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REVIEW PAPER

The GenAI is out of the bottle: generative artificial intelligence from a business model innovation perspective

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Abstract

The introduction of ChatGPT in November 2022 by OpenAI has stimulated substantial discourse on the implementation of artificial intelligence (AI) in various domains such as academia, business, and society at large. Although AI has been utilized in numerous areas for several years, the emergence of generative AI (GAI) applications such as ChatGPT, Jasper, or DALL-E are considered a breakthrough for the acceleration of AI technology due to their ease of use, intuitive interface, and performance. With GAI, it is possible to create a variety of content such as texts, images, audio, code, and even videos. This creates a variety of implications for businesses requiring a deeper examination, including an influence on business model innovation (BMI). Therefore, this study provides a BMI perspective on GAI with two primary contributions: (1) The development of six comprehensive propositions outlining the impact of GAI on businesses, and (2) the discussion of three industry examples, specifically software engineering, healthcare, and financial services. This study employs a qualitative content analysis using a scoping review methodology, drawing from a wide-ranging sample of 513 data points. These include academic publications, company reports, and public information such as press releases, news articles, interviews, and podcasts. The study thus contributes to the growing academic discourse in management research concerning AI's potential impact and offers practical insights into how to utilize this technology to develop new or improve existing business models.

Keywords Artificial intelligence · Generative AI · ChatGPT · Business model innovation · Large language models

JEL Classification M10 · M13 · M15 · M19

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1 Introduction

One million users in five days and 100 million monthly users just two months after launch: such record-breaking growth makes ChatGPT one of the fastest-growing consumer applications (Hu 2023). To put this into context, it took Instagram two and a half years to get 100 million users, and TikTok reached this milestone after nine months (Chow 2023). ChatGPT is just one—albeit prominent—example of generative artificial intelligence (GAI) applications. GAI refers to a type of artificial intelligence (AI) that can generate text, images, audio, code, videos, and synthetic data (Davenport and Mittal 2022; Gordijn and Have 2023). Recent interest in GAI has been driven by the simplicity of the user interfaces, which allow seemingly everyone, regardless of prior expertise, to generate content within seconds. As of right now, practitioners and researchers stand at the very beginning of a journey to understand GAI's capabilities, reach, and impact on society and economy alike. Multiple studies and research endeavors foresee potentially significant implications for companies' processes, way of working, interaction with customers, and ultimately the core of their business models through GAI (Agrawal et al. 2022; Dwivedi et al. 2023). However, not all business functions and, subsequently not all industries appear yet to be affected to the same degree by GAI. First analyses predict that white collar tasks such as administrative support will be more affected than manual labor-related functions required, for example, in construction or manufacturing which are less prone to automation (Eloundou et al. 2023). Already a few months after the launch of ChatGPT, confronting the public with the capabilities of such large language models (LLM), researchers and industry experts forecast a significant boost to human creativity and productivity while simultaneously estimating that 300 million jobs could be affected by AI, making it a potentially significant change driver in society (Kelly 2023). Also in the context of academic research, a discussion about the potential implications of GAI has started (e.g. Burger et al. 2023; Stokel-Walker 2022).

The past has shown that the emergence of groundbreaking technologies, such as personal computers or the internet, force companies to adapt and innovate their business models to stay competitive and relevant (Amit and Zott 2020). And the future influence of GAI is compared to that one of personal computers or the internet by industry experts (Konrad and Cai 2023). The rapid development of GAI is not only an external factor but a catalyst for internal change, requiring businesses to rethink and potentially restructure their business models to stay ahead in a highly competitive and swiftly evolving landscape.

The aim of this study is therefore to provide a BMI perspective on GAI, with two main contributions: (1) The derivation of six propositions about GAI's potential impact on industry-overarching business and working environment dynamics as drivers for BMI. (2) Building on three BMI categories (a) value creation innovation, (b) new proposition innovation, and (c) value capture innovation (Kraus et al. 2022b), examining three industries, namely software engineering, healthcare, and financial services, with regards to the potential implications of GAI.

Given the empirical relevance and recency of the topic, an in-depth qualitative content analysis, based on a scoping review methodology that builds on an

extensive sample of 513 sources is utilized. The research protocol hereby yielded data points classified into two clusters, (a) data obtained from academic journal publications ($n = 410$), and (b) data acquired from non-academic sources, such as online newspapers and online repositories of the companies that have developed GAI ($n = 103$).

The study's findings highlight how GAI's rapid advancements enable novel capabilities, leading to improved efficiencies and the emergence of new products and services. Simultaneously, GAI is potentially transforming skill requirements, shifting the human role from content creation to evaluation and editing. GAI could also drive new revenue models and cost structures, lowering content production costs and enabling various innovative monetization strategies. As GAI continues to evolve, businesses must adapt to harness its power, with their future success depending on their ability to integrate GAI technologies and continually explore new growth opportunities. The rise of GAI represents a paradigm shift, democratizing knowledge access and content creation, ultimately reshaping how businesses operate and innovate.

Thereby, the study contributes to three academic discussions: First, it adds to the emerging discussion about the implications of GAI on businesses (e.g., Dwivedi et al. 2023; Daugherty et al. 2023; Mathew 2023) by adopting a BMI perspective. Second, it contributes to the growing discussion at the interface of digital technologies and BMI (e.g., Ancillai et al. 2023; Aström et al. 2022; Jorzik et al. 2023). Third, it extends the discussion of artificial intelligence and analytics in management context (e.g., Korherr et al. 2022; Korherr and Kanbach 2023; Sáez-Ortuño et al. 2023).

2 Theoretical background: business model innovation

The investigation of business model development and innovation has emerged as a prominent area of research over recent decades (Clauss et al. 2020; Foss and Saebi 2016). Scholars have conceptualized BMI as an attempt to create, implement, and sustain strategies to generate, deliver, and capture value (Kraus et al. 2020). Innovation in this context involves modifying the architecture or configuration of a business model regarding its activities and components (Clauss et al. 2020; Dymitrowski and Mielcarek 2021; Reim et al. 2020). Lee et al. (2019) regard AI as a catalyst for BMI, providing momentum for companies to adapt their current approaches. Lindgren (2016) goes further, arguing that firms must incorporate advanced technologies such as AI to remain competitive. The recent emergence of GAI has further sparked this discussion. Consequently, business models are becoming increasingly divergent due to the groundbreaking technologies that have entered and altered the market. Existing literature focuses on the process of BMI and the nature of change, whereby the process is something internal (Katsamakas and Pavlov 2019) and the introduction of new tools such as ChatGPT can be seen as an external factor. The rapid development and progress of GAI requires firms to alternate. The significance of BMI is shifting from internal perspectives to external developments that impact a business and its need to innovate.

The lifespan of a business model is often limited in rapidly evolving digital environments with new technologies, where a previously successful business model in the field of competitors is threatened (Valter et al. 2018). This means companies must proactively seek new configurations of their business model components, even before external pressures necessitate changes (Neuhuettler et al. 2020). In addition, in dynamic environments characterized by significant changes or technological breakthroughs such as the emergence of GAI, constant BMIs are essential (Breier et al. 2021). In the context of BMI, changes to specific business model components, such as the use of modern methods and techniques like those AI provides, can impact a firm's success, even if not all components change simultaneously (Clauss et al. 2020). According to Clauss et al. (2020), changes to business models can vary in extent and scope, from incremental modifications to entirely novel and radical solutions forced by new technical opportunities. A recent model which builds upon the literature described above and captures the latest findings on BMI dimensions is developed by Kraus et al. (2022b) based on Clauss (2017) and Spieth and Schneider (2015). The framework includes the categories (1) value creation innovation, (2) new proposition innovation, and (3) value capture innovation, with accompanying sub-categories that each are potential drivers of innovation within the respective categories (see Fig. 1).

