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The Role of Artificial Intelligence in Music Production

A Survey on Public Acceptance, Perception and Bias

Francisco Fialho Correia

Master Thesis

presented as partial requirement for obtaining the Master Degree in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

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The Role of Artificial Intelligence in Music Production

A Survey on Public Acceptance, Perception and Bias

by

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Master Thesis presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Information Systems Management

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July, 2024

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisbon, July 2024

DEDICATION

To my grandparents, António Correia, Luísa Correia, Leonel Fialho, and Conceição Fialho, thank you for your firm care and belief in my dreams throughout my life.

To my parents, Pedro Correia and Helena Correia, thank you for your constant support in achieving my goals and for always being there for me.

To my little brother, Afonso Correia, thank you for teaching me how to maintain a good mood even in the toughest moments.

To my girlfriend, Catarina Alves, who inspires me every day to do better.

To my closest friends, thank you for being there for both the serious and relaxed moments.

ACKNOWLEDGEMENTS

To professor Vitor Santos, for giving me the opportunity to work with him in an area that I am so passionate about. I am thankful for the technical support as well as the constant motivation to keep up and stay in the right path.

To NOVA University of Lisbon, Information Management School, for an education of excellence.

ABSTRACT

The integration of artificial intelligence (AI) in music production represents a significant shift in how music is created and consumed. This study investigates the acceptance of AI-produced music among Portuguese listeners, analysing the influence of music consumption habits, interaction with AI technologies, and genre preferences. Using a quantitative methodology, an online survey was conducted with 183 participants, collecting data on music consumption habits, interaction with AI, and acceptance of AI-produced music. The results show that listeners aged 35 to 54 are slightly more receptive to AI-produced music compared to younger listeners, contradicting some existing literature. Exposure to AI-produced music mainly occurs on social media and streaming platforms and the main perceived advantages of AI-produced music include cost and time efficiency, while the disadvantages include a lack of emotional depth and authenticity concerns. The future use of AI in music production is likely to benefit producers through its advanced tools, while remaining mindful that most listeners still value human authenticity and genuine emotion in musical creations.

KEYWORDS

Artificial Intelligence; Music Production; Music Industry; AI-Generated Music; AI Acceptance;

Sustainable Development Goals (SDG):



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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
BMST	Bidirectional Music Style Transformer
DAW	Digital Audio Workstation
EDM	Electronic Dance Music
EMP	Expressive Music Performance
GANs	Generative Adversarial Networks
IFPI	International Federation of the Phonographic Industry
LR	Literature Review
LSTM	Long Short-Term Memory
MIDI	Musical Instrument Digital Interface
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RQ	Research Question
SDG	Sustainable Development Goals
SLRQ	Systematic Literature Research Question

1. INTRODUCTION

The origins of music date back to the early days of human civilization, with archaeological evidence suggesting that music has been a part of human culture for at least 40000 years (Killin, 2018). Early instruments, such as flutes made from bird bones and mammoth ivory found in prehistoric sites, were initially used for ritualistic purposes, communication, and social cohesion (Killin, 2021). Over the years, music evolved to cover a wide variety of sounds and silences, including melody, harmony, rhythm, and timbre (Metzer, 2006). It became a universal language, transcending cultural and physical boundaries, connecting people across the globe, and playing a crucial role in celebrations and personal expression (Griswold, 2013).

The evolution of music is marked by significant developments in musical styles, instruments, and technology (Townsend, 2019). From the classical compositions of the Baroque, Classical, and Romantic eras to the advent of jazz, rock, and electronic music in the 20th century, music has continually transformed, each era introducing new innovations and styles, reflecting the cultural and technological changes of the times (Gagné & Nicole V, 2019).

Although music has existed since the beginning of time, with songs and melodies passed down through generations and shared among neighboring communities and villages, the formal production and recording of music only began in the 19th century (Burgess, 2014). Before this period, many musical traditions were preserved orally, while others faded away with time. The first successful attempt at recording sound came with Thomas Edison's invention of the phonograph in 1877 which marked the beginning of an era where music could be captured and replayed, despite initial limitations in clarity, volume, and bass response (Thompson, 1995). As the 20th century progressed, the advent of electrical recording brought about the development of mechanical systems such as microphones, amplifiers, and electrically powered recording devices (Kadis, 2012). These advancements significantly improved sound quality and expanded the range of sounds that could be recorded, capturing finer tones that previous technology could not (Ashbourn, 2021).

By this time, music editing flexibility was still limited because all song's components had to be recorded in the same track. The creation of magnetic tape in the 1940s revolutionized it by enabling multitrack, which allowed for the separate recording of different parts of a performance, which could then be mixed separately (Edmond, 2021). Once it was easier to splice, rearrange, and overlay audio segments, the overall audio quality became superior with this innovation (Kromhout, 2021).

