

The Use of Artificial Intelligence for Qualitative Data Analysis: ChatGPT

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This paper thoroughly investigates the profound and complex impact of tools such as ChatGPT in the analysis of qualitative data. Using a comparative analysis starting from the data obtained in a previous study, the paper highlights the relevance of employing generative artificial intelligence in research. ChatGPT 3.5 was utilized in the analysis process, and the data were extracted from a focus group involving 8 respondents. The conclusions emphasize a significant similarity in data analysis, supporting the idea that artificial intelligence can play a trustworthy role in interpreting qualitative information. The generative artificial intelligence's synthesis capability becomes fundamental, facilitating the efficient handling of complex texts for researchers and analysts. ChatGPT accelerates the analysis process, providing results in a much shorter timeframe compared to traditional methods, an essential characteristic in the current academic and research context.

Keywords: Generative Artificial Intelligence, Qualitative Research, ChatGPT

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1 Introduction

In the contemporary era of accelerated technological progress, the importance of artificial intelligence in the scientific field becomes increasingly evident, representing not only an innovative source of solutions but also an essential tool for exploring and understanding the complexity of scientific phenomena. In the context created to anticipate Industry 5.0, where collaborative intelligence is a distinctive element, the focus is particularly on

the capacity for mutual cognitive coordination between human and artificial intelligence. This perspective emphasizes the ability to collaborate in innovation, design, and the creation of personalized products and services [1]. The growing relevance of artificial intelligence for use in various fields is a promising premise for its development, as observed in the study conducted by AIPRM [2] (Figure 1).

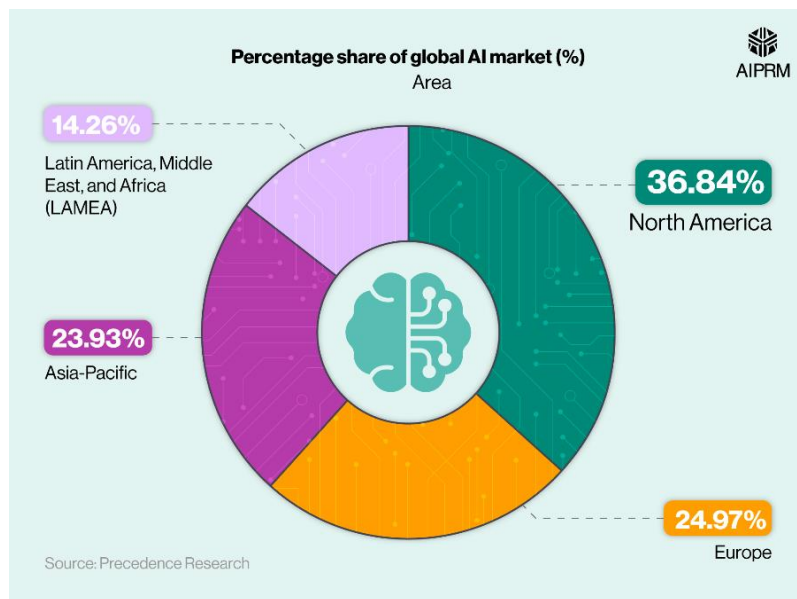


Fig. 1. Market Size of Artificial Intelligence in Different Regions [2]

As observed in the work of Liu et al. [3], the development of artificial intelligence has experienced significant growth in recent years,

with a substantial increase in the number of patents in this field, as seen in Figure 2.