The model delineates three categories of BMI. First, in terms of "value creation innovation" technological advancements play a pivotal role in driving BMI (Clauss 2017). Companies striving to gain a competitive edge must continuously innovate through the adoption of new technologies or processes (Needleman et al. 2021). This necessitates the acquisition of expert knowledge of the new technology and its broader context (Desai et al. 2014). Regarding AI, companies must be adept at integrating technical innovations into an existing landscape. Second, "new proposition innovation" of BMI is driven by the emergence of new markets and sales channels, requiring organizations to adapt their internal and external communication processes (Needleman et al. 2021). The introduction of new products and services through BMI necessitates changes to the existing strategy of a company, which entails modifying both the technical implementations and process structures simultaneously. Last, the expansion of revenues is a significant driver of BMI in "value

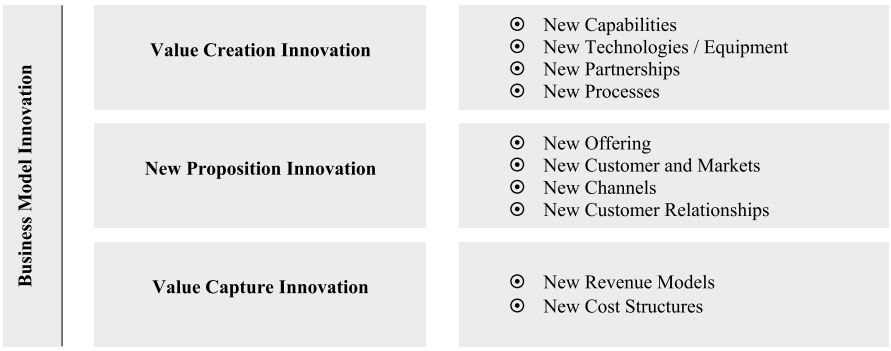

Fig. 1 BMI Categorization (own illustration following Kraus et al. (2022b))

capture innovation". The advent of AI provides new value-creating opportunities, which necessitates the adoption of techniques that generate new cost streams.

This categorization was selected as theoretical basis for this study for three main reasons. First, it integrates widely accepted and recent conceptualizations of BMI (e.g., Clauss 2017; Spieth and Schneider 2015). Second, it provides three condensed categories which build an ideal basis for the analysis of the impact of GAI. Third, it was developed in the context of analyzing BMI implications of another technological advancement, namely metaverse technology. In Sect. 5 of this study, we present the findings considering the outlined categories to clarify the impact of GAI on BMI—both industry overarching and narrowed down to three industry examples.

3 Development of generative artificial intelligence

It is widely argued that the important question is not if AI will play a role in the future, but rather which role it will take on, and more importantly, how humans can coexist with AI (Haenlein and Kaplan 2019). Therefore, it is important to understand the emergence of this technology. The roots of AI began with the foundational work of Alan Turing in the early 1950s. Turing introduced the notion of machine intelligence, proposing an imitation game to distinguish between human and machine responses (Turing 1950). Despite controversies surrounding the "Turing test," it became a cornerstone for the exploration of the human–machine boundary and remains influential in AI discourse (Haenlein and Kaplan 2019). A decade later, Joseph Weizenbaum introduced the chatbot ELIZA (Weizenbaum 1966) which is considered as pioneering work in the field of natural language processing (NLP) laying the foundation for today's language models. The following decades further marked the advent of rule-based expert systems, employing predefined rules for output generation within specific domains (Buchanan and Smith 1988). These systems had limited generative capacity and were primarily used in narrow domains. However, their development led to recurrent neural networks for coherent text generation by predicting the probability of next words in a sequence (Marr 2019) and networks for improved pattern recognition (Huang 2023). The early 2000s saw a significant development with the rise of machine learning and deep learning, becoming more effective due to advancements in data availability and computational capabilities (Marr 2019). Driven by the availability of massive data volumes and the increased efficiency of graphics card processors, which drastically accelerated learning algorithms, breakthroughs were made in various areas such as advanced computer vision, speech recognition, image classification, and the ability to construct 3D scenes and assets out of 2D images (House 2019; Krizhevsky et al. 2017; Yoo et al. 2021). Based on these advancements, a recent progress in GAI are transformer-based LLMs such as OpenAI's GPT (Generative Pretrained Transformer) (OpenAI and Pilipiszyn 2021). Those GAI tools emerged rapidly in the public attention but have been in development for years and the release of GPT-2 in 2019 already marked the beginning of GAI's power to unleash vast economic and societal transformation (Toews 2023). As of 2023, numerous GAI tools are available focusing on different tasks including for example the generation of text, image,

video, audio, and code. Midjourney, for example, offers a text-to-image generator through the messenger-service Discord and a web app (Midjourney 2023). In addition to the seemingly omnipresent LLM from OpenAI, named Chat-GPT, Bard is another conversational GAI, powered by Google's LLM "LaMDA" (Pichai 2023). Like OpenAI's ChatGPT, it was trained on a massive dataset and can be used to generate text, translate languages, create various kinds of content, and answer questions in an informative manner. Bard has been used in a variety of scientific applications, including data analysis, experiment design, literature review, and scientific writing. Despite Bard's seemingly hasty release to rival ChatGPT, Google had already pioneered LLM development by publicly sharing its transformer deep learning model back in 2017.

The field has come a long way, from the early days of simple text creation to the complex and sophisticated application use cases seen today. The development of GAI today is marked by further advancements in algorithms and techniques that enable a generation of new and original content. Although these recent advancements are still far away from artificial general intelligence in which systems are capable of human-like behavior in all aspects, encompassing cognitive, emotional, and social intelligence, businesses in all industries should not neglect these developments. It is widely argued that we are entering a new era that will revolutionize how we obtain information, generate content, cater to consumer demands, and operate businesses (Daugherty et al. 2023).

4 Methodology and data

4.1 Approach

To gain an overview of the actual landscape in the field of GAI, we conducted a scoping review and categorized the publications and sources with a qualitative content analysis. The primary aim of this paper is to provide an initial understanding of the potential implications of GAI for BMI. Due to the novelty and rapid development of this technology, we employed a systematic scoping review method, incorporating scientific as well as non-scientific sources, to ensure the inclusion of developments on the forefront of the scientific as well as public discourse. More specifically, we followed a PRISMA-ScR, which ensures consistent reporting items by identifying, pre-selecting, checking the suitability, and finally deciding to include or exclude a source, as proposed by Tricco et al. (2018). In line with Kraus et al. (2022a) and Sauer and Seuring (2023), we conducted a systematic sampling technique involving a structured process for data collection to enhance our study's reproducibility and transparency. To ensure comprehensive coverage, we additionally enriched the scientific sources with non-academic sources, including articles, books, pre-prints, press statements, and company websites, in addition to publicly available information such as podcasts, interviews, or event recordings capturing industry leaders' opinions, as also applied by other scoping reviews analyzing recent emerging phenomena (e.g., Cheong et al. 2022; Murphy et al. 2021; Syrowatka et al. 2021). For the content analysis of the identified sources, we

followed an inductive approach, following Mayring (2000). This provides a systematic and structured approach to identify and analyze patterns in textual sources. Following Mayring's guideline to analyze the found content qualitatively (Mayring 2000), we structured the sources first by branches and second by specific subfields, and then categorized them according to their implications for business models. Fairclough et al. (2007) and Hardy (2001) advise analyzing the textual material in three categories: (1) subjects and objectives in the text; (2) evaluation of the used language, such as text types, speech actions, or the text tone (e.g., does the author believe that GAI will positively, negatively, or not at all impact a respective industry, business model, or area of expertise?); and (3) the text's core ideas, from understanding to the context of the publication. Finally, the detected relevant sources resulted in six industry-overarching propositions, which we assigned to higher-level categories.