The transition from analog to digital recording was marked by the introduction of the Compact Disc in the 1970s and 1980s, offering unprecedented sound clarity and editing possibilities (Fine, 2015). Alongside this came MIDI (Musical Instrument Digital Interface), a technology that enabled electronic instruments to communicate with each other and with computers (Dickens et al., 2018) allowing producers to record instruments directly into a track without a microphone (Strong, 2020).

By the end of the 20th century, the rise of computer software led to the emergence of Digital Audio Workstations (DAWs) making it possible to produce professional-quality music entirely on computers and with no need for an expensive studio (Maz, 2023). Coupled with the arrival of platforms like iTunes, and Spotify, this innovation, made music creation, distribution and consumption more accessible to a wider audience (Dolata, 2020). Currently, the industry is experiencing another major shift with the integration of Artificial Intelligence (AI), which is revolutionizing how music is created and composed which is now capable of composing, performing, and even analysing music, adding layers of creativity and efficiency to music production (Leight & Robinson, 2023).

AI technologies such as neural networks and machine learning have brought a number of applications, including the synthesis of individual musical sounds, musical painting, interpolation between musical material, and the synthesis of multi-instrumental soundscapes (Dadman et al., 2022). Concerns and misconceptions about AI in music are major barriers to the effective application of AI in this sector (Knotts & Collins, 2020) as the new shape it is giving to the industry is not yet fully understood (Lee, 2022). Developed technologies based on AI are able to affect the content produced and distributed based on algorithmic recommendations, which raises concerns about the potential homogenization (Olayeni, 2023). However, the complex procedures involved in music composition demand additional investigation to comprehend the effects of AI on both creators and listeners.

In order to better comprehend how the audience is perceiving music generated by AI, this thesis examines how AI has advanced in the field of music production. There aren't enough thorough studies examining how the public views AI's participation in music production, despite the AI field's rapid breakthroughs and rising integration. This is a significant weakness because the creation of music requires not only technology but also consumer approval and trust. To close this gap, this thesis presents deep research on how AI is transforming the music industry and the future for producers and empirical research based on survey data to learn how the public views AI's involvement in music production, across different genres, environments and musical components. It aims to provide answers to the following queries:

RQ1: What are the listeners' acceptance levels on the growth of AI-generated music, and potential influencing factors?

RQ2: Under what circumstances are listeners more comfortable with AI-produced music?

RQ3: Among the studied advantages and disadvantages of AI-generated music, which ones do listeners consider the most?

RQ4: How can musicians and companies take advantage from AI tools in music production and distribution?

To address these goals, the methodology includes a study on the impact of AI in music production and the AI tools available to music producers through existing literature, followed

by a survey to understand music listeners' acceptance of AI-produced music and their feelings about AI's growth in this field. The survey's answers will be analyzed and combined with the literature review to identify areas where producers can effectively leverage AI tools, while maintaining industry acceptance.

Understanding public perception of AI-generated music is important for several reasons. Firstly, it can guide developers and musicians in creating AI tools that are well-received and widely adopted, ensuring that technological advancements enhance rather than hinder creativity. Secondly, insights from this research can help the music industry make informed strategic decisions about investing in and implementing AI technologies. By aligning technological innovations with consumer preferences, the industry can better navigate the evolving landscape of music production and distribution. Ultimately, this thesis seeks to contribute to the academic discourse on AI in music and offer practical recommendations that support the sustainable integration of AI into the creative processes of the music industry.

2. LITERATURE REVIEW

The literature review of this thesis delves into the topics of music industry and artificial intelligence, and the intersection of these fields in the realm of AI-driven music production. It provides a comprehensive background on the historical and technological evolution of music production, exploring how advancements in AI are transforming this landscape. Additionally, the review includes a detailed examination of existing studies on AI in music production, utilizing the PRISMA methodology to systematically review and synthesize relevant research. This section highlights similar studies and their findings, offering a critical analysis of the current state of knowledge and identifying gaps that this thesis aims to address.

2.1. BACKGROUND

2.1.1. Music Industry

The music industry has undergone transformations over the years, evolving from traditional record production to encompassing a wide array of functions that extend beyond mere music creation (Arditi, 2020). Traditionally responsible for creating records, recording companies now supervise various aspects of an artist's career, including image management, public relations, social media, and merchandising (Harrison, 2021). This shift reflects the expansion of the modern music industry into a multifaceted entertainment sector, where the music itself holds similar value to the accompanying visuals, marketing strategies, and overall promotion. As Tony Powell, MCA Records' Managing Director, states, these companies no longer consider themselves merely record labels but rather comprehensive entertainment organizations (Negus, 1992).

The pop music industry, in particular, is closely connected with the broader entertainment industry. The ownership of the most valuable publishing libraries has shifted significantly, with many now under the control of corporate subsidiaries of major record labels, what highlights the power large labels have over the monetization of music rights and artist promotion (Towse, 2020). However, the heavy focus on entertainment and commercial success has led to a discernible "indie prejudice" in popular music studies. The industry has started to romanticize the role of independent labels in promoting artistic innovation against the commercial practices of major labels (Mall, 2018), the consumer attention has become increasingly fragmented and pop music's perceived lack of innovation and appeal, causing major labels to be more cautious about investing in unknown artists (Eggertsen, 2023).

