments, to make learning processes more attractive, motivating, and sustainable. The Edutainment approach combines various audiovisual, interactive, and gamification elements to increase the learner's attention, maintain their interest in learning, and support lasting learning. The new millennium, despite the widespread focus on digital technologies, is characterized by the increasing importance of knowledge for economic prosperity and the emergence of a learning society. The analysis shows that innovation should be understood as a broad social and economic activity within the context of that society: it should transcend any particular technology, including revolutionary ones, and be dependent on attitudes and behaviors toward exploiting change by adding value (Conceiçâo et al., 2001). Traditional programming education is often boring and daunting, especially for young learners. Although programming is the foundation of modern technology, this often results in resistance and lack of adoption. Gaming is the defining characteristic of immersion. Its powerful ability to engage players can overcome reluctance and motivate students to learn coding. A digital game is an excellent way to learn programming. Cross-platform gaming provides the player with a kinesthetic approach to reinforcing role-playing game design and fundamental programming concepts (Sarkar et al., 2016). Gamification in digital education and instruction, or e-learning, emerged a few years ago. A closer look at the evolution of game-based learning and gamification in computer science reveals that game-based learning seems to have entered a stalemate where the instructional seamless integration of learning and playing has not yet become a reality. Edutainment not only presents information but also encourages the individual's active emotional, cognitive, and social participation in the learning process. From this perspective, it appears to be quite effective in educational programs, particularly those targeting children, young people, and individuals open to digital content consumption. However, in recent years, this approach has begun to be applied not only to early age groups but also to many areas such as health education, professional development, and online courses for adult learners. This method is also considered an alternative form of learning to overcome the limitations of traditional teaching techniques. Tools used within the scope of edutainment include animations, interactive videos, simulations, digital storytelling, gamified tasks, virtual reality applications, and conversational artificial intelligence**.** These tools make learning materials more engaging and effective, especially in today's digital age where individuals' attention spans are shortened. Gamification can help develop a systematic approach, which can then support an organized and methodologically robust gamification design for digital instruction and education (Martens and Mueller, 2016). Various computer games are widely used in the field of education. Creating appropriate games can increase student acceptance of instructional materials. Game-based learning and gamification have emerged as a primary focus for numerous researchers. Game-based learning is an innovative educational method that combines computer games with educational value. It also includes educational game software for purposes such as learning aids, instructional enhancement, and student assessment. Gamification has long been around, stemming from marketing efforts such as scorecards and reward memberships, educational structures, top scientific level, degrees, and workplace productivity (Al Fatta et al., 2018). The fundamental philosophy of using edutainment in education acknowledges that learning occurs not only through cognitive processes but also through emotional and behavioral processes. In this respect, edutainment aligns with many learning theories, most notably Bloom's taxonomy. For example, the effectiveness of entertaining content in achieving affective goals supports the development of positive attitudes and values in individuals; while for cognitive goals, it makes it possible to present complex information in a simpler, more understandable way using audiovisual stimuli. Furthermore, the personalized learning opportunities offered by edutainment content allow individuals to access content tailored to their learning pace, interests, and knowledge level. Especially when integrated with AI-powered digital systems, edutainment structures can create a more interactive learning experience by being supported by real-time feedback, guidance, and motivation tools. In this respect, the edutainment approach contributes to areas such as critical thinking, problem-solving, digital literacy, and creative productivity, which are referred to as 21st-century skills. For edutainment applications to be successful, the educational content must be based on solid pedagogical foundations, and the entertainment elements should not overshadow the learning objective. The aim is not just to entertain the individual, but to motivate them in the learning process and to help them acquire knowledge, skills, and attitudesTherefore, collaboration between educational scientists and media designers is crucial in developing edutainment strategies. In digital learning environments, which have become much more diverse with technological advancements, edutainment is considered a powerful method for making the learning process more effective, meaningful, and lasting. Especially in fields that directly affect an individual's quality of life, such as health education, the edutainment approach plays a critical role in enabling learners to internalize information and translate it into behavior. Technological advancements have paved the way for a learning revolution. E-learning, or technology-assisted learning, is becoming an integral component of a larger system