4.2 Sample selection

We conducted a comprehensive search of databases, including EBSCO, ScienceDirect, Web of Science, and Google Scholar. The data collection processes were conducted from March 15th to April 30th, 2023. The initial approach of the search scope resulted in targeting publications with the terms "business model (innovation)" and "generative AI" within either title or abstract. However, we realized that the combination of those terms is not sufficient for the analysis, and so we chose a broader approach, enhanced with manual selection and the precise narrowing down of the research funnel. Therefore, we opted for a dual search strain approach, completed by the inclusion of non-academic sources (see Fig. 2 for details).

In the first strain, we searched for "generative AI" terms (including spelling variations such as "Generative AI", "Generative Artificial Intelligence", "GAI", "GenAI") which resulted in 2845 hits in EBSCO. Narrowing this down further based on the exclusion of publications older than 2022 and additionally filtering for peer-reviewed publications resulted in 234 hits. The same search yielded 145 results from Web of Science, resulting in 26 narrowed down results. In ScienceDirect, this resulted in an initial 4748; again, this was considerably narrowed down to 76 results. Last, the same search conducted in Google Scholar resulted in 3407 hits, reduced by the filter criteria to 166. The total of 502 publications was then reduced by excluding duplications and manually removing publications that (a) did not match the topic; (b) were solely IT-focused (e.g., explaining the training of the datasets); and (c) that were not in English (if not already filtered automatically beforehand). This led to 143 publications.

The second search strain was conducted with specific companies and concrete applications, including "OpenAI," "ChatGPT" (and its variations), "DALL-E," "Midjourney," "Jasper," "StableAI," and "Google Bard". These specific GAI applications and companies were selected following Forbes' AI 50 list by selecting companies which were additionally listed in the Market Insights report of Statista (Cai 2023; Senn-Kalb and Metha 2023), to ensure the inclusion listing of relevant applications and companies on the forefront of the public as well as scientific

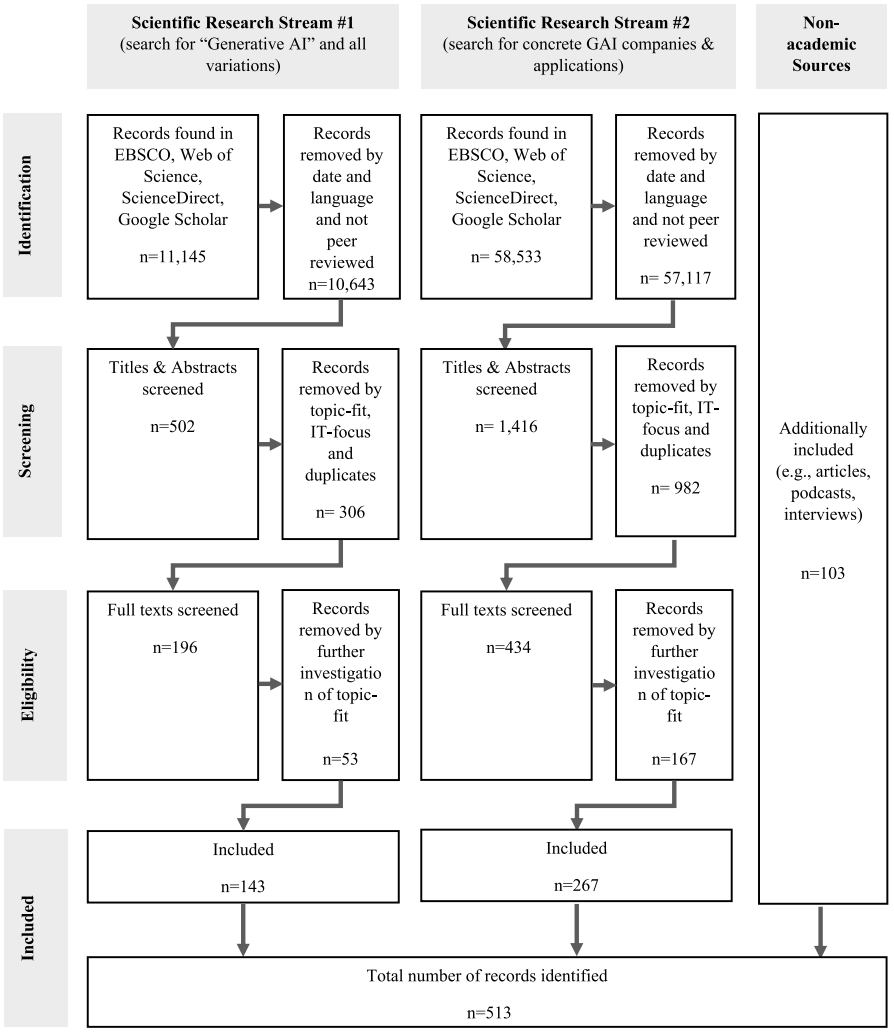

Fig. 2 PRISMA-ScR for this paper's publication selection (own illustration following Tricco et al. (2018))

discourse. Furthermore, we cross-referenced the actuality and importance by studying Google Trends in AI from September 1st 2022 to April 30th 2023 and hereby added more relevant companies, e.g., DALL-E. Given the rapid development of the technology, it is not possible to include all tools, services, and even companies who have launched GAI applications, but at the time of research we covered the most intensely discussed ones following (non-) scientific literature and AI trends in search engines by excluding the ones that do not concentrate on creating content (like text, audio, or video). This resulted in 40,045 hits in EBSCO; filtering for results only in 2022–2023, peer-reviewed, only including English results, and removing false hits

led to 796 hits. In the ScienceDirect database, the same search led to an initial 4748 results, which was narrowed down to 505 hits. Applying the same search terms and mechanics for Web of Science resulted in 13,740 hits, narrowed down to 115 by applying the specific search criteria. All these results demonstrated a clear tendency of most of the publications to focus on ChatGPT as the most prominent application of GAI. Again, excluding duplicates and solely IT-focused publications and publications with a non-topic related focus led to 267 publications. This added up overall to 410 academic resources from the two search strains for further analysis.

Third, to stay true to the multifaceted approach to gathering relevant information from diverse sources and given the rapid development of the topic beyond academia, we conducted a keyword search using two prominent search engines, namely Google and Bing. The search results incorporated information from sources such as reports, articles, podcasts, interviews, and insights from industry experts, including consultancies. Given the number of sources, this last screening process was not conducted in an extensive, all-encompassing manner. Searching for the relevant terms in Google alone led to over 75,000 hits. Nevertheless, we included publications in renowned (online) news outlets and industry-related reports, such as Forbes, New York Times, Gartner, McKinsey, and Bain. We defined renowned news as articles from trustworthy companies and news outlets (see Glader 2017 for an overview). Additionally, we rely on the selected AI tools and companies' websites due to their reputable standing in the field.

4.3 Descriptive results

The research protocol described above yielded a total of 513 data points classified into two clusters (a) data obtained from academic journal publications ($n = 410$), and (b) data acquired from non-academic sources, such as online newspapers and online repositories of the companies that have developed GAI ($n = 103$). GAI in general is a topic of great interest across various domains, industries, and research disciplines. The versatility of GAI has made it applicable to seemingly every domain. In particular, the recent hype and spike in research are based on the advancements in the technology and access to large datasets and computing resources, which have resulted in improved GAI algorithms with intuitive operating interfaces and handling. The vast applications of the technology have fueled research interest in it almost as rapidly as the increase in investments in AI companies.