In this environment, where music is packaged with visuals, social media presence, and other elements to capture audience attention, creativity often falls short. Over the past half-century, popular music, particularly in the Western context, has demonstrated a notable lack of structural evolution, presenting trends such as reduced pitch variation, increased uniformity in timbral characteristics, and a shift towards louder but less dynamic volume levels (Serrà et al., 2012). These changes reflect the industry's adaptation to consumer preferences and

technological advancements, often prioritizing marketability over artistic innovation and audio quality what changes the way music producers work, as well, as they are more focused on rapid product development (Tidd & Bessant, 2020).

Music production now begins with understanding the producer's multifaceted role, which involves building raw musical elements into a cohesive whole. This process requires creativity, technical expertise with Digital Audio Workstations (DAWs), and a sense of what sounds good to provide guidance to musicians in the studio, if any (Burgess, 2013). The producer's work starts with pre-production, involving discussions on style, writing, structure, but essentially the feelings that the song will transmit, once it is not still in a robust form. The recording process then takes place in a studio equipped to transform abstract ideas into sound waves. Recording methods vary, from capturing live band performances to layered track-by-track sessions, each offering different levels of control over the final sound (Zager, 2021).

As mentioned before, differently from previous years, all these processes of music production can now be executed using Digital Audio Workstations (DAWs), which incorporates synthesizers, sample libraries, and virtual instruments to create high-quality music. DAWs provide a workspace for the entire music production process, depending on the quality of the machine they are installed on (Deruty et al., 2022). Also, online platforms such as Looperman offer free sample banks, facilitating music production by allowing producers to download and manipulate samples to align with their ideas (Ramires et al., 2020) and social media has also become a crucial tool for collaboration among producers, enabling them to share skills and resources easily (Nwagwu & Akintoye, 2023). Following recording, the mixing process balances all tracks into a harmonious whole, ensuring the song meets industry sonic standards. The final step, mastering, fine-tunes the sonic qualities, ensures consistency across an album, and prepares the music for distribution (Burgess, 2013).

The composition and production aspects of music significantly influence a song's overall appeal and sound (Salakka et al., 2021). A song may combine lead and backup vocals with various instruments, including guitars, bass, keyboards, and drums, where lead vocals, in particular, act as focal points that strongly attract the listener's attention. Research shows that listeners can follow lead vocals in complex musical arrangements, highlighting their importance (Bürgel et al., 2021). Vocals also carry a significant part of the song's sentiment. Between 1951 and 2016, there has been a shift from predominantly positive emotions to more negative emotional content in lyrics, encompassing anger, disgust, fear, and sadness (Napier & Shamir, 2018).

Considering what science presents about the industry, the follow paragraphs explore how listeners, as the final consumers of the musical products, want to experience music these days and what genres they are searching for.

Live concert attendance has seen a resurgence, with studies showing a 20% increase in 2023 compared to 2022, driven by fans' craving for in-person experiences and the industry's

delivery of a wider variety of concerts (Live Nation Entertainment, 2024). Social media has also represented a change in music consumption. Specifically, TikTok has transformed music discovery and promotion, with its users being more likely to pay for a streaming service, in comparison to the average music listener (TikTok, 2023).

Traditional radio remains significant and continues to play a crucial role in music discovery. Studies reveal that radio airtime greatly impacts the sales of lesser-known artists, while bigger artists benefit more from social media engagement, which smaller artists do not have as much access to (Nikolov et al., 2023). Streaming platforms, however, have become dominant among younger generations, offering convenience and personalized experiences. According to the International Federation of the Phonographic Industry (IFPI) 2023, streaming revenues grew by 11.5% in 2022, accounting for 67% of total global recorded music revenues (International Federation of the Phonographic Industry, 2023).

Nightclubs and bars are essential venues for experiencing music, especially genres like Electronic, Dance, and Hip-Hop, which are integral to nightlife culture (Matos, 2024). The United States bar and nightclub market size remained relatively stable between 25\$ billion and 31.33\$ billion until 2019. However, the COVID-19 pandemic caused a sharp decline to 18.63\$ billion in 2020 due to widespread closures and reduced patronage. In 2021, the market began to recover, reaching 22.91\$ billion as restrictions eased. By 2022, the industry saw a substantial resurgence, with the market size soaring to 35.3\$ billion, surpassing pre-pandemic levels and reflecting a strong recovery and growth, which means the exposure to music in the nightlife is rising (Statista, 2023).

In 2020, a global study on music genre preferences from a streaming platform revealed that Pop, Rock, Classical, and Metal were among the most popular genres worldwide (Lex et al., 2020). Similarly, an analysis of Spotify Wrapped 2023 for Portugal indicated a significant shift towards local music consumption, with Portuguese Pop and Hip Hop experiencing substantial growth, and Pop, Hip Hop, and electronic music being the most popular genres among Portuguese listeners. Both studies are based on streaming platforms, so there's an inherent bias of not accounting for data from concerts, radio, or social media (Pro DJ, 2023). Given that the present study aims to understand the music preferences of the Portuguese population, it is essential to consider these local trends to provide a comprehensive analysis.