of practices and policies designed to prepare and support a highly skilled workforce in the digital economy. The power of e-learning stems from its ability to leverage technology and information to transform the fundamental principles of learning by eliminating the one-size-fits-all approach in teaching and customizing content to meet everyone's needs and learning styles (Pantazis, 2002). Digital natives enjoy playing digital games for entertainment, engagement, fun, and enjoyment. With the advent of the internet and mobile applications, educational entertainment and gamification are gaining importance in the education sector. As mobile technologies and applications rapidly advance, games are entering a new era where they serve to entertain, educate, and inform. Games can provide interactive learning tasks and activities that encourage collaboration and innovation (Apriani et al., 2022; Apriani et al., 2023; Muthmainnah, 2023; Muthmainnah et al., 2022; Khaddage et al., 2014). The transition from industrial economies to digital and knowledge-based economies in the 21st century has been fueled by rapid Information and Communication Technologies (ICTs) such as the internet, YouTube, Chartrooms, Skype, and social media networks. This has not only resulted in a new teaching approach globally but has also paved the way for a new generation of learners (always-on, anywhere learners) to enter the higher education system. Universities and other higher education institutions in developed countries and many other countries have acknowledged that the evolution of the 21st-century global digital and knowledge-based economies has launched a new generation of learners. Therefore, while they have taken the necessary steps to integrate traditional teaching methods in higher education with web-based learning management systems to accommodate these learners, universities and other higher education institutions in developing countries and some other countries have not yet taken these steps (Fosu, 2019). Gamification is the application of game design principles to non-game contexts. The main concept is to use the motivating and engaging power of games to motivate users to participate in specific activities (Santonen and Faber, 2015). A robust definition is proposed to distinguish gamification from other game or game concepts.

Gamification;

They have argued that gamification means

1) the use of design (rather than its extension) (instead of game-based technology or other game-related applications) and

2) the inclusion of game elements into a design (instead of full-fledged games).

3) Game-specific elements (rather than game or acting).

4) in non-game contexts (regardless of use, contexts, or media application) (Al Fatta et al., 2018).

Gamification incorporates game design elements (such as competition and scoring) into non-game contexts such as education (Evans, 2016). In interactive exhibits, gamification can attract visitors and improve engagement, flow, and learning, especially when multiple groups share an experience (Haesler et al., 2016). Gamifying learning, or applying game design elements to learning activities, is a controversial but popular trend in education. On the one hand, proponents of gamification argue that it results in learning outcomes. Gamification in education reinforces fundamental skills such as problem-solving, collaboration, and communication. Additionally, the need for interaction in a gamified teaching approach encourages students to take an active role in the learning process, thus increasing their participation in online forums, projects, and other learning activities. According to opponents of gamification, it derails learning with aimless distractions, adds unnecessary competitive stress, and disregards students' pedagogical needs (Rabah et al., 2018). Virtual games are one of today's most important opportunities to enhance learning processes in educational settings. Numerous applications have been demonstrated, including teaching cultural aspects, fostering citizenship, science, and critical thinking. However, despite scientific evidence, many questions remain regarding the effectiveness of gamification in education. The effects of gamification on motivation, concentration, and other cognitive aspects, as well as interaction and positive social behavior, are generally positive. However, there are differences in aims and outcomes between the application of gamification and serious games (De Oro et al., 2021). The term "Edutainment" is a portmanteau of the words "Education" and "Entertainment," and as the name suggests, it provides educational entertainment or entertainment-based learning. This means that instead of students becoming accustomed to learning through teacher-centered methods, they can learn subjects while having fun. Under the umbrella of this new concept known as "Edutainment," two new teaching methods are included: Game-Based Learning and Gamification. These concepts can be used to facilitate the education of students of all ages (Jayasinghe and Dharmaratne, 2013). Gamification is the application of game theory and game mechanics to non-game contexts. It is important to note that many game designers and researchers agree that gamification is more than just scores and leaderboards, and that certain elements and features need to be considered and included when training a system (Gerber, 2014). In foreign language classrooms, games or gamified activities can be used in conjunction with traditional teaching methods. As a new pedagogical approach, gamification offers opportunities with game elements and techniques that can be applied in non-game contexts such as classrooms. An online, free application has been used to encourage students to learn English as a foreign language in a more effective, active, and engaging way. Teachers have access to it for use in foreign language classrooms (Yürük, 2019). Gamification, a design technique that utilizes the motivational elements of games in other contexts, is increasingly seen as a potential solution to the observed decline in student motivation. However, the question is whether gamification is practical in education. A more accurate assessment of the potential of gamification is needed. To evaluate this, it is necessary to examine how gamification works for edutainment (Roy and Zaman, 2017). It is known that the correct use of seatbelts saves thousands of lives every year, and is among the most important. A VR-enhanced educational entertainment application is designed to increase awareness of seat-