First, we screened and categorized the sources based on the type of GAI mentioned within the publication. In line with Aydin and Karaarslan (2023), we again classified the types of GAI as "text to…" text, image, video, audio, or code. In this way, each category is reflective of the use of GAI based on a prompted written command and differentiated between the type of output generated, namely the beforehand mentioned five categories. While screening the sources it was searched for the main focus type of GAI of the publication and multiple counts are included, as the majority of sources concentrated on more than one type of GAI. In addition, data analysis is added as a general category to describe the use of GAI in analytical capacities, varying from, for example, drug discovery (Chen 2021; Patronov et al.

2022) and data analytics in business education and research (Cribben and Zeinali 2023) to data interpretation to counter global warming (Biswas 2023a). The distribution across the different categories is thereby not mutually exclusive. Table 1 presents the exact distribution of the types of GAI in the sample.

Moreover, we examined the industry context in which GAI is mentioned. Again, the results of the screening are not mutually exclusive and, frequently, multiple industries were mentioned in one publication or none. Table 2 shows the most frequently included industries, starting with "healthcare" (95), followed by "education" (92) and "media, creative, and journalism" (51). In addition, "academic research" included 142 sources; 128 were industry "unspecified" and multiple industries, with fewer than ten counts excluded in this overview, ranging from agriculture (Biswas 2023b; Wiles 2023) to tourism and hospitality (Carvalho and Ivanov 2023; Erul and Isin 2023). Moreover, the conscious decision to exclude purely technical publications from the data set does not imply that we disregarded software engineering. In fact, most of the papers included a perspective into how new software solutions could influence their respective area of study.

As the data analysis demonstrates, the remarkable progress of GAI, especially in natural language understanding and content generation, has undoubtedly prompted the interest of researchers and practitioners. The analysis further shows that research regarding GAI varies widely in its focus, (technological) depth, and methodology, in addition to whether GAI will result in beneficial effects or if the negative consequences will prevail. The research types vary from short, explorative papers commenting on chat interview protocols, setting the output of mainly ChatGPT into context (Biswas 2023a; Du et al. 2023a; Iskender 2023; Lund and Wang 2023; Neves 2022; Wang et al. 2023a; Wang et al. 2023a), to broad, multidisciplinary perspectives on a variety of topics, implications and industry analysis, primarily conducted by research collectives (e.g., Dwivedi et al. 2023)). In addition, other studies and publications focus on overarching topics, for example ethical discussions (e.g., Motoki et al. 2023; Youvan 2023; Zhuo et al. 2023).

5 Generative artificial intelligence implications for business model innovation

This chapter introduces a macro-level analysis of technology's impact on business model innovation, focusing on the implications of GAI. We first present six industry-overarching propositions, followed by three industry case studies, applying the BMI matrix to specific industries.

Table 1 Distribution of types of generative AI (duplicate count)

Type of GAI					
Text	Image	Video	Audio (Music/Speech)	Code	Data analysis
466	178	119	88	123	140

Table 2 Overview of included sources per industry

Included sources per industry								
Research	Healthcare	Education	Media, creative, and journalism	Professional services (e.g., law)	Financial services	Retail and commerce	Entertainment	Industrials
151	95	92	51	27	25	17	11	10

5.1 Analysis of business model components and innovation activities: six propositions

Based on our analysis, we explore the multifaceted impact and potential of GAI, emphasizing its transformative capacity for business models. Building on our sample, we derive six propositions to provide an initial view of GAI´s capabilities to impact (1) innovation activities, (2) work environment, and (3) information infrastructure. Based on the outlined BMI categories (Kraus et al. 2022b), we discuss the potential of GAI impact in three specific industries (see Fig. 3).

Proposition I—Initiators of Innovations: *GAI levels the playing field for innovators from all regions and social backgrounds by providing access to expertise, technology, and resources.*

The first experiences with GAI demonstrate in many business areas that holding specific knowledge becomes a less important factor in work and innovation success. For example, a study conducted by Noy and Zhang (2023) indicates that the disparity among employees diminishes as ChatGPT narrows the productivity distribution by providing greater benefits to workers with lower abilities, ergo leveling the playing field (Noy and Whitney 2023). GAI democratizes prior knowledge by evening out educational disadvantages, language discrepancies, and individual handicaps (see, e.g., Gimpel et al. 2023). A very precise application of this is provided by Yue et al. (2023) as they examine the possibility of utilizing Explainable AI and large language models, such as ChatGPT, to transfer financial knowledge to individuals without financial backgrounds (Yue et al. 2023). The study rests upon experimentation and demonstrates that ChatGPT has significant potential as a resource for conveying multifaceted financial concepts to diverse target groups.

Beyond knowledge accessibility, GAI theoretically provides technology and resources to almost everybody. For example, it not only assists in writing code (knowledge), but it can also run it no matter how resource-intense the execution is or how expensive the appropriate software tool is. CTO of Microsoft Kevin Scott describes another example of how new AI tools are democratizing access

GAI's Impact on Innovation Activities	GAI's Impact on Work Environment	GAI's Impact on Information Infrastructure
Prop. I —Initiators of Innovations: GAI levels the playing field by providing access to expertise, technology, and resources.		
Prop. II—Degree of Innovations: GAI's sweet spot lies in combinations of factual knowledge and creative thinking.	**Prop. IV—People:** GAI has its highest impact on the jobs of white-collar knowledge workers.	
Prop. III—Timing of Innovations: GAI affects most business models initially via value creation innovations.	**Prop. V—Skill Set:** GAI redefines required skill sets as many job roles transform from being creators to becoming editors.	**Prop. VI—Consume or Customize:** "The GAI is out of the bottle." It is not a question if generative AI *will* be used by companies— but *how*.

Fig. 3 Propositions of GAI's impact on businesses (own illustration)

to design: "An AI system such as DALL-E 2 doesn't turn ordinary people into professional artists, but it gives a ton of people a visual vocabulary that they didn't have before—a new superpower they didn't think they would ever have. […] The applications of GAI are potentially endless, limited only by one's ability to imagine scenarios in which productivity-assisting software could be applied to complex cognitive work, whether that be editing videos, writing scripts, designing new molecules for medicines, or creating manufacturing recipes from 3D models" (Scott 2023). Consequently, fewer hardware investments are required, democratizing access to technology.

To conclude, GAI has the potential to shift more of the focus on creativity and the uniqueness of ideas irrespective of a person's regional or social background—truly leveling the playing field.