2.1.2. Artificial Intelligence

Artificial Intelligence refers to the simulation of human intelligence processes by machines, particularly computer systems, including learning, reasoning, and self-correction correction (Alkathairi, 2022). Over time, AI has evolved from basic algorithmic calculations to complex machine learning models capable of performing tasks that traditionally required human intelligence, such as visual perception, speech recognition, decision-making, and language translation (Garg, 2021).

AI has been integrated into various fields, including the fine arts, education, finance, legal services, and healthcare (Ooi et al., 2023). Understanding how individuals interact with AI technologies is essential for contextualizing its presence in various domains. Research indicates that AI has significantly influenced daily habits and comfort levels (Puntoni et al., 2021). For example, studies show that students using AI chatbots report positive experiences, such as enhanced learning efficiency and reduced stress levels, demonstrating a high level of comfort with these tools in educational settings (Sia et al., 2021).

Building on this, research also indicates that individuals who use AI technologies tend to be more open to adopting AI across various fields. For instance, American respondents proved that openness to AI technologies is influenced by their perceived benefits and the context in which AI is used. Those who have experience with AI applications are generally more receptive to its broader adoption, particularly when they see tangible benefits (Rainie et al., 2022).

Despite the growing integration of AI into everyday life, there are notable concerns and reservations (Dwivedi et al., 2021). Privacy concerns are prominent, as individuals worry about how their data is collected, stored, and used by AI systems. A study revealed that, in 2019, 63% of internet users believed that most companies are not transparent about how their data is used, and 48% stopped shopping with a company due to privacy concerns (Pandey, 2020). Science highlights that AI technologies significantly enhance the ability to analyze personal information, raising privacy worries due to the increased volume, variety, and velocity of data being processed (F. Kerry, 2020). This includes potential misuse of data for purposes such as targeted advertising and surveillance, which can intrude on personal privacy (Javadi et al., 2020).

In terms of professional life, with the presence of AI technologies now capable of performing or assisting with both high and low-skilled routine and non-routine tasks (previously handled entirely by workers), workers are concerned about job loss and increased vulnerability to AI-driven displacement. Specifically, AI is being modeled to replace low-skilled labor or routine tasks, while complementing high-skilled labor and non-routine tasks (Naudé, 2021). In order to mitigate, yet leverage from AI's impact on the professional world, there is a need for coordinated efforts like upskilling programs and support mechanisms for affected workers (Rafner et al., 2021).

In addition to these valid concerns, misinformation about AI can lead to increased public skepticism and fear (Pelau et al., 2021). A Pew Research Center article notes that the rapid spread of misinformation facilitated by AI technologies can create a perception that AI is more dangerous than it is, further hindering its acceptance and use (Anderson & Rainie, 2017).

Consequently, good practices should focus on developing comprehensive retraining programs, implementing supportive policies for workforce transition, and promoting continuous learning to ensure that people can adapt to the evolving technological landscape. The following paragraphs study how the art field is managing this evolving situation.

AI challenges traditional conceptions of creativity and authorship, producing creations that rival human-made works. While AI works based on preexisting data and learned patterns, human creativity frequently originates from real-world experiences, emotions, and ideas (Kirkpatrick, 2023). AI-driven platforms allow users to create complex artworks through simple interfaces, making art creation more accessible. However, questions arise about the nature of creativity: is an artwork less authentic if conceived by a machine? This debate touches on deep philosophical questions about consciousness, intentionality, and the essence of art (Oksanen et al., 2023). Ethically, AI challenges traditional notions of creativity and raises questions about authorship and copyright, particularly in AI-generated art and music (Škiljić, 2021) as the authenticity of AI-created works and the ownership of these creations represent significant concerns (Aziz, 2023).

Although AI is becoming more integrated into our reality, AI-generated works may display limitations, such as errors stemming from poorly trained data. Therefore, AI should be seen as a distinct kind of creativity and as a tool to aid the creative process. Rather than completely replacing human originality, AI can inspire it and open new avenues for artistic expression, innovation, and the enhancement of human capabilities (Ali Elfa & Dawood, 2023).

2.1.3. AI Technology for Music Production

Artificial intelligence has significantly transformed various industries, including the music industry (Miranda, 2021). The concept of AI-produced music dates to early experiments in the 1950s and 1960s, with composers like Hiller and Iannis Xenakis using algorithms to create music (IV, 1999). Over the decades, advancements in machine learning and AI have led to more sophisticated music generation systems capable of creating complex compositions that mimic human creativity (Carnovalini & Rodà, 2020). Early milestones include systems like EMI (Experiments in Musical Intelligence) developed by David Cope, which could compose music in the style of classical composers (Verma, 2021).