belt use. To achieve this goal, a motorized rollover system has been developed that, when synchronized with a VR application (displayed on a head-mounted screen for each user inside a real car), rolls over a vehicle with up to four passengers inside (Riera et al., 2021). The term "21st-century skills" is most prevalent in contemporary education discussions. Proponents point to a new reality in the workforce that requires the next generation of university students and workers to be independent thinkers, problem solvers, and decision-makers. Schools should focus on providing the foundations and enabling students to acquire increasingly vital thinking and reasoning skills. These skills, widely cited as necessary for today's students by national education groups, teacher unions, higher education organizations, and workforce development groups, are also gaining attention among policymakers (Silva, 2009). Different areas of the new learning paradigm incorporate these skills and create a new method for effective teaching and learning. The Learning and Innovation Skills field can explain how these skills can be effectively taught to enable higher education students to acquire them (Kivunja, 2014). In broader contexts where uncertainty in the labor market is prevalent and the higher education system is becoming mass-produced, policymakers and academics continue to place great emphasis on this challenging endeavor (Bridgstock, 2017). Students can use feedback as a balancing strategy to identify where they are making mistakes and then adjust their approaches to increase their productivity and effectiveness in 21st-century learning (Kivunja, 2015). Gamification, which incorporates game elements into non-game contexts, continues to gain popularity to increase student engagement in the classroom. Learning can be assessed using student motivation, social comparison, effort, satisfaction, student empowerment, and academic performance in two courses. Over time, students in the gamified course show less motivation, satisfaction, and empowerment compared to students in the non-gamified course. Some gamification mechanics should be applied carefully in educational settings (Hanus et al., 2015).

1.2. Digital Health and Health Literacy

Digital media has permeated all aspects of daily life to the point where people interact with it for an average of several hours each day. While its importance for health-related purposes is constantly increasing, digital media can also play a ruthless role in the spread of misinformation; this not only sows doubt but can also harm individual and public health (Bridgstock, 2017). Digital literacy is defined as "the ability to use information and communication technologies to find, evaluate, create, and transmit information requiring cognitive and technical skills." This definition is constantly evolving as digital transformations and applications become more powerful and complex. Today, digital literacy is becoming increasingly important to the point where it can be considered a fundamental prerequisite for meaningful participation in modern society. Health literacy—the ability to obtain, read, understand, and use health information to make appropriate/informed health decisions—is increasingly becoming a fundamental skill for accessing health-related information online. Digital health literacy can, at first glance, be seen as a fusion of digital literacy and health literacy. It is also important to consider that these factors likely vary together to some extent. Age, gender, socioeconomic status (i.e., income, employment, and education), health status, and living in urban or rural environments are all factors that can influence the development of both health and digital literacy. Both health and digital literacy are generally conceptualized through competency-based frameworks. Health literacy is expressed in detail through a four-dimensional matrix applied in three areas (health care, disease prevention, and health promotion): accessing/obtaining health-related information, understanding health-related information, processing/evaluating health-related information, and applying/using health-related information. The European Commission's framework on digital competencies adopts a similar approach to digital literacy, depicting five dimensions (information and data literacy, communication and collaboration, digital content creation, security, and problem-solving), each with four to six sub-dimensions demonstrating the core competency of digital literacy. These frameworks showcase the complexity and multidimensionality of health and digital literacy and therefore highlight the need to conceptualize digital health literacy within a competency framework context. The Transactional Model of e-Health Literacy outlines four competency levels of digital health literacy (Riera et al., 2021):

(1) Functional: the ability to successfully read and write about health using technological devices;

(2) Communicative: the ability to control, adapt, and collaborate in communicating about health with others in online social environments;

(3) Critical: the ability to assess the relevance, reliability, and risks of sharing and receiving health-related information through the digital ecosystem (e.g., the Internet); and

(4) Translational: the ability to apply health-related information in the digital ecosystem (e.g., the Internet) in different contexts.

While digital and health literacy are related to digital health literacy, the reality is likely more complex. The relationship between digital, health, and digital health literacy is multifaceted. Each competency area of digital and health literacy can influence one or more competency areas of digital health literacy. However, certain competencies of digital health literacy may not be covered by either digital literacy or health literacy (Yürük, 2019).

1.3. Real-Time Chat-Based Applications (Chatbots)

The rapid development of digital communication technologies has transformed the ways in which users interact, leading to a shift from traditional information presentation methods to more dynamic, personalized, and interactive systems. In this context, real-time chat-based applications, commonly known as chatbots, play significant roles in various sectors today. Chatbots are software systems that can instantly respond to questions posed by users in natural language, perform specific tasks, and possess learning capabilities at different levels. In its most basic definition, chatbots are software entities that can communicate with humans in

real-time in written (or spoken) form, using natural language processing (NLP) techniques. Today, thanks to the development of artificial intelligence (AI), machine learning (ML), and especially generative AI technologies, chatbots can establish much more advanced, context-aware, personalized, and task-oriented communications.

Modern chatbots are generally divided into two main categories:

Rule-Based Chatbots: They operate according to predefined commands and scenarios. They have limited flexibility and a low capacity to adapt to new situations.