Proposition II—Degree of Innovations: *GAI's sweet spot lies in business models that rest upon a combination of factual knowledge and creative thinking. This is where the potential for fast new proposition innovations and value capture innovations is highest.*

Much is currently being written about how many repetitive, fixed-knowledge activities can be automated by GAI (e.g., product descriptions, categorizing, writing code), and the opportunities GAI opens to get creative (e.g., writing stories, creating image ads, generating video clips). However, our analysis shows that the greatest potential of GAI for business model innovation now lies between factual knowledge and creative thinking. This follows from two factual statements. First, repetitive activities are mostly already inexpensive, either because they are performed by a less skilled workforce or because they are already partially automated (see, e.g., Kagermann 2015). Thus, on this side of the spectrum, the business case is not very strong. Second, although we do observe high-value creation in extremely creative business areas (e.g., art, film, photography), this commercial success depends only partly on the craftsmanship of creativity. More decisive for success is usually the story's ability to resonate with the audience (e.g., Wieczerzycki and Deszczyński 2022). GAI certainly offers the potential to move into this area soon, but for now, it remains difficult to imagine that the next best-selling book, the next blockbuster movie, or even the next multi-million-dollar painting will be generated solely via GAI. In any case, commercial success in this area remains harder to predict and uncertain (see, e.g., Berg 2022). However, this is different for business models that are based on the combination of complex knowledge and creative solution orientation. The workforce in such businesses is more expensive and rarer, whereas the working approaches are still fairly rule based. Examples are lawyers, auditors, notaries, consultants, software engineers, architects, doctors, and therapists. Frequently, these are also the areas where, traditionally, the cost of making errors is very high and expert responsibility is key (e.g., the audit of financial statements or notaries carrying the risk of a contract's inaccuracy). It is worth mentioning that GAI or the companies behind it do not assume this responsibility by default. In fact, it remains an open question for the future whether GAI can ever do this. Nonetheless, from a value creation perspective, this is the area where GAI's impact can be maximized—by removing the bottleneck of the most demanded knowledge workers first.

Proposition III—Timing of Innovation: *GAI affects most businesses via the extension of existing products and services as readily attainable innovations are prioritized.*

The impact of GAI on new offerings will most likely be significant and shall not be underestimated. As Przegalinska and Jemielniak (2023) argue, the shift towards embracing GAI will lead to new offerings and business models which cannot yet be imagined. However, many current offerings are clearly enhanced by adding GAI. Many businesses embrace the integration of GAI into their existing products and services. This approach focuses on incremental changes that improve user experience, making products more accessible, efficient, and streamlined. This approach can be observed from the releases of, for example, Adobe 2023; Canva 2023; GitHub 2023a; Microsoft 2023; Sean 2023; Spataro 2023. These large corporations did not revamp their complete software product suites but rather prioritized readily attainable innovation and integration. This approach allows businesses to experiment with the technology, refine its applications, and learn from valuable user feedback. It also enables companies to leverage their established brand, distribution channels, and customer base, thus mitigating the risks associated with the introduction of entirely new products and creating a lock-in effect. In this manner, the more GAI is integrated, the more they are put in a position of power to potentially increase their pricing for "smarter" software products. This also implies higher entry barriers for smaller, new market players. As the maturity of GAI progresses, business will potentially be better positioned to develop and launch novel products and services, instead of making existing offerings "just" faster. Although there are initial examples emerging, these new offerings will potentially disrupt market dynamics more drastically by leveraging the technology to a larger degree and ultimately replacing human input in various capacities.

This already observable tendency will most likely have various BMI implications with the adoption of new, AI-powered services and features in existing products, helping companies to advance their offerings. In addition, the newly added features, which will result in an eased user experience, can potentially enable new customers to be targeted, which—in the case of graphic design tools—suddenly requires fewer skills (Agrawal, Gans and Goldfarb, 2022). Overall, customer relationships can be strengthened, and lock-in effects can be created via even more features and smarter, more intuitive solutions which are valued by customers. Lastly, value capture innovation, new pricing, and a potentially altered cost structure will be possible after the roll-out of even more GAI features in existing products. However, the sole implementation of additional features will most likely not result in a completely new revenue model. As the example of (corporate) software adding those smart features makes clear, subscription-based models remain their go-to solution.

Proposition IV—Impact: *GAI has its highest impact on the jobs of white-collar knowledge workers, for whom entire job roles will be replaced, reshaped, or elevated.*

The effects of GAI on the labor market are estimated to be substantial. Recently, Goldman Sachs predicted that 300 million jobs could be affected by AI (Kelly 2023) and Accenture found that 40% of all working hours may be impacted by LLMs such as GPT-4 (Daugherty et al. 2023). GAI has the potential to revolutionize the nature

of work for white-collar knowledge workers, as outlined in *Proposition I,* driven by the automation of repetitive, fixed-knowledge activities. According to Cardon et al. (2022), the anticipated AI revolution is based on three observable tendencies: the integration of GAI into core products by major software vendors, rapid user adoption of AI tools, and the continuous release of new AI applications. Particularly higher-income jobs with advanced language and communication skills are at greater risk of exposure to AI-driven disruption (Felten et al. 2023). More specifically, GAI tools have the potential to replace or reshape numerous jobs. Noy and Whitney (2023) find that ChatGPT primarily serves as a replacement for employee effort, shifting tasks towards idea generation and editing. Particularly affected jobs will be those with highly repetitive tasks, for example, data entry clerks, customer service representatives, proofreaders, paralegals, and bookkeepers (Mok and Zinkula 2023; Schafer 2023; Zhang et al. 2023). However, the situation is not entirely bleak. GAI also creates new jobs as demonstrated by the increase in open position postings related to (generative) AI tasks (Tarrant 2023). In addition, the rise of GAI offers opportunities to elevate existing professions, for example customer service jobs (Daugherty et al. 2023). By examining how white-collar workers spent their workday, GAI could enable them to devote their time to more advanced cognitive tasks, profoundly altering the way they engage with technology to accomplish tasks (Scott 2023). This would not only potentially enhance customer relationships by offering more efficient customer-service (e.g., 24/7), but simultaneously reshape processes through streamlined workflow and the elimination of repetitive tasks, allowing employees to, for example, focus on meaningful customer interaction or creativity-related tasks. One hypothesis is that by automating tasks, workers in, for example, care-related jobs—which are currently often undervalued and underpaid—can free up time for human-related tasks (Gupta 2022). This could potentially result in a more balanced and fulfilling labor market, with a greater focus on social priorities due to the additional time that was previously spent on repetitive tasks. The outcome will most likely be one of two scenarios: increased efficiency or reduced working hours. In the first scenario, the increased efficiency of white-collar workers results in a higher output with similar working hours. In the second scenario, workers produce the same output in less time, leading to a reduction of working hours (Rees 2023). Both scenarios raise questions about the future structure of the workday, compensation, and overall implications for the labor market. This potential change in output can result in a range of consequences, from small efficiency gains and potential cost reductions due to a smaller necessary workforce to a complete shift of how society operates, for example.

Proposition V—Skill Set: *GAI redefines the skill set required to generate content as many job roles transform from creators to editors—human amplification and not complete substitution.*

The use of AI is transforming the required skillset of employees (Santana and Díaz-Fernández 2022). The rapid development of GAI is transforming the landscape of content production and impacting the capabilities of both companies and their employees. Content production is meant in the broadest sense as generating media output from given input. This transformation is causing a paradigm shift in the human role within the creative process. Traditionally, humans have been the primary

creators of content. There was no possibility—especially not a publicly accessible one—of generating (high-quality) ideas and shaping them into consumable forms without manual labor. The rise of GAI has challenged this idea, prompting a revolution of the human role in content production. GAI gives content creators powerful tools, erasing the entry barriers to many jobs (Towson 2023). GAI tools have already significantly reduced the marginal cost of content creation (OpenAI 2023). These algorithms generate vast amounts of content with minimal human input. Workers' skillsets can and must therefore adapt to deliver value in the generating content process. Individuals should evaluate the quality and relevance of the seeming abundance in a world with a zero-marginal content cost (Noy and Whitney 2023). Therefore, one of the most critical skills in this new paradigm is judgment (Fridman 2019). The ability to discern good from mediocre or irrelevant content becomes paramount. This emphasis on curation necessitates the development of critical thinking, analytical, and evaluative skills, enabling individuals to assess the value, resonance, and impact of AI-generated content—a task that cannot yet be automated. In addition, these skills empower individuals to mold and refine the generated content, aligning it with the intended purpose and audience. The integration of GAI in content production offers new capabilities and the potential for increased effectiveness when employed correctly. By leveraging AI-generated content, individuals can focus on refining and tailoring the output to suit specific needs, thus enhancing its overall efficiency. In this manner, the collaboration between GAI and humans has the potential to unlock unprecedented levels of creativity and productivity. As Mostaque, the CEO of StabilityAI, euphorically predicted, "with AI we figured out how to make humans scale" (Goldman Sachs 2023). Time will tell if this prediction becomes reality. Overall, it can be summarized that GAI's anticipated ability to decrease the marginal cost of content production could lead to significant business model innovations along the whole value chain, enabling companies to create and capture value in new ways. This will begin with small achievements which make existing tasks quicker with the new capabilities to completely new processes, and lastly, entirely new revenue models. The integration of GAI could unlock innovative revenue models by capitalizing on its capacity to augment human creativity and decrease content production costs, ultimately promoting value capture and business growth. This would work, for example, by differentiation between freemium and premium content: By employing GAI to produce high-quality content cost-effectively, businesses can offer basic content for free and reserve exclusive, personalized content for paying customers.