Today, AI is employed in various aspects of music production, from composition editing and mixing to mastering and distribution, using deep learning techniques to analyse vast datasets of existing music, learning patterns and structures. AI tools like OpenAI's Jukebox and Google's Magenta can generate music in a wide range of genres, styles and for different purposes, from original songs (Cousins, 2021), to entertainment, such as, deceased artists covering new music (Jones, 2023).

Furthermore, AI is revolutionizing the music production process by aiding the musician. Tools like LANDR for AI mastering (Sterne & Razlogova, 2019) and BandLab's SongStarter (BandLab, 2024) for generating song ideas make it easier for producers to create high-quality music quickly and efficiently. These tools analyse audio data and adjust enhance sound quality, offering suggestions for improvements and automating time-consuming tasks like mixing and mastering. This democratizes music creation, providing affordable and accessible options for musicians and producers who may not have the resources to access traditional music

production services, consequently, reducing barriers to become a producer or step up the quality of productions (Birtchnell & Elliott, 2018).

Ultimately, for the final consumer, AI personalizes the music listening experience. Streaming services like Spotify and Apple Music use AI algorithms to analyse users' listening habits and suggest songs that match their preferences, creating custom playlists and radio stations that cater to individual tastes (Freeman et al., 2022). This not only enhances user experience but also influences the type of music that gains popularity, feeding back into the music production process.

2.2. SYSTEMATIC LITERATURE REVIEW ON AI IN MUSIC PRODUCTION

To thoroughly investigate the contribution of various studies on the use of AI in the music industry, PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) technique was employed. This methodology began with the formulation of the main research questions and the identification of relevant keywords which were designed to bring valuable insights for future studies, considering the current scenario, challenges, and opportunities within the field.

To ensure a comprehensive search, specific keywords related to AI and music production were defined. These keywords were strategically selected to cover a broad spectrum of topics within the domain, ensuring that the search captured a wide array of relevant studies. The search string was meticulously designed to filter through recent advancements, focusing on articles published between 2019 and 2023 to reflect the most contemporary integrations of AI in music production.

The search was conducted across three major academic databases: Scopus, Web of Science, and Science Direct. These databases were selected for their extensive coverage and high-quality resources. After retrieving documents from these sources, were applied inclusion and exclusion criteria to filter out irrelevant articles. Inclusion criteria focused on peer-reviewed papers that demonstrated evidence of AI utilization in music production, published in English between 2019 and 2023. Exclusion criteria eliminated papers that did not focus on AI techniques, were not in English, were duplicates, or fell outside the academic and scientific scope.

Following the application of these criteria, the initial pool of 240 documents was narrowed down to 17 relevant articles. These selected studies were then read, analyzed, and used to answer the formulated system literature research questions (SLRQ), providing a comprehensive overview of the current status, challenges, opportunities, and effective AI techniques in music production.

2.2.1. Research Questions

To ensure that the research comprehensively covers the necessary aspects of AI in music production, three primary research questions were formulated. These questions aim to investigate the current state of research, the challenges and opportunities AI presents to artists and producers, and the effectiveness of various AI techniques in music production.

Table 1 - Systematic Literature Research Questions

<i>SLRQ1</i>	What is the current status of research in the field of AI in Music production?
<i>SLRQ2</i>	What are the major challenges and opportunities of AI in Music production for artists and producers?
<i>SLRQ3</i>	What types of AI techniques are currently effective in Music production?

2.2.2. Keywords

To perform an exhaustive and targeted literature search, specific keywords related to AI and music production were identified. These keywords were chosen to include a wide range of topics within the field, ensuring the capture of a broad spectrum of relevant studies and used to design a search string that effectively filters through the vast amount of available literature to identify the most pertinent studies. Table 2 presents the keywords used for the search.

Table 2 - SLR Keywords

<i>Music production</i>	<i>Artificial intelligence</i>
Music	AI
Music production, music, production	Artificial Intelligence
Music composition, Composition	Deep Learning
Music creation	Machine learning
Digital music production, Digital	Artificial Neural Networks

2.2.3. Search String Definition

In the research targeting AI in pop music production, the focus was on the most recent advancements, referring only to articles from 2019 to 2023. This timeframe was defined to capture up-to-date integration of AI in this field. The search string, designed to filter relevant academic papers, targeted specific terms. It is: ("**Artificial Intelligence**" OR "**AI**" OR "**Machine Learning**") AND ("**Music Production**" OR "**Music Composition**" OR "**Music Creation**" OR

"Digital Music Production") AND ("Impact" OR "Influence" OR "Role" OR "Contribution" OR "Integration"). This methodological choice aimed to ensure a relevant gathering of documents, focusing on the contemporary role of AI in music production.

2.2.4. Resources Database

To gather a comprehensive collection of scientific articles on the topic of AI in music production, I utilized three major academic databases. These databases were chosen due to their extensive coverage and high-quality resources. The selected databases are Scopus, Web of Science, and Science Direct, each providing a robust platform for accessing peer-reviewed academic papers and research studies relevant to the field of AI in music production. This strategic selection of databases ensured a thorough and credible literature review, capturing the most recent and significant advancements in the integration of AI within the music industry.