AI-Based Chatbots: They try to understand user expressions, extract meaning, analyze context, and produce more flexible, natural responses by considering previous interactions. This type of chatbot has made great progress in recent years, especially thanks to deep learning and transformer architectures (e.g., GPT, BERT). Real-time interaction allows chatbots to offer a fundamental advantage in user experience. Users can receive answers without waiting when they need information; this increases user satisfaction and loyalty. In addition, chatbots have the capacity to serve a large number of users simultaneously, making them scalable and cost-effective solutions. Real-time functionality also supports tasks such as instant guidance, problem-solving, consulting, and the delivery of educational content (Rabah et al., 2018). The use of chatbots in education has become widespread, particularly in parallel with distance learning, mobile learning, and micro-learning approaches. Educational chatbots can take on multifaceted roles beyond simply providing information to the user; they can guide the learning process, conduct assessments, provide motivation, and offer access to learning materials. For example, when a user wants information about a health symptom, the chatbot can provide simple and accurate answers based on reliable sources. In this process, multimedia elements such as educational videos, infographics, and audio narrations can also be integrated into the chat flow (Pasca et al., 2021). Chatbots operating with generative AI models go beyond working with fixed datasets, distinguishing themselves from traditional systems with features such as understanding context, generating original answers, and responding to complex queries. These systems, powered by generative AI technologies, have high potential in terms of both educational content delivery and user experience; they facilitate individuals' access to information and make the learning process more efficient. In this context, chatbots are considered not only a technological innovation but also a transformative component in terms of learning design (Apriani et al., 2022; Apriani et al., 2023; Muthmainnah, 2023).

1.4. No-Code Platforms and Their Application Areas

With the acceleration of digital transformation, accessibility, speed, and cost efficiency have become prominent in software development processes. In line with this transformation, "no-code" platforms, which enable individuals without technical knowledge to create digital solutions, have been attracting increasing attention in recent years. The no-code approach, unlike traditional software development methods, is a set of tools and systems that allow the development of applications, websites, chatbots, databases, or workflows without the need to know a programming language (Al Fatta et al., 2018).

1.4.1. Definition and Basic Characteristics of the No-Code Concept

No-code platforms are systems that enable software production through visual components, working with drag-and-drop design principles in the user interface. Thanks to these platforms, users can develop applications by configuring functions that run complex software codes in the background only through a graphical interface. The main goal of no-code technology is to democratize software production and enable a wider range of users to create digital solutions (Martens and Mueller, 2016).

The basic features of no-code platforms are:

- No programming knowledge required.
- Provides a visual development environment.
- Rapid prototyping is possible with ready-made components.
- Provides integration and automation capabilities.
- Based on a cloud-based working principle.

Thanks to these features, users can quickly transform their business ideas into digital products, reducing their dependence on software developers (Apriani et al., 2022; Apriani et al., 2023; Muthmainnah, 2023, Muthmainnah et al., 2022; Khaddage et al., 2014).

1.4.2. Main Types of No-Code Platforms

The no-code approach is applied to platforms with different functionalities.

The main types of no-code platforms are: Web and Mobile Application Development Platforms: Tools such as Glide, Adalo, and Bubble allow users to create mobile or web-based applications without coding.

Chatbot and Automation Platforms: Platforms such as Landbot, Tidio, and ManyChat are used to design chatbots, automate customer service, and produce interactive content (Muthmainnah, 2023, Muthmainnah et al., 2022).

Workflow and Process Automation: Platforms such as Zapier and Integromat (Make) offer the possibility to automate workflows by integrating different digital services.

Website Design: Tools such as Webflow, Wix, and Carrd allow users to create professional websites with drag-and-drop interfaces.

Data Management and Analysis: Platforms like Airtable and Notion offer user-friendly solutions for database management, project tracking, and information sharing.

1.4.3. Use of No-Code Platforms in Education, Healthcare, and Marketing

No-code technologies are applicable in a wide variety of fields. They offer significant advantages, especially for startups with limited resources, individual developers, educational institutions, and healthcare professionals. In education, no-code platforms enable teachers and educational designers to create digital learning materials, interactive exams, student tracking systems, and micro-learning applications. Gamified, interactive, and personalized educational content is possible through these platforms. Furthermore, chatbot-based guidance and consulting services can be easily

integrated with no-code tools (Apriani et al., 2022). In the healthcare sector, no-code-based applications produce a wide range of solutions, from patient information systems and symptom control chatbots to appointment management tools and mobile applications offering health education content. Especially for increasing individuals' health literacy and providing accessible health information, no-code platforms offer low-cost and quickly implementable solutions. No-code platforms are also widely used in digital marketing processes. Processes such as email automation, customer relationship management (CRM), sales funnels, social media integrations, and digital campaign management can be easily managed with no-code tools.