Proposition VI—Consume or Customize: *It is not a question of if GAI will be used by companies but how it will be built or integrated into the company's data infrastructure.*

As GAI becomes increasingly pervasive, companies should decide how to adapt their processes to harness this technology's potential. Przegalinska and Jemielniak (2023) argue that every company must embrace AI technology or risk obsolescence. Consequently, companies face the question of how to use this new technology appropriately. They have three overarching opportunities: utilizing off-the-shelf LLMs; customizing models for specific use cases (independently or with external assistance, e.g., consultancies or technology providers such as Google, NVIDIA, or

Microsoft); creating their own LLMs, or a combination of the former (Daugherty et al. 2023; Pounds 2023). Key factors in this decision include mitigating the risk of proprietary data leakage and balancing the potentially large costs of training and inference with the anticipated benefits. In addition, especially regarding BMI and the required adaptation to a changing environment, time-to-market is a crucial factor. Pre-trained, existing LLMs offer the fastest deployment, followed by the customization of models, whereas in-house development of an own model may take longer to fully implement. Furthermore, off-the-shelf LLMs are accessible and easy to deploy, even for non-experts, allowing employees to integrate GAI into various business areas, such as marketing or customer-facing processes (Dwivedi et al. 2023). However, as businesses require more specialized solutions, customization becomes increasingly important. Customized models demand higher investment and capabilities, but potentially enable deeper process innovation and differentiation in the long run. Security and data concerns are paramount when adopting GAI technology. Third-party providers address these concerns by offering separate instances for different tenants to prevent data leakage. The full scope of business process disruption remains uncertain, but it is likely to affect every industry. Third-party providers facilitate the use of customized GAI solutions as opposed to using pre-trained models such as GPT-4 directly via API. One example is Epic's implementation of ChatGPT in the healthcare sector (Microsoft News Center 2023). Ultimately, the choice between adopting an existing GAI or building a company specific LLM will significantly impact the organization's data structure and setup. Consequently, this will impact the company's differentiation and value creation, and can be a success factor when it comes to constantly innovating the business model and staying relevant.

5.2 Industry case studies

In line with the BMI categories, we analyze potential GAI implications for the sectors software engineering, healthcare, and financial services. With new technologies as a key factor in the reconfiguration of business models (Clauss 2017), the integration of GAI in various use cases and capacities will undisputedly alter many industries, the question is to what extent. The following analysis focuses on the degree to which three selected industries will be changed, from incremental improvements and efficiency gains to completely new revenue and business models. In these examples, we discuss the potential impact of GAI on business models, following the logic of three underlying categories—*value creation innovation, new proposition innovation,* and *value capture innovation*—with respective sub-categories, as described in Sect. 2. Along these categories, we provide examples to demonstrate the varying degrees of change that can potentially be caused by GAI in the future—or those that are already visible today. Revisiting the previously discussed six propositions, the extent of the expected influence on the business model components exhibits a broad range. The presented industry examples serve as explanatory demonstrations of the application of the BMI categories and basis for transfer to further industries. Therefore, the industries have been selected in a way to cover a great variety of different sectors with varying use cases for GAI. The first one depicts software engineering,

a field at the forefront of GAI application due to its inherent nature. The second one examines the potential of GAI in healthcare, specifically its potential to assist in therapeutic processes with high societal relevance. The third one shows the potential implications in the financial services sector, concretely in investment management. It was selected due to the recent surge of new GAI-based products and services in an industry characterized by trust and high importance of human interactions, creating potentially an interesting contradiction for the adoption of GAI.

5.2.1 Case study #1 | software engineering

Through automated code generation, documentation, bug detection, and performance optimization, GAI is predicted to impact the software engineering landscape (Greymatter 2023a, b; Baker 2023). Already today, Stable AI's CEO, Mostaque, notes that 41% of new GitHub code is AI-generated (Goldman Sachs, 2023b). Google recently made headlines by stating that ChatGPT could hypothetically pass interviews to be hired as an entry-level software engineer, citing internal Google sources (Elias 2023). Through cloud-based platforms and online offerings, the sector could become more accessible to non-technical users. Entrepreneurs on the forefront of GAI development foresee that developers will become more like product managers, specifying, customizing, and editing rather than coding themselves. This could trigger a change in developers' work, from writing code to strategic decision making (Brady 2023), with some calling the rise of GAI in software engineering a paradigm shift as significant as the cloud or DevOps (Shank and Combs 2023).

5.2.1.1 Value creation innovation New capabilities exist already and are predicted to grow further, including automated code generation, error detection, and resolution. Examples include Wolverine.py, which automatically finds errors in Python scripts and fixes them (GitHub 2023a); the performance optimization of existing code and software (Daugherty et al. 2023); or automated documentation writing and translating code from one language to another, helping with legacy migration (Shank and Combs 2023). Moreover, the implementation of GAI makes programming easier and faster overall (Boza 2021). One study found that developers who used GitHub Copilot reported feeling 88% more productive (Kalliamcakou 2022).

New technologies and equipment become prevalent in a shift from traditional computing to large-scale deep learning models, for example NLP as well as other machine learning frameworks. New and adapted processes could be necessary as the friction to start to code disappears (Thompson 2023), challenging the traditional role of distribution in software development. Sprint plannings and product owners as the intermediates between developers and the business stakeholders in agile project setups, as they are typical in especially but not exclusively tech companies, might become less important. GAI is making it possible to write code simultaneously in different languages and for different operating systems (Seshia et al. 2022). Consequently, application development becomes faster and entails lower costs (resulting in cheaper content production, as discussed in proposition III).

5.2.1.2 New proposition innovation New offerings could be imaginable in the form of AI-powered software development platforms, integrating AI tools for code generation and testing. The reduced entry barrier allows people without a technical background to start coding. Consequently, new offerings could reduce the hurdle faced by new, non-technical developers when starting a project or certain tasks. These non-traditional, AI-enabled developers represent new customers and markets for the software industry. The relationship with customers is shifting as well: developers move forward with new tasks more quickly and are more reliant than ever on their tooling.

5.2.1.3 Value capture innovation GAI could transform the value cost structure of the software engineering industry by boosting operational efficiency, automating tasks, and reducing overheads—especially for junior developers (Hassan 2023; van Gool 2023)—and enabling more scalable solutions. This could result in reduced costs, optimized resource allocation, and quicker time-to-market, with shorter development cycles and less downtime for developers, thus freeing up time for additional projects. New revenue models could be imaginable, with marketplace solutions for plug-ins and extensions of LLM models, which increase functionalities and data, creating an ecosystem around the GAI APIs.