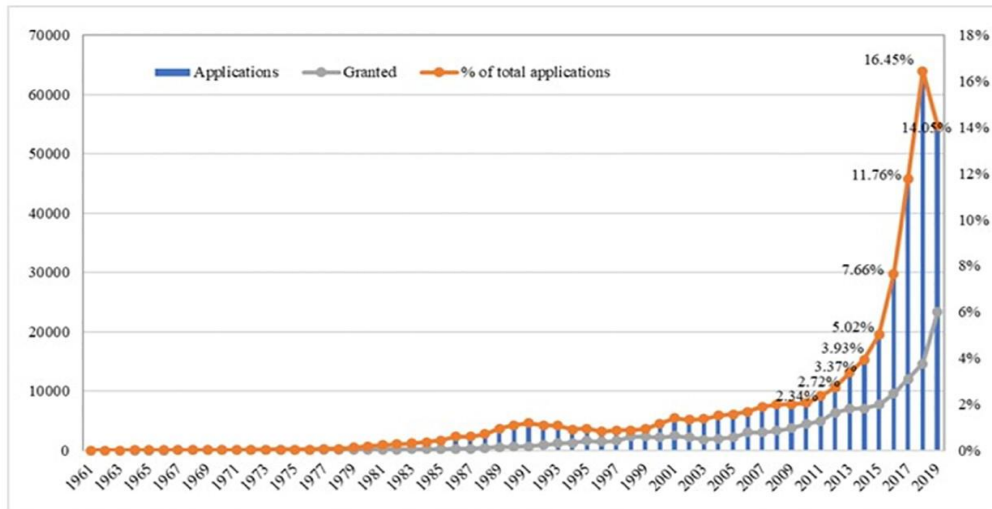


Fig. 2. Patent applications and grants in the field of artificial intelligence over the years [3]

As stated by Verma [4], artificial intelligence technologies have reached a stage where they provide real practical advantages in their various applications. Key areas of artificial intelligence encompass expert systems, computer-assisted intelligent instructions, natural language processing, speech understanding, robotics and sensory systems, computer vision and scene recognition, as well as neural computing. Artificial Intelligence (AI), a rapidly expanding field, has evolved in response to contemporary challenges, becoming one of the most influential and omnipresent technologies in various sectors of modern life [5], with applications in areas such as education, finance, medicine, transportation, and even research.

According to a report, Artificial Intelligence (AI) is an essential ally for researchers, offering support in multiple ways [6]. It aids in editing and translation for non-native English speakers, accelerates programming, synthesizes information, and saves time. Furthermore, it streamlines administrative tasks, contributes to the rapid drafting of scientific manuscripts, or enhances scientific search, stimulates creativity through brainstorming, and generates new research hypotheses. Through

these functions, AI becomes an essential partner in the process of exploring and advancing human knowledge. Starting from this idea, one may wonder to what extent an artificial intelligence tool can assist a researcher.

2 The Concept of Artificial Intelligence and Generative Intelligence

Various reports [7], [8] define artificial intelligence (AI) as a machine-based system capable of making predictions, offering recommendations, or making decisions based on goals defined by humans. It represents a set of technologies that aim to replicate or surpass the abilities of computational systems, including learning and adaptation, sensing and interacting, reasoning and planning, autonomous action, or even creation, facilitating the use and understanding of data. As stated by Liu et al., [3] AI involves the development of machines or agents that seek to replicate human rationality, using technologies such as machine learning, neural networks, and natural language processing to mimic or extend human capabilities through logical calculation or modeling human consciousness at a cognitive level.

Generative artificial intelligence, a branch of AI and deep learning, has made significant

progress, focusing on generating new content such as images, texts, music, and video using algorithms and models trained on existing data through machine learning techniques [9]. Generative Artificial Intelligence applications are integrated into organizations to solve spe-

cific problems and meet the needs of stakeholders, using technologies that enhance human capabilities, as mentioned by Feurriegel et al. [10]. Observing Figure 3, we can see the basic principles of generative AI, derived from those of artificial intelligence, machine learning, and deep learning.