1.5. Advantages and Limitations of the No-Code Approach

Among the advantages offered by no-code platforms are accessibility, time savings, low application development costs, and rapid prototyping. This allows entrepreneurs, small businesses, and educators to create digital products despite having a low level of technical knowledge. However, this approach also has some limitations. Customization capacity may be limited, it may be insufficient for advanced technical functions, and in some cases, it can create vendor lock-in. No-code platforms represent a paradigm shift that democratizes the processes of creating digital solutions and minimizes the need for technological knowledge. Especially when integrated with generative artificial intelligence technologies, no-code systems become even more powerful and have the potential to produce real-time, personalized digital experiences (Fosu, 2019).).

2. Generative Artificial Intelligence

2.1. The Concept of Artificial Intelligence

Artificial intelligence (AI) has ushered in a new era by transforming businesses and improving people's lives in unprecedented ways. Personal assistants like Amazon's Alexa and Apple's Siri can understand and respond to commands and queries, while medical diagnostic systems identify diseases and suggest treatments. AI-based text and image algorithms like Dall-e and stable fusion can generate images based on text commands, while AI-based large language models like ChatGPT can write stories and code programs based on user queries. Despite all the recent successes, it is important to consider the ethical implications of these technologies (Belk, 2021; Breidbach and Maglio 2020; Wirtz et al., 2023). One example of this is the danger of dehumanizing healthcare as healthcare providers implement AI-driven systems to facilitate patient care and diagnosis. Doctors and healthcare professionals are increasingly relying on AI systems, reducing direct human interaction and personalized care. Patients risk feeling marginalized and undervalued because they are treated more as data points than as individuals with unique needs and concerns. This raises ethical questions about the balance between efficiency and the human touch in healthcare. The vast scope and ubiquity of relevant data and rapidly evolving technologies, their opacity, and the complexity of service delivery are concerning (e.g., Wixom et al. 2020). Generative AI, on the other hand, uses large language model (LLM) datasets and user prompts to generate new content. While AI-generated applications and content can increase efficiency, they also present challenges related to transparency and authenticity, with the issue of bias at the heart of these concerns.

2.2. The Concept of Corporate Digital Responsibility

Given the rapidly evolving development of digital technology, the concept of corporate digital responsibility (CDR) (Lobschat et al., 2021; Merbacks, 2023) has recently been incorporated into the service context (Wirtz et al., 2023). CDR refers to “principles that support the ethical, equitable, and protective use of data and technology by a service firm when interacting with customers in the digital service ecosystem” (Wirtz et al., 2023). Wirtz and colleagues propose a framework for CDR that considers data and technology lifecycles, financial flows, performance flows, data flows, information flows, technology flows, and the balances between CDR best practices and corporate goals. Using a data and technology lifecycle perspective, Wirtz and colleagues illustrate the problems that may arise at different stages of the creation, use, improvement, storage, and decommissioning of data and technology.

The digital service ecosystem model shows where problems may arise in the network of relationships and exchanges between service companies, customers, and other partners. It describes how money, services, data, insights, and technologies flow within the ecosystem comprised of service companies, customers, complements, and external business partners (Wirtz et al., 2023). The model clearly demonstrates that data and insights can lead to valuable opportunities, but it also raises the question of whether customers receive a fair share of the value created (Gawer, 2022). Wirtz et al., 2023, illustrate a range of strategies, tools, and practices that service firms can use to build a strong CDR culture. Key strategies include establishing company-wide standards that prioritize ethical practices. This involves ensuring all stakeholders understand and accept the standards they must adhere to, and that they are rewarded and motivated for their commitment to these standards. Despite the associated risks, many companies do not prioritize good CDR practices. This means there are barriers and justifications that can prevent companies from implementing such practicesHere are four key reasons why companies might choose not to participate in CDR (Customer Relationship Management). First, companies can financially benefit from collecting and using consumer data for sales and marketing purposes. The wealth of data available today allows companies to gain valuable insights into customer behavior, preferences, and purchasing patterns. By analyzing data related to customer behavior, feedback, and interactions, companies can identify areas for improvement and innovation to enhance the overall customer experience. This customer-centric approach builds loyalty and encourages repeat business, ultimately contributing to long-term profitability (Wixom et al., 2020). Second, AI and data-driven customization and personalization improve the customer experience by providing greater customization, convenience, accessibility, and speed of service (Huang and Rust, 2017; Wirtz et al., 201). By using AI algorithms and analyzing large amounts of customer data, companies