Table 3 - SLR Resource Database

<i>Resource database</i>	<i>Resource url</i>
Scopus	https://www.scopus.com/home.uri
Web of science	https://www.webofknowledge.com/
Science direct	https://www.sciencedirect.com/

2.2.5. Inclusion and Exclusion Criteria

The analysis is only performed to the selection of the most relevant and high-quality academic papers for this study, so inclusion and exclusion criteria were applied to filter out irrelevant documents and focus on those that would provide valuable insights into the use of AI in music production.

Table 4 - SLR Inclusion/Exclusion Criteria

<i>Inclusion criteria</i>	<i>Exclusion criteria</i>
Any scientific article showing evidence of ai utilization in music production	1- Papers focusing on Music Production but without a focus on AI techniques
The paper must be a peer-reviewed conference or journal paper written in english	2- Articles not in English and duplicate papers
Paper is published between 2019 and 2023	3- Articles published before 2019
	4- Non-academic or non-scientific papers (e.g., Website, Magazine, Report, Newspaper, Consulting Article, Book, Book Chapter, Citation)
	5- Papers with titles outside the scope of this research

2.2.6. Execution

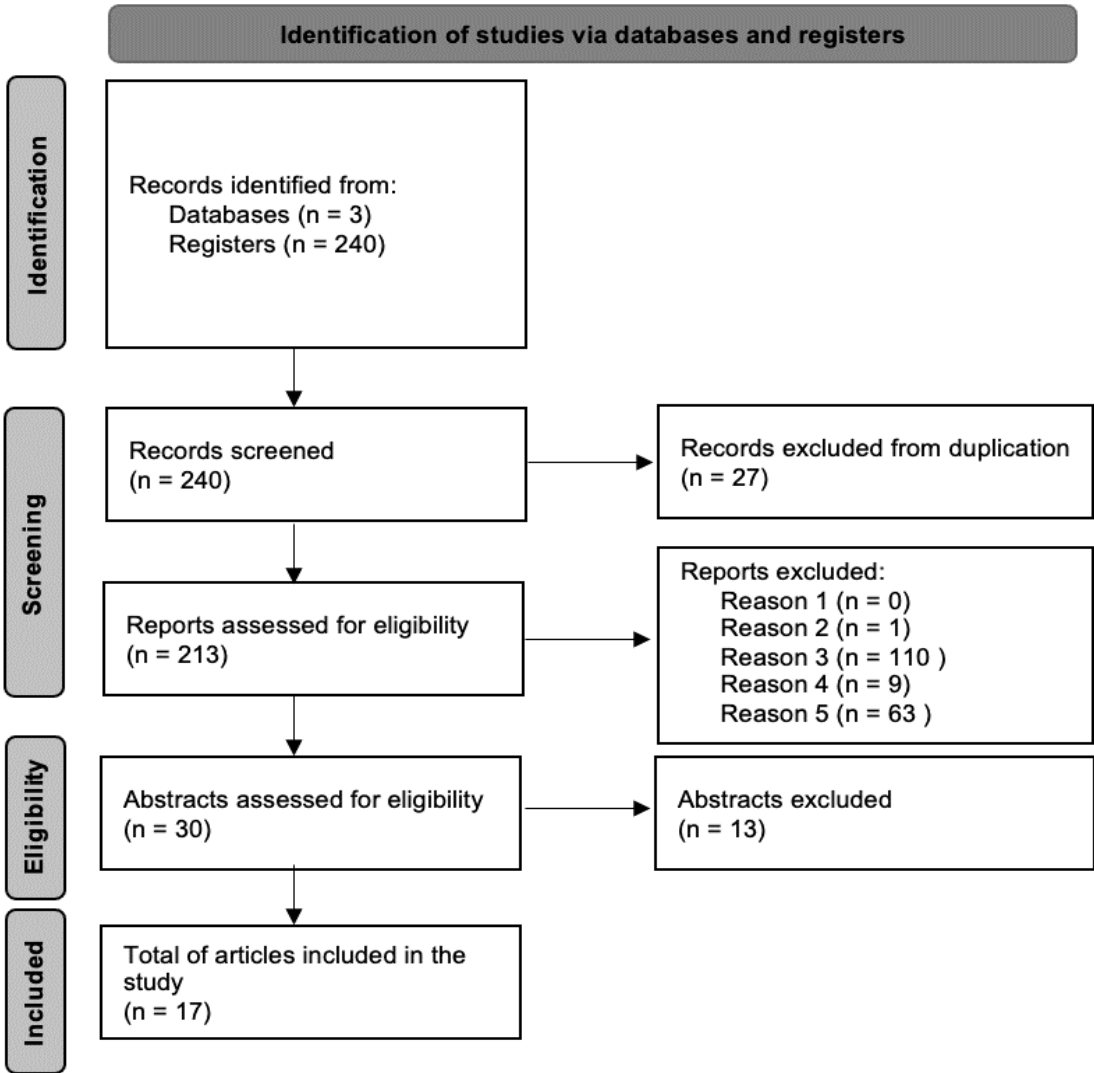


Figure 1 - PRISMA diagram

In this section, after retrieving all documents from the three selected sources, was applied the exclusion criteria to filter out the articles that did not fit the study. Starting with 240 documents and ending with 17 to read, analyze, and produce answers to the research questions from the information gathered.