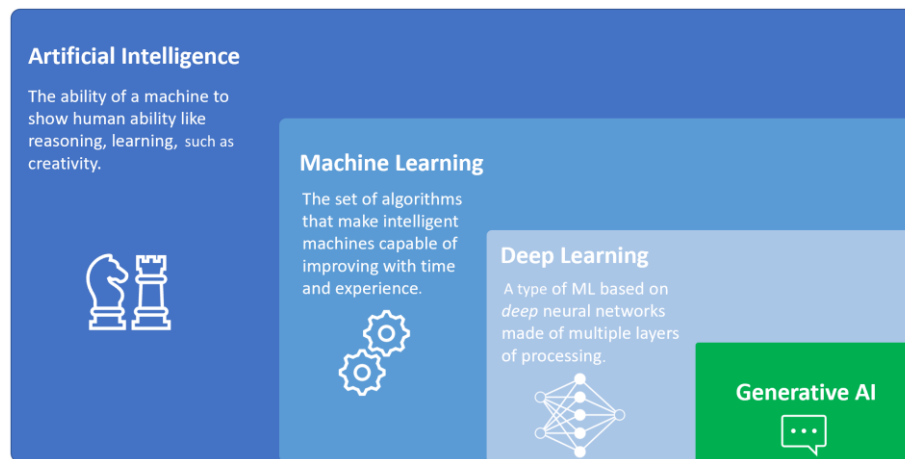


Fig 3. The Place of Generative AI in Artificial Intelligence [9]

Generative Artificial Intelligence is a term that describes machine learning solutions trained on large amounts of data to produce results based on user requests [11]. As mentioned by Brynjolfsson et al. [12], generative artificial intelligence tools do not require explicit instructions to perform tasks, providing professional and accommodating responses based on communication patterns encountered in the work environment, even in the absence of clear specifications for the appropriate tone or exact meaning of "adequate" behavior. What generative AI systems do very successfully is remixing and recombining music or text relevant to a specific request [13]. As artificial intelligence has evolved, various generative AI tools suitable for different functionalities have emerged. Whether we are talking about generative AI related to the development of text content or the development of video and audio content, these tools have been perfected by different companies. Some of the most relevant generative AI tools, such as ChatGPT, CoPilot, or Tabnine [14], use multiple types of technologies to tackle tasks. One of the most widely used tools, ChatGPT, developed by OpenAI, is an advanced lan-

guage model that produces human-like responses to text-based prompts, thanks to the "Generative Pre-trained Transformer" architecture and training on a vast range of text data. Hamilton et al., [15] argue that, with its ability to predict the next words and generate coherent responses, ChatGPT is useful in tasks such as language translation, summarizing texts, and answering questions, although it faces limitations in understanding the world and may generate biased responses. Building on the framework provided by a tool like ChatGPT, we can outline a perspective on how it could significantly contribute to facilitating and improving the research process.

4 The Intersection of Generative AI and Qualitative Research

Qualitative research, according to Aspers and Corte [16], is defined as an iterative process that enhances understanding for the scientific community by elaborating on new meaningful distinctions resulting from an approach to the studied phenomenon. This process undergoes modifications in relation to contemporary theoretical changes and researchers' creativity. Because technology has evolved significantly and is widely used in the research process,

qualitative research is not exempt from the impact of technological progress. Currently, technological progress and time management are increasingly essential, allowing the use of software in contexts beyond purely statistical ones, including qualitative research, where many researchers use various programs for data analysis [17]. Although approximately 20 years ago, it was considered attractive that computers could handle information in qualitative data analysis, but software could not replace the conceptual processes of the researcher [18], the situation has changed today. As mentioned by [19], integrating artificial intelligence into qualitative research redefines how researchers analyze data, providing increased efficiency and facilitating their collection and organization. However, the complexity of qualitative analysis still presents challenges that current machine learning technologies and deep learning language models are still learning to handle.

While a tool like ChatGPT presents many advantages and becomes highly relevant in the research world, a significant challenge is related to the generated information and research ethics. Researchers must adhere to ethical and professional standards during the conduct, reporting, and publication of their research, and in the case of using ChatGPT, the attribution of collected information depends on the context, and non-compliance with ethical and professional standards is unacceptable [20]. However, according to Costa [21], the use of Artificial Intelligence (AI) can bring significant improvements to qualitative research methods, focusing on text analysis through tools such as Natural Language Processing (NLP). These technologies facilitate the analysis of large amounts of unstructured data, such as interview transcripts or social media posts, extracting and identifying relevant themes, sentiments, and patterns. Referring to Korkmaz et al. [22], as ChatGPT becomes increasingly known, the use of AI-powered chatbots expands into various fields, and the efficient potential of ChatGPT in foreign language education, medical examinations, and scientific summarization indicates a significant increase in its practical use.