can tailor their products or services to the specific preferences, needs, and desires of individual customers. Companies streamline the customer journey through data analytics and AI-driven recommendations, providing a smoother and more efficient experience. For example, e-commerce platforms save customers time and effort searching for relevant items by offering personalized product recommendations based on a customer's browsing history or previous purchases. Ride-sharing platforms, for instance, use AI algorithms to predict and optimize routes, minimize wait times, and provide customers with fast transportation services. Automation involves using technologies such as AI, chatbots, and self-service systems to handle customer inquiries, support requests, and other interactions. This shift towards automation offers many significant benefits for service organizations (Davenport et al., 2020; Hunkenschroer and Luetge, 2022; Wirtz et al., 2018). Automation also improves customer service performance. Automated systems are designed to efficiently handle routine and repetitive tasks, reduce reliance on labor-intensive processes, and free up human resources to focus on more complex and value-added activities.

2.3. New Challenges Arising from Generative AI

Advances in artificial intelligence present both exciting opportunities and challenging difficulties to explore and understand. The recent emergence of powerful AI tools such as Dall-E, ChatGPT, and Bard has had a significant impact on society (Dwivedi et al., 2023). These tools have demonstrated how AI can transform people's lives in many ways, from work and entertainment to education and communication.

Research opportunities include:

2.3.1. Responsible Job Restructuring

As generative AI becomes more advanced and accessible, it could potentially replace some human-centric roles and tasks in service organizations, such as content creation, customer service, design, and analytics. Service firms will need to adapt to this change by investing in the training and development of their employees and rethinking their strategies, processes, and value propositions in light of generative AI capabilities. The workforce of the future will need to know and understand the principles of AI, be able to effectively use such technologies, evaluate outcomes, and be aware of potential ethical issues (Ng et al., 2021).

2.3.2. Responsible Service Automation

Generative AI is becoming increasingly complex and is used to make decisions based on large amounts of data. This can lead to biased outcomes and discrimination against specific groups or individuals. Recent research has shown that training sets can be poisoned even with a small number of data points. For example, by changing only 1,000 apple images in a training set (representing 0.00025% of the data), researchers can cause an AI to consistently misidentify the images as containing apples (Tramer et al., 2022). This type of data poisoning can be used to manipulate customer search results and recommendation systems. Service companies need to find ways to ensure fairness in AI systems. They need to weigh the costs and benefits of using these systems and develop mitigation strategies. Even seemingly simple AI systems can be complex and difficult to understand and monitor (Rahwan et al., 2019).

2.3.3. Dehumanization of Service Delivery

Service organizations will increasingly replace human interactions and relationships with automated processes and algorithms. This can lead to negative consequences for both service providers and customers, such as a loss of trust, empathy, satisfaction, and loyalty. Dehumanization can also affect the ethical and social aspects of service delivery, such as fairness, accountability, transparency, and privacy. For example, AI recruitment algorithms can dehumanize the hiring process by reducing candidates to data points and disregarding their individuality and dignity (Fritts and Cabrera, 2021). Similarly, AI delivery systems can dehumanize the customer experience by eliminating the human touch and personalization that can enhance loyalty and satisfaction.

This raises the following questions:

• How important is the human touch in service delivery?

• What do we miss when it's gone?

• What does human-centered design mean in a world dominated by AI systems?

2.3.4. Creating Responsible Customer Profiles

Artificial intelligence can provide new tools and techniques for monitoring and managing digital risks, but it can also lead to privacy concerns and the creation of detailed profiles of individuals. Such profiles raise several important ethical issues. First and foremost is the issue of privacy. Individuals may not be aware of the extent to which their personal information is collected and used to create these profiles. This lack of transparency and control over their data raises concerns about privacy breaches and the potential for unauthorized access and misuse of sensitive information. In addition, detailed profiles created by AI have the potential to be used for targeted advertising, personalized marketing, and influencing consumer behavior. While personalization can improve the user experience, there is a fine line between providing relevant recommendations and resorting to intrusive and manipulative practices. The collection of personal data and the creation of detailed profiles raise questions about data security and the potential for data breaches. The more comprehensive and detailed the profiles become, the greater the risk of them falling into the wrong hands, potentially leading to identity theft, fraud, and other malicious activities. Addressing concerns about AI-generated, detailed profiles requires careful consideration of privacy regulations, data governance frameworks, and ethical guidelines.

2.3.5. Preventing the Misuse of Artificial Intelligence

While artificial intelligence has enormous potential for positive impact, it can also be misused for various harmful purposes. For example, AI technologies can be expected to be used to exploit individuals, manipulate markets, or harm societal well-being. This can be done by manipulating entire markets by spreading fake news, controlling users, and even creating addictions (Wirtz et al., 2023).