1. Identification: This initial stage involved identifying 240 records from three different databases and registers. These records included all potentially relevant studies on AI in music production.

2. Screening: From the initial 240 records, 27 duplicates were removed, resulting in 213 unique records. These records were screened by reviewing their titles and abstracts to determine their relevance to the study.

3. Eligibility: Of the 213 records screened, 183 were excluded for specific reasons:

- **Reason 1:** 0 documents were removed.
- **Reason 2:** 1 document was removed for not being peer-reviewed or not in English.
- **Reason 3:** 110 documents were removed because they were published before 2019.
- **Reason 4:** 9 documents were removed as they were not related to AI in music production.
- **Reason 5:** 63 documents were removed as they were outside the academic and scientific scope.

After this detailed assessment, 30 abstracts remained and were further evaluated for their eligibility.

4. Inclusion: From the 30 abstracts assessed for eligibility, 13 were excluded for not meeting the theme accurately. This resulted in a final total of 17 studies that were included in the systematic review. These studies were then thoroughly analyzed to answer the research questions, providing a comprehensive overview of AI's role in music production.

Below, in table 5, is presented a summary of the contributions from the 17 documents included in the systematic approach.

Table 5 - PRISMA articles for analysis

#	Authors	Article	Contribution	Publication type
1	(Wu, 2023)	An Analysis of the Origin, Integration, and Development of Contemporary Music Composition and Artificial Intelligence and Human-Computer Interaction	Studies the advancements in AI applications in music, such as automatic music generation, intelligent analysis, and personalized music production. Highlights the potential of AI to enhance music creation through collaborative innovation, suggesting a significant impact on future cognitive and creative processes in music.	Journal Article
2	(Alaeddine & Tannoury, 2021)	Artificial Intelligence in Music Composition	Studies the implementation of AI models for music composition, including batch and online training, and the use of various technologies like MIDI and neural networks.	Journal Article
3	(Tubadji et al., 2021)	Cultural Proximity Bias in AI-acceptability: The Importance of Being Human	Explores how cultural proximity bias influences consumer preferences and the valuation of AI-produced goods. By analysing reactions to music composed by both humans and AI, it provides insights into the importance of 'humanness' in creative products.	Journal Article
4	(Hong et al., 2022)	Human, I Wrote a Song for You: An Experiment Testing the Influence of Machines' Attributes on the AI-Composed Music Evaluation	Investigates public perceptions of creative AI in music, specifically how human-like traits and the level of creativity autonomy in AI	Journal Article

			impact its acceptance and the evaluation of its music compositions.	
5	(Mukherjee & mulimani, 2022)	Composeinstyle: music composition with and without style transfer	Contributes to the field of music by addressing the challenges of capturing and replicating individual compositional styles through innovative technology.	Journal article
6	(Epstein et al., 2020)	Who Gets Credit for AI-Generated Art?	Contributes to the discourse on the ethics and governance of AI, specifically in creative domains, by empirically investigating how the framing of AI affects the perception of its role in artistic creation.	Journal Article
7	(Knees et al., 2019)	Intelligent Music Interfaces for Listening and Creation	Focuses on intelligent user interfaces to improve access to music and sound, supporting creativity in music creation with tools like new sensor-based musical instruments and software, and enhancing music consumption with recommender systems and active listening applications.	Conference Paper
8	(Lu et al., 2021)	Actions Speak Louder than Listening: Evaluating Music Style Transfer based on Editing Experience	The study compares a newly proposed Bidirectional Music Style Transformer (BMST) against a baseline model, demonstrating the BMST's superior performance through editing tests. This evaluation framework contributes to the field by providing deeper insights into user interaction	Conference Paper

			with music generation AI, which are not obtainable from standard listening tests alone.	
9	(Suh & Youngblom, 2021)	AI as Social Glue" explores the role of AI in collaborative music composition	Studies the fact that AI can serve as a common ground, provide a psychological safety net, and act as a catalyst for progress. It also suggests that AI can mediate interpersonal friction and alter the creative roles of participants.	Conference Paper
10	(Li, 2022)	Automatic Piano Harmony Arrangement System Based on Deep Learning	The study demonstrates a deep learning system capable of recognizing a melody and adding a harmonic to it, automatically.	Journal Article
11	(Chang & Chen, 2020)	AntsOMG: A Framework Aiming to Automate Creativity and Intelligent Behavior with a Showcase on Cantus Firmus Composition and Style Development	Proposes a framework inspired by ant colony behavior to model creative processes in music composition. Shows that this approach, applied to the creation of cantus firmus, results in distinct autonomous music styles from the same initial conditions.	Journal Article
12	(Dai et al., 2021)	Generating Music with Generative Adversarial Networks and Long ShortTerm Memory	Present a model able to generate music and explores its adaptability. The research is contributory in showing how advanced AI techniques can be applied to music creation, offering new possibilities for AI-assisted music production.	Conference Paper