Considering the promising results of recent studies on ChatGPT and the diversity of fields in which it has been applied, I have decided to initiate research focusing on the relevance of its use in qualitative research, through comparison. This investigation will explore how ChatGPT can contribute to improving the analysis and interpretation of qualitative data, thus making a significant contribution to the field of qualitative research by integrating artificial intelligence into existing methodologies.

3 References, citations and authors descriptions

The main objective of this research is to assess the level of agreement between the researcher's unsystematic approach to data analysis and how ChatGPT performs this analysis. Through the research, we aimed to explore the similarities and differences in the analysis process between the human approach and the one assisted by artificial intelligence, with a focus on understanding the degree of coherence between manually obtained results and those generated by ChatGPT. This comparison intends to provide a detailed perspective on how technology can contribute to the qualitative data analysis process, highlighting possible advantages and limitations of each approach.

In evaluating ChatGPT's capabilities in conducting qualitative data analysis, I chose to use a dataset from previous personal research [23]. Using the free version of ChatGPT (3.5), I queried this data, transforming the obtained results into sets of themes that were used for the research in the form of questions for participants involved in a focus group. This approach allowed for an efficient adaptation of the information obtained from the previous research, facilitating a seamless and relevant integration into the new analysis based on ChatGPT. In other words, I decided to provide ChatGPT with the responses of the participants from the previous research to compare the analysis I conducted with that of ChatGPT. The responses were organized based on themes/discussion topics related to students' motivation for choosing a master's

program at the Faculty of Marketing of the Bucharest University of Economic Studies, as seen in Table 1.

Table 1. Topics Discussed in the Focus Group

Topic 1. How do you assess your experience so far at the Faculty of Marketing?
Topic 2. What improvements do you consider useful to implement at the Faculty of Marketing?
Topic 3. Have you considered whether or not to pursue a master's degree at the Faculty of Marketing or any other Faculty? What are the reasons for wanting to do this?
Topic 4. What are your expectations regarding master's programs, both at the Faculty of Marketing and at another Faculty?
Topic 5. What do you believe are the benefits of pursuing a master's program?

After obtaining responses from the respondents labeled generically as Respondent A, B, C, D, E, F, G, H (8 participants), I asked ChatGPT to provide an interpretation of those responses and then summarize them. This was done because, for each request, ChatGPT also performed a statistical analysis. The following section presents the resolution of the task in relation to my personal analysis for 5 of the discussion topics.

4 Results

Topic 1: Delving into Topic 1 and scrutinizing the visual representation in Figure 4, it becomes evident that ChatGPT's analysis is predominantly focused on the unfavorable feedback emanating from students enrolled at the Faculty of Marketing. In stark contrast, the second text, a representation of personal analysis, places a strong emphasis on the significance of past experiences in shaping purchasing decision-making. This text further immerses itself in exploring diverse perspectives associated with the overall student experience within the faculty. The discernible disparity

between these two textual approaches is noteworthy, as ChatGPT not only sheds light on the existing problem but also proactively proposes a strategic solution to address the discussed issue. This dichotomy in approach not only highlights the diversity of perspectives but also underscores the complementary nature of insights derived from artificial intelligence and human analysis. Together, they contribute to providing a more holistic and comprehensive understanding of the complex dynamics at play within the Faculty of Marketing. While ChatGPT leverages its analytical capabilities to identify and propose solutions, the personal analysis text adds a nuanced layer by delving into the intricate web of students' past experiences and their implications on decision-making. This dynamic interplay between artificial intelligence and human insight showcases the versatility and collaborative potential of these approaches, ultimately leading to a more informed and enriched comprehension of the multifaceted situation under consideration.

Requirement

- How can you interpret the following data arising from the question "How do you assess your experience so far at the Faculty of Marketing?"; Summarize!

ChatGPT analysis

- The data collected from the focus group indicates a predominantly negative perception of students' experiences at the Faculty of Marketing. Respondents express frustration with the discrepancies between theory and practice, the low level of professors, outdated teaching methods, and the inadequacy of the information provided. The flexibility of the program and the possibility of having a full-time job are appreciated, but concerns exist regarding preparation for employment. Respondents emphasize the need for knowledge updates and motivation in the learning process. Overall, the results suggest the need for improvements in the study program structure to ensure a closer connection between theory and practice, a more careful selection of professors, and a greater focus on providing relevant and up-to-date information in the field of marketing.