3. Application of Generative AI in Healthcare Systems

3.1. Different Categories and Applications of Generative AI Models

Generative AI models continue to advance, and their applications encompass a wide range of fields, from creative arts to practical problem-solving in healthcare, economics, and more. Generative AI models gained attention in the mid-2010s following the development of Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), and diffusion models. Breakthroughs have emerged in generative neural network models, such as Transformers, which can analyze large datasets to automatically generate Large Language Models (LLMs). In healthcare, NeRFs can be useful in medical imaging by facilitating the creation of comprehensive anatomical and physiological structures from 2D scans such as Magnetic Resonance Imaging (MRIs). That is, they can reconstruct realistic representations of body tissues and organs, providing useful visual context to doctors and clinic administrators. VAEs are often used to generate realistic images, text, speech, or videos and for tasks requiring probabilistic representations. GANs are more applicable in generating realistic data and image processing. The diffusion model, on the other hand, realizes better use cases related to image synthesis, video generation, and molecular design. Furthermore, Transformers can be applied in multimodal applications such as natural language processing, computer vision, speech synthesis, music generation, and visual question answering and common-sense reasoning. Transformer-based models like GPT (Generative Pre-trained Transformer) and BERT (Bidirectional Encoder Representations from Transformers) are a breakthrough known for their ability to generate coherent and contextually relevant text, and were popularized by OpenAI and Google, respectively. Many healthcare systems are struggling with high care costs, staff shortages, and employee burnout. Value-Based Care is crucial to addressing this. It aims to ensure quality of care while promoting employee well-being and providing personalized and affordable care. Text prompts for GenAI, such as GPT-4, can create a standard Value-Based Care template and generate contracts based on market trends and features.

3.2. Real-Time Conversational Marketing with Generative AI

In the digital age, consumer behavior is rapidly evolving, and marketing strategies are being built accordingly on structures that can provide more personalized, interactive, and timely services. At the heart of this transformation are generative artificial intelligence (AI) technologies; in particular, real-time conversational marketing applications enable brands to interact with users more effectively and meaningfully.

3.3. Key Features of Generative AI and its Role in Marketing

Generative AI refers to a set of algorithms that can learn from data and generate new content, texts, images, videos, code snippets, or interactive dialogues. Especially with the development of natural language processing (NLP) and deep learning-based models (such as GPT, LLaMA, Claude), artificial intelligence has transformed into a tool that not only analyzes data but also produces original, creative, and human-like outputs (Haesler et al., 2016).

From a marketing perspective, generative AI offers significant advantages in the following areas (Rabah et al., 2018):

• Establishing personalized dialogues with users,

• Generating dynamic content based on customer data,

• Automating and optimizing marketing campaigns,

• Providing real-time customer support and guidance,

• Increasing conversion rates in the purchasing process.

3.4. Real-Time Chat-Based Marketing: Conceptual Framework

Real-time chat-based marketing refers to dialogue-based marketing interactions established with users in instant messaging environments (e.g., websites, social media platforms, mobile applications). The main goal of this approach is to quickly identify the needs of potential customers, inform them correctly, and guide them through the purchasing process. Chatbots and virtual assistants, in particular, play a critical role in automating this process (Pasca et al., 2021). Chatbots powered by generative AI not only provide predefined responses but also understand the user's language, generating contextually appropriate, natural, and flexible responses. This improves user experience and brings interaction with brands to a more human level (De Oro et al., 2021).

3.5. Use Cases and Application Areas

Generative AI-powered real-time chat-based marketing is applied in many sectors for various purposes. Among these applications, the following stand out (Apriani et al., 2022; Apriani et al., 2023; Muthmainnah, 2023, Muthmainnah et al., 2022):

• Product recommendations and sales guidance: Providing recommendations based on the user's past preferences and behaviors.

• Content marketing: Automatically generating personalized blog posts, social media content, or email texts.

• Customer service: Providing quick, effective, and contextual answers to frequently asked questions.

• Campaign integration: Presenting promotions, discounts, or special offers through chat windows.

• Surveys and data collection: Conducting market research by collecting data from the user in a natural flow.

3.6. Personalization and User Experience

Personalization is a key determinant in the success of marketing strategies. Generative AI can analyze user data and generate content and responses tailored to their expectations and behaviors. For example, when a user asks a chatbot, "What do you recommend for a headache?", the system can not only provide general information but also offer a more specific and targeted suggestion based on information such as the user's age, gender, and past chat history. This personalized form of interaction not only increases user satisfaction but also strengthens brand loyalty, increases conversion rates, and significantly enhances the effectiveness of marketing strategies (Apriani et al., 2022; Apriani et al., 2023).