5.2.2 Case study #2 | healthcare (AI-powered therapies)

There are few sectors in which people are so prone to searching the internet for their problems before consulting an expert. Studies indicate that many individuals research medical symptoms online, or even self-diagnose based solely on online information (Hochberg et al. 2020). Among these search inquiries, mental health issues have been growing (WHO 2022). To counter this expanding need, digital mental health solutions, including AI chatbots, are on the rise (Hamdoun et al. 2023) and consequently the emotional comprehension capabilities of GAI are gaining attention (Uludag 2023). Assuming users' data privacy is safeguarded, encrypted GAI chatbots can serve as confidants, allowing individuals to share their emotions, or psychological symptoms, and feel heard (Eshghi 2023). By enabling healthcare providers to analyze vast amounts of medical data and make more accurate diagnoses, in addition to making more data-driven decisions, valuable time could be freed up for healthcare providers (Dilmegani 2023; Lin 2023). Through virtual and hybrid concepts, or completely outsourcing tasks to AI-powered bots, therapy could be made accessible to a wider group of patients in the future. However, some experts emphasize that mental health apps should only be used as a supplement to in-person therapy (Wakefield 2023).

5.2.2.1 Value creation innovation AI-driven diagnostics, personalized treatment plans, and virtual mental health support are potential new capabilities with which doctors could provide better-quality care to more patients. New technology and equipment could amplify their work, enabling them to treat more patients by utilizing, for example, NLP powered chatbots, which would act as virtual therapists to pre-diagnose or screen patients or provide 24/7 support (Metz 2023). Already,

some users are turning to ChatGPT as a personal therapist—despite privacy concerns regarding the anonymity of their data (Metz 2023). New partnerships are imaginable with AI developers, healthcare providers, or third-party technology companies, implementing AI mental health therapy in hardware, for example in wearables such as smartwatches. New processes could be more efficient and automated with the help of AI-driven tools by, for example, drastically reducing the time spent on patient documentation and back-office tasks such as the scheduling of shifts.

5.2.2.2 New proposition innovation New offerings and new channels could include AI-powered therapy apps, online mental health support platforms and communities, therapy with virtual reality, or self-help courses with customized topics tailored to the individual needs, all powered with NLP, sentiment analysis, and machine learning. New customers and markets could be reached because of the reduced costs, making healthcare cheaper and more accessible by automating, for example, pre-screening or AI-conducted pre-diagnosis (Greymatter 2023b). In addition, new customer relationships might be formed with more autonomous and informed patients, who can monitor their own condition better and provide valuable feedback and actual data (e.g., with smart wearables combined), thus enhancing the therapy's success.

5.2.2.3 Value capture innovation Increasing numbers of pay-per-session and subscription-based models have appeared in recent years (e.g., Stanford therapy chatbot or Woebot Health). AI-powered mental health solutions will most likely decrease costs drastically and thereby enable a broader patient group to access the services. A freemium model is imaginable in which some services and assistance, for example via chat, are free, whereas consultations with a human doctor are charged. Value cost structure can be impacted through efficiency gains, reduced overheads, more automation, and the outsourcing of repetitive tasks, meaning that human doctors can shift their focus towards value-adding tasks. In addition, the extended, potentially global reach allows for an unprecedented scalability of services. So, what should we expect? Mental health chatbots, increasingly popular and smart, will most likely provide a discreet, convenient avenue for addressing mental health concerns such as anxiety, depression, or stress in the future to a growing target group who require assistance.

5.2.3 Case study #3 | financial services (investment management)

GAI has the potential to impact investment management through data analysis, risk assessment, and decision-making (Ko and Lee 2023). By employing sophisticated algorithms to process vast amounts of financial data, GAI could identify patterns, predict market trends, and uncover investment prospects. This would ultimately enhance investment strategies, optimize returns, automate due diligence, and improve portfolio performance (Daugherty et al. 2023). In addition,

GAI could help with fraud detection as well as customer-facing tasks such as personalized financial advice in wealth management, for example (Schmidt and Albright 2023). It appears that change is already happening, with new tools such as the IPO prediction software developed by PitchBook (Wiggers 2023); the "ChatGPT of finance," Finchat; or the launch of Bloomberg's own 50-billion parameter large language model (Bloomberg 2023). Another example is GPTQuant, a conversational AI chatbot for developing and evaluating investment strategies (Yue and Au 2023). Initial harbingers can be seen in the surge of job postings related to AI in the financial sector: Stanford's AI Index Report (Maslej 2023) places the AI job postings in the finance industry as the third highest out of all industries. Nonetheless, in an industry where trust is crucial and that is traditionally not an early adopter (Hinkfuss 2023), it is especially necessary to ensure the safe, reliable, and compliant usage of GAI (Lau 2023).

5.2.3.1 Value creation innovation Enhanced new capabilities, such as AI-driven analytics, could enable firms to uncover patterns and predict market trends, leading to more informed investment decisions. Improved risk assessment through AI-generated insights could support decision-making, whereas AI-driven research could enable better due diligence and risk minimization, ultimately leading to improved work efficiency and reduced working time of analysts (Daugherty et al. 2023). New technologies and equipment integration is also a new reality with the strong interconnection of hardware and AI, as demonstrated by the news that Bloomberg has integrated AI into its famous terminal (Sheikh 2023). New partnerships with AI technology companies could provide direct access to cutting-edge tools, while collaborations with data providers ensure access to financial information. Engaging with regulatory institutions is thereby crucial to guaranteeing that AI-driven investment practices are compliant. Following this hypothesis, new processes would be required to facilitate the adoption of AI in due diligence, risk assessment, and portfolio building. These processes, resulting from new capabilities, can optimize the efficiency and effectiveness of investment strategies.

5.2.3.2 New proposition innovation New offerings could arise in the form of integrating AI into investment products, leveraging AI-generated insights, or using predictions to optimize returns. AI-powered trading algorithms could analyze and act upon real-time market data, enabling high-frequency and automated trading. Moreover, GAI can be used to detect fraudulent financial transactions by identifying patterns previously hidden to human inspection (Hinkfuss 2023). This can assist financial institutions in identifying and preventing fraudulent activity. Due to the automation of tasks, new customers and new markets could be addressed with the reshaping of cost structures. Personalized investment and wealth management could be offered to a wider audience—not only would high-net-worth individuals have access, but everyone could profit from AI-driven financial planning based on insights into their preferences, financial situation, and needs. As a result of this, the new channels to offer robo-advisory services could potentially be digital—for example, in the form of apps and online platforms. Lastly, all these

changes could elevate and alter the customer relationship through data-driven personalization, accompanying the client's preferences and individual risk tolerance profile. In addition, NLP chatbots, which are available 24/7, could improve their availability and therefore customer satisfaction.

5.2.3.3 Value capture innovation New, or rather slightly altered, revenue models could be envisioned in the form of performance-based fees, contingent on achieving specific benchmarks, thus incentivizing investment managers to leverage AI to maximize client returns. Freemium models could expand the customer base by providing basic AI-driven investment tools free of charge while charging for premium features and services.

Value cost structure: As elaborated in new proposition innovation and in line with proposition five, operational efficiency could be enhanced by implementing AI-driven tools for research, risk assessment, due diligence, and portfolio management tasks. This would decrease operational costs with reduced needs for (entry-level) analysts while simultaneously boosting investment outcomes with better decision-making. This potentially also applies to automation, driven by utilizing AI-powered algorithms for tasks such as trading and portfolio rebalancing, which subsequently minimizes human intervention and associated labor costs. Moreover, scalability could potentially be achieved by leveraging AI to efficiently expand the availability of investment management services, accommodating a larger customer base without a significant increase in costs. Customization and personalization, utilizing AI-generated insights, could enable tailored investment strategies and financial advice, resulting in enhanced customer satisfaction and retention in addition to optimized resource allocation.