Personal analysis

- Previous experience is an extremely important motivating factor in the choice of a purchase, in the absence of experience and detailed information about the product to be purchased. Therefore, respondents believe that too much detailed information, the lack of knowledge about the motivation to acquire that information, the gap between theoretical and practical knowledge, as well as the fact that many employers consider the theoretical background insufficient for employment, together with the timeliness of information, are among the reasons that lead them to perceive an unpleasant experience at the faculty. However, a strength of the faculty is the relatively easy program, which allows them to obtain employment. Therefore, a significant factor in their decision, making it easier to increase the number of master's students, is knowledge of the university product from the perspective of previous experience, being a major influencing factor.

Fig. 4. Topic 1 - generative AI analysis vs. personal analysis

Topic 2. Within Topic 2, the two texts share a closely aligned structural framework, sequentially introducing the context, presenting findings, and concluding with improvement suggestions, as depicted in Figure 5. However, a notable divergence emerges in their thematic emphasis. The ChatGPT text meticulously delves into the perspective of focus group participants, highlighting their recommendations.

In contrast, Text 2, the personal narrative, shifts its focal point to the specific perceptions and needs of the students, offering a distinct, personalized approach. This contrast underscores the versatility of approaches in exploring diverse facets of the topic within a unified structural framework.

Requirement

- How can you interpret the following data arising from the question "What improvements do you consider useful to implement at the Faculty of Marketing?"; Summarize!

ChatGPT analysis

- Participants in the focus group on the topic "Motivation for choosing a master's program" highlighted several aspects regarding the necessary improvements at the Faculty of Marketing. Suggestions include closer alignment of the internship program with industry reality, balanced management of frequent program and seminar duration changes, revising the teaching methods, introducing practical seminars, and actively involving both students and professors. Other proposals include maintaining continuity in subjects, providing advanced technological support, and investing in modern facilities and technologies, such as eye-tracking. Overall, participants emphasized the importance of constantly adapting academic elements to the demands of the job market and the need for a more relevant and practice-connected learning experience.

Personal analysis

- Awareness of needs becomes a useful factor through which a communication bridge is created between the consumer and any organization. Faculty students believe that the utility of aligning the internship program with industry employers' expectations and the theory learned here, updating the school curriculum, as well as a more interactive and up-to-date teaching approach, or digitizing **textbooks** and using existing platforms, are elements that would help them build satisfaction. Other improvements mentioned by respondents include the possibility of studying final-year courses in previous years and their continuity for a better understanding of information, the current teaching method pushing them to learn theory just to pass exams. Additionally, there was a mention of the proposal to invest in renovating classrooms and research labs, with eye-tracking technology being deemed not promoted and irrelevant, even though it is current and innovative in the field. Therefore, students request a change in the mentioned aspects in their responses, aiming to provide added value in the field and develop their skills, indicating that the impact of the already formed image is quite powerful.

Fig. 5. Topic 2 - generative AI analysis vs. personal analysis

Topic 3. Broadly speaking, a common organizational framework is observable in the structural alignment of both texts, as elucidated by Figure 6. Nevertheless, a nuanced examination reveals distinctive thematic orientations: the ChatGPT text intricately underscores the intricate interplay of diverse factors shaping the decision-making process when contemplating a master's program. In contrast, the

second text delves deeply into the realm of students' inclinations, shedding light on the necessity for program customization to cater to individual preferences and needs. This dichotomy highlights the comprehensive exploration undertaken by each text, one navigating the intricate landscape of decision influencers, and the other delving into the tailored dimensions of academic preferences.

Requirement

- How can you interpret the following data derived from the question "Have you considered whether or not to pursue a master's degree at the Faculty of Marketing or any other faculty? What are the reasons for wanting this?"; Summarize!