3.7. Ethics, Security, and Limitations

Although generative AI-powered marketing applications offer significant opportunities, they also carry some ethical and security-based risks. In particular, the possibilities of generating misleading information, data privacy breaches, and user manipulation necessitate the responsible use of these technologies. Obtaining explicit user consent, transparently specifying AI-generated content, and subjecting the generated content to human review are important requirements. Furthermore, chat-based marketing systems must adhere to the principle of inclusivity, appealing to different age groups, education levels, and cultural backgrounds. More careful design and control processes are crucial, especially in sensitive sectors such as healthcare, finance, and public services (Al Fatta et al., 2018).

3.8. Integration with No-Code Platforms

No-code platforms facilitate the integration of generative AI models into marketing systems. These tools, which do not require coding knowledge, allow marketing professionals to create chatbot flows, perform AI integrations, and manage user interactions with visual interfaces. This increases the accessibility of generative AI and enables small businesses to implement advanced marketing strategies (Apriani et al., 2022; Apriani et al., 2023; Muthmainnah, 2023, Muthmainnah et al., 2022).

Real-time chat-based marketing, powered by generative AI technologies, is creating a fundamental transformation in today's digital marketing paradigms. These systems make customer interaction smarter, more personalized, and more effective, increasing user satisfaction and providing businesses with a strategic advantage. When ethical and security principles are considered, generative AI-powered chat systems are poised to play a central role in the future of marketing.

Conclusion and Recommendations

This study proposes an innovative model to enhance the effectiveness of digital health education within the framework of the edutainment approach, which has emerged as a necessity of the digital transformation era. It has been shown that real-time chat-based marketing systems, developed through the integration of generative artificial intelligence (GAI) technologies via no-code platforms, can make significant contributions to health education processes in both pedagogical and technological terms. Edutainment-based learning environments support knowledge transfer not only at the cognitive level but also at the affective and experiential levels, increasing the retention of learning, attracting individuals' attention, and actively involving them in the process. At this point, generative AI applications supported by real-time chatbots can successfully fulfill the function of informing and raising awareness about health issues by establishing personal and contextual communication with participants. The accessible, fast, and economical solutions offered by no-code platforms enable individuals without technical knowledge to create their own health education tools. Thus, it becomes possible for not only professionals but also educators working in the health field, social entrepreneurs, or non-governmental organizations to reach their target groups through these tools. Furthermore, thanks to the natural language processing capabilities of generative AI models, communication with the user becomes more human-like, contextually responsive, and personalized. This, in turn, motivates individuals to access information more effectively and increases their potential to positively influence their health behaviors.

The main findings obtained within the scope of this project can be summarized as follows:

• The edutainment approach increases the effectiveness of health education, especially supporting learning motivation in the digital environment.

• No-code platforms democratize software development processes, enabling the development of innovative applications in the field of health communication.

• Chatbots developed with generative artificial intelligence can provide instant, personalized information according to users' individual characteristics, thus increasing digital health literacy.

• Real-time chat-based marketing strategies increase user interaction and transform health education into an individual-focused structure.

In conclusion, edutainment-based digital health education applications integrated with generative artificial intelligence and no-code technologies stand out as an effective, sustainable, and scalable method for reaching today's digital citizens and raising their awareness about healthy lifestyle behaviors. In line with this study, the following recommendations are presented for future academic, applied, and strategic studies:

Empirical studies should be conducted on how generative AI-powered chat-based health education applications perform in different age groups, socio-economic levels, and cultural contexts. Research models including monitoring and evaluation mechanisms should be developed to assess the long-term impacts of edutainment-based applications. Conducting qualitative research on the pedagogical effects of no-code tools in the field of educational technologies will contribute to a deeper understanding of learner experiences. Health education institutions should be encouraged to develop their own chatbots or digital guide systems using no-code platforms, especially within the scope of public health campaigns. Guidelines based on ethical principles, content moderation strategies, and user privacy policies should be created for the safe use of generative AI-based systems. UX/UI design, language use, and accessibility principles should be central to the processes in order to maximize user experience. Integrating generative AI and no-code solutions into national education and health policies is important for the widespread adoption of digital health education. Interdisciplinary collaborations should be established between universities and healthcare institutions, bringing together technological and pedagogical expertise. Capacity-building programs based on technological literacy should be organized for young entrepreneurs, healthcare professionals, and digital content creators. Edutainment-based health education approaches, blended with the technological opportunities offered by the digital age, have become powerful tools that support individuals in both learning through fun and making informed health decisions. Generative artificial intelligence applications developed with no-code platforms offer freedom and flexibility to both content

creators and learners in this transformation. In this context, adopting digital, interactive, and inclusive methods in the field of health communication is an important strategic step that will increase the general health literacy of society.

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