6 Limitations

First, a limitation with any kind of (generative) AI-related research attempt is the speed of development of the phenomenon. As Coldewey, a writer for TechCrunch, explains: "Writing a report on the state of AI must feel a lot like building on shifting sands—by the time you hit publish, the whole industry has changed under your feet" (Coldewey 2023). However, the continuous advancements in AI technologies and the growing influence of GAI on various industries necessitate an understanding in light of the theoretical concepts of management research. Therefore, our study takes these recent and fast-moving developments and frames them in the theoretical context of BMI, contributing to an understanding of the GAI phenomenon that will stand the test of time. However, with new developments, this view should be extended in future research which empirically analyzes the upcoming business models in this field.

Second, some of the included articles, albeit peer-reviewed, consist of the same structure: A topic is discussed with ChatGPT in a chat format and the authors merely comment and set the output into context. Although this might appear less academic, this type of research provides valuable insights into the practical application of ChatGPT and its outputs. These articles offer real-world examples of how

GAI can be used to generate content, and the authors' commentary helps contextualize its strengths and limitations. Furthermore, the inclusion of these articles contributes to a more comprehensive understanding of the current state of AI research and demonstrates the diverse range of methodologies employed in the field. Future research can also focus on understanding the implications of GAI on research methodologies by considering academic research as an industry affected by technological developments.

Third, as with any type of qualitative scoping review, the methodology possesses certain constraints. Among these is the exclusion of publications in languages other than English and German. Another limitation is the researchers' subjectivity in defining relevant concepts, aggregated themes, and interpreting the outcomes. Nevertheless, to mitigate subjectivity, we included a four-eye coding approach, whereby two researchers, separately from one another, analyzed the data, and interim results were discussed by the entire team of authors.

Fourth, the limited scope of the three included industries as case studies poses a selective and not generalizable sample. They were selected to cover a great variety of different sectors with varying use cases for GAI and serve only as explanatory demonstrations of the application of the BMI categories.

7 Conclusion

This study aims to provide a business model innovation perspective on the increasing phenomenon of GAI. To summarize the findings from the extensive scoping review, GAI is foreseen as significantly impacting business models across industries in the areas of value creation innovation, new proposition innovation, and value capture innovation.

Regarding value creation innovation (as detailed especially in proposition I, V, and VI) GAI already facilitates new capabilities, technologies, partnerships, and processes. First, the rapid advancements GAI offers are reshaping information access, content creation, and business operations, allowing freed-up time through automation and the potential restructuring of processes and departments. Second, another potential for business model innovation exists at the intersection of factual knowledge and creative thinking—companies must identify this sweet spot and be aware that if they do not fill it, another player might discover how the new capabilities can be used advantageously. Third, the most visible GAI implementations as of now are efficiency improvements made to existing products and services—often by established corporations that wish to broaden the lock-in effect of their already renowned (software) products. It remains to be seen when the "real" innovation in the form of completely novel products and services will emerge, building something from the ground-up with novel possibilities to think and solve problems with the help of GAI.

Regarding new proposition innovation (as elaborated further especially in proposition II, III, and VI), GAI can lead to new offerings, markets, channels, and customer relationships, as seen in, for example, personalized marketing campaigns and enhanced customer service experiences. GAI is expected to have the most significant impact on white-collar knowledge workers, reshaping their roles while

simultaneously creating new opportunities. In addition, GAI redefines the skill set required to generate (almost) any type of content, with an increasing focus on critical thinking and evaluative skills—shifting the role of humans from creator to editor.

Regarding value capture innovation (as detailed further especially in propositions II, IV, and VI), GAI can drive new revenue models and cost structures, as demonstrated by reduced content production costs and novel monetization strategies—increasing the attractiveness of mass customization and freemium models with decreased marginal costs of content creation.

Ultimately, GAI will continue to evolve and permeate various industries, pushing the boundaries of what was previously thought possible. As businesses navigate this new landscape, they must adapt to the changing environment, harnessing the power of GAI to enhance their productivity, innovation, and competitiveness. The future success of businesses will also be determined by their ability to embrace GAI technologies and effectively integrate them into their existing frameworks while continually exploring new possibilities for growth and differentiation. The extent of GAI's influence will depend on each company's specific context and their willingness to embrace these technologies, with early adopters potentially gaining competitive advantage compared to slower market players. GAI and LLMs will undoubtedly optimize tasks, enhance human abilities, and enable enterprise reinvention—to which degree remains to be seen. However, it is clear that the rise of GAI presents a paradigm shift in the manner businesses operate and innovate. GAI has the ability to democratize access to knowledge, and capabilities to create content with zero marginal costs, thereby leveling the playing field for access to resources.

However, amid all the praise and promises of the new technology, the rapid growth of GAI presents significant challenges. Even the entrepreneurs at the forefront of AI say that caution is required. Altman (OpenAI CEO) stated that he is "(…) worried that these models could be used for large-scale disinformation, now that they're getting better at writing code, they could be used for offensive cyber-attacks" (Ordonez, Dunn and Noll 2023). Google CEO Pichai warns against rush to deploy AI without oversight and demands "(…) strong regulations to avert harmful effects" (Love 2023) and accentuated that the development of AI should include not just engineers, but social scientists, philosophers and so on, to ensure the alignment with human values and morality (Dean 2023). Some of the main concerns are the following: ethical biases inherently rooted in the data that the large datasets were trained on could reflect historical or societal biases in the GAI such as racial or gender prejudices (Motoki et al. 2023; Youvan 2023; Zhuo et al. 2023), manipulation and disinformation scams intellectual property theft (Yurkevich 2023) and, lastly, the—for now dystopian—idea of a post-humanism area with general AI dominance. All these aspects require consideration, despite the enormous upside potential for innovation. To prevent the propagation of biased AI systems, it is crucial to implement ethical frameworks for AI development—an approach agreed upon by researchers (Goldstein et al. 2023) and companies on the forefront of AI development alike (Google 2023; OpenAI 2018; Meta AI 2023). Transparency, fairness, and inclusivity must be upheld. Mitigating the associated risks will require new policies and laws and the establishment of collaborations between countries, given the technology's global reach. As of now, regulators often face the challenge of penalizing misuse of GAI

due to legal limitations (Dwivedi et al. 2023). To ensure the human-centric focus of AI developments with the necessary degree of oversight and accountability, various institutions (e.g., OECD's principles on artificial intelligence, OECD.AI 2023)) as well as governments (e.g., the ongoing aims to establish new regulations of the US government (Shepardson and Bartz 2023), or the temporary ChatGPT ban issued by the Italian government (Mukherjee et al. 2023)) are currently trying to ensure the uphold of societal values in light of AI's rapid expansion. As society and businesses alike navigate this complex mix of opportunities and challenges at the advent of this new technology, it becomes apparent that GAI stands to become a game-changer, ready to spark a new era of innovative prowess and entrepreneurial vigor.

This will also impact further research in the management domain. Given the novelty of the topic this study can only provide a first, mainly hypothetical view on how GAI will impact business models and trigger innovations along the value chain of businesses. Therefore, future research endeavors should include empirical approaches, analyzing measurable effects on businesses, with e.g., companies' performance and/or the degree of measurable business model innovation as the dependent variable of the studies. Additionally, longitudinal study designs are required to understand the evolution of GAI over time and its evolving impact on business models.

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