ChatGPT analysis

- The majority of respondents express the intention to pursue a master's degree, either at the Faculty of Marketing or at other faculties, with the main reason being the desire for career advancement and deepening of knowledge. Some feel compelled to choose the Faculty of Marketing due to the admission schedule, while others are undecided or have financial reservations and prefer to explore other options. There are also respondents who reject the idea of pursuing a master's degree, either due to lack of conviction or the desire to explore a different field. Influencing factors in the decision include logistics, financial resources, or interest in specific domains, highlighting the variability of individual considerations in making decisions about postgraduate studies.

Personal analysis

- Understanding the desire to pursue a master's program and the reasons students do so is a way to grasp the key aspects that drive demand. Out of the 8 respondents, 6 have expressed their willingness to pursue a master's program, of which 2 would not choose the Faculty of Marketing, citing that there are no programs aligned with their professional aspirations. Three respondents have decided to choose a program at the Faculty of Marketing, stating that the desire for career advancement and deepening current studies are the main reasons for continuing there. The indecision of other respondents is based on the type of enrollment they would have (budget/tuition), lack of knowledge about the main advantages of a master's degree. Therefore, customization of programs according to their desires is necessary to attract them, and the alternatives already outlined in the minds of consumers once again demonstrate the applicability of the aforementioned computational model and the decision to choose an academic product.

Fig. 6. Topic 3 - generative AI analysis vs. personal analysis

Regarding Topic 4, a clear structural similarity can be observed, as illustrated in Figure 7, in the case of both texts. However, their essence differentiates in emphasizing distinct aspects of students' expectations and needs, thus underscoring the diversity of perspectives and the importance of customizing educational offerings. In an effort to explore these varied dimensions, the texts carefully address students' expectations and their needs within the context of higher education. The ChatGPT text focuses on an intricate approach that highlights the multiplicity of factors influencing students' expectations, while the second

text delves into the necessity for customizing educational offerings to reflect various preferences and individual requirements. This detailed perspective on the diversity in students' expectations and needs emphasizes the significance of continuously adapting educational programs to meet the requirements of an increasingly heterogeneous student body. Thus, Topic 4 not only brings forth a similar structure but also a profound exploration of the dynamic diversity in students' perceptions and requirements, highlighting the need for a personalized approach in delivering higher education.

Requirement

- How can you interpret the following data derived from the question "What are your expectations regarding master's programs, both at the Faculty of Marketing and at another Faculty?" Summarize!

ChatGPT analysis

- The expectations of participants in the focus group regarding master's programs at the Faculty of Marketing and in other faculties are diverse. These include the desire for high-quality and up-to-date theory (Respondent A), expressed reservation by a participant who is not familiar enough with the educational offerings (Respondent B), the need for a flexible program that allows for concurrent employment (Respondent D), the desire to acquire skills and employment opportunities (Respondent C), the perception of an additional degree as an asset (Respondent E), emphasis on the quality of professors (Respondent F), lack of expressed expectations (Respondent G), and the expectation that a master's program should provide employment opportunities, even if one of the respondents would not choose the Faculty of Marketing (Respondent H). The conclusion indicates diversity in the views and priorities of respondents, highlighting the need to customize the educational offer to address the varied needs and expectations of students.

Personal analysis

- Considering the main needs of students, the elements that can establish key points of interest for promoting and improving the quality of educational services, according to respondents, are as follows: theoretical reasoning, knowledge of a well-founded and updated information base for innovation in the field, the creation of skills and knowledge from individuals providing information in the field, as well as the existence of a mentor to guide activities or a job offered by the faculty. The psychological perspective from which this discussion can take place is important; involvement in the decision-making process extends from the beginning to a post-acquisition evaluation, so a cost-benefit analysis is introduced early in the acquisition stage.

Fig. 7. Topic 4 - generative AI analysis vs. personal analysis

In the context of Topic 5, akin to the preceding instances, both texts exhibit a congruent organizational structure, commencing with the elucidation of the context, followed by the exposition of findings, and culminating in conclusions and recommendations. However, a closer examination reveals that each text directs its focus toward distinct facets of perspectives and expectations related to the advantages conferred by a master's program, a distinction evident in Figure 8. The intricate alignment of these textual elements not only underscores a parallel framework but also emphasizes the nuanced exploration of diverse dimensions within the realm of master's program benefits. The first text, emanating from

ChatGPT, intricately delves into the multifaceted spectrum of perspectives surrounding the benefits, elucidating a comprehensive understanding of the myriad factors at play. On the other hand, the second text scrutinizes specific expectations and their correlation with the advantages offered by a master's program, contributing to a more granular examination of student viewpoints. This divergence in thematic emphasis within the shared structural framework illustrates the depth of analysis employed by each text, unveiling a comprehensive panorama of perspectives and expectations associated with the advantages of pursuing a master's program.

Requirement

- How can you interpret the following data derived from the question "What do you believe are the benefits of pursuing a master's program?" Summarize!

ChatGPT analysis

- Perspectives on the benefits of pursuing a master's program vary within the focus group, reflecting diverse priorities and visions of the respondents. Some see a master's degree as an opportunity for salary increase and acquiring additional knowledge, while others emphasize securing a good position, quick career advancement, and expanding social networks. There is appreciation for deepening studies in the chosen field, but also skepticism regarding its relevance in the face of personal skills. The social perspective on the status of a master's graduate is underscored, and criticisms are raised by those who challenge the concrete benefits of this level of education, presenting examples of success without academic studies. Thus, the interpretation of the data reveals the diversity of perceptions and attitudes towards the benefits brought by a master's program.

Personal analysis

- The consumer's purpose in transitioning to the acquisition of a product stems from an internal desire that can be translated through the anticipated benefits. As a result, salary advantages, wealth of information, a good job, rapid career advancement, knowledge about individuals in the field, perceived statutory benefits, seen as a constraint in today's society, a consequence of labor market development, are among the aspects considered beneficial by them. Among the respondents were those who believed that a master's degree does not necessarily strengthen skills, arguing with examples from everyday life that demonstrate education at this level does not necessarily have the chance to develop in life. Under the strong influence of society, there is a psychological pressure in choosing an academic product, so the decision undergoes fewer internal changes. It is noteworthy that an external factor acting on the consumer, social influence, tends to become an endogenous factor, with motivational implications, individuals being so concerned about being categorized by society in a certain way that they give greater importance to this aspect than to their own beliefs.

Fig. 8. Topic 5 - generative AI analysis vs. personal analysis

5 Conclusions

By delving into the subject in detail, the complexity and depth that tools like ChatGPT bring to the analysis of qualitative data are revealed. An essential aspect highlighted in this context is the significant similarity in the analysis of introduced data, thus supporting the idea that artificial intelligence can be a trustworthy partner in the information interpretation process. The synthesis capability of generative artificial intelligence becomes a cornerstone, providing researchers and analysts with the ability to address complex texts with increased efficiency. The speed at which ChatGPT can process and analyze information significantly contributes to accelerating research, yielding results much faster than traditional methods. This feature becomes crucial in an academic and research environment where efficiency and promptness are essential for scientific progress.

According to the obtained results, both versions of the texts are very similar in all discussed topics. Small differences lie in the text arrangement, but the information is presented in the same manner, with generative artificial intelligence managing not to jeopardize the

understanding of the data as they were extracted from respondents.

From personal experience, I have observed that the laborious process I followed in data analysis without the aid of such a tool was a disrupting factor, possibly even decisive in choosing to pursue qualitative studies. In the initial case (manual processing), I extracted data from respondents' recordings, then watched the video to transcribe respondents' words, and finally performed text analysis. Nowadays, generative artificial intelligence can even extract text directly from such a recording, which can be a valuable support in the coding and analysis process. In addition to these aspects, I noticed in the current study that generative artificial intelligence can identify general themes and subthemes, leading to a better understanding of the text and, consequently, the formation of new research directions. This ability to bring out connections and subtle meanings could represent a crucial factor in developing new research directions and formulating more complex and relevant questions.

Thus, by deeply exploring the subject, the significant contribution of tools like ChatGPT in

the analysis of qualitative data is undoubtedly emphasized, reaffirming the need for their integration into research processes to ensure efficient and consistent advancement in the scientific and academic field.

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