13	(Wen & Ting, 2023)	Recent Advances of Computational Intelligence Techniques for Composing Music	Discusses the use of computational intelligence (CI) techniques in music composition. It reviews recent studies on the topic, highlighting the growing interest in deep learning for music composition and the increased engagement of synergizing domain knowledge, music data, and human interaction.	Journal Article
14	(Piskopani et al., 2023)	Responsible AI and the Arts: The Ethical and Legal Implications of AI in the Arts and Creative Industries	Highlights debates on AI's influence on creativity, authorship, and the devaluation of artistic processes. States the need for responsible innovation and discusses the need for legal reforms, ethical AI design, and regulation to protect artists' rights and address biases.	Conference Paper
15	(Lupker, 2021)	Score-Transformer: A Deep Learning Aid for Music Composition	Focuses on the development of an AI tool designed to assist music composers – Score Transformer (ST).	Conference Paper
16	(Bontempi et al., 2023)	Research in Computational Expressive Music Performance and Popular Music Production	Explains the integration of computational expressive music performance (EMP) within popular music production and explores the use of digital audio workstations (DAWs) and virtual instruments,	Journal Article

			emphasizing the potential and limitations of current EMP research in the context of popular music.	
17	(Fenwick & Jurcys, 2023)	Originality and the future of copyright in age of generative	Discusses the ethical and legal implications of AI in the arts and creative industries.	Journal Article

2.2.7. Result Analysis

The following section presents the answers to the research questions using the documents retrieved in the PRISMA execution, providing detailed insights into the use of AI in music production.

SLRQ1: What is the current status of research in the field of AI in Music production?

The current status of investigation in the field of AI approaches to music production has made great progress and found many uses. From composition to performance and analysis, AI technologies are now an integral part of many facets of music production, highlighting its potential for improving creative processes and promoting innovation through collaboration. Studies have shown AI to be capable of generating music automatically, carrying out intelligent analysis and personalizing the music production process (1). Further documentation on this integration, includes how AI modules work for musical composition combining technologies such as MIDI and neural networks (2), the use of deep learning structures to automate creative tasks (15,10) in music production and other innovative technologies (5,16). The development of intelligent user interfaces has been the main focus so far aiming to improve access to music and sound, support creativity in music creation, and enhance music consumption through tools like recommender systems and active listening application (7).

SLRQ2: What are the major challenges and opportunities of AI in Music production for artists and producers?

The major challenges and opportunities of AI in music production revolve around enhancing creative collaboration, addressing ethical concerns, and improving technical capabilities. One significant opportunity is AI's ability to act as a common ground and catalyst for progress, providing a psychological safety net and mediating interpersonal contact in collaborative music composition (9). Other is AI's potential to enhance music creation through collaborative innovation suggests a significant impact on future cognitive and creative processes in music (1). However, challenges persist, particularly in the cultural implications of AI in music. Research has explored how cultural proximity bias influences consumer preferences and the valuation of AI-produced goods (3). Public perceptions of creative AI in music indicate that

human-like traits and the level of creative autonomy in AI significantly impact its acceptance (4). Ethical implications and governance of AI in creative domains present another major challenge. The discourse on who gets credit for AI-generated art raises concerns about authorship and the devaluation of artistic processes (6). Responsible innovation, legal reforms, ethical AI design, and regulation to protect artists' rights and address biases are essential considerations (14).

SLRQ3: What types of AI techniques are currently effective in Music production?

Various AI techniques have proven effective in music production, ranging from deep learning to generative adversarial networks (GANs). Deep learning systems have been successfully demonstrated to recognize melodies and add harmonic elements, showcasing AI's potential in automating intricate musical tasks (10). The use of GANs and Long Short-Term Memory (LSTM) networks in generating music has also been explored, highlighting the adaptability and advanced capabilities of these techniques in music creation (12). Innovative frameworks inspired by ant colony behavior have been proposed to model creative processes in music composition, resulting in distinct autonomous music styles from the same initial conditions (11). The Bidirectional Music Style Transformers (BMST) have shown superior performance in music style transfer, emphasizing the importance of advanced AI models in enhancing user interaction with music generation AI (8). Computational intelligence techniques continue to gain interest, particularly deep learning for music composition, which leverages domain knowledge, music data, and human interaction (13) as well as AI tools designed to assist music composers, like the Score Transformer (ST), that further exemplifies the effective applications of AI in facilitating creative processes (15).

The research on AI in music production reveals a dynamic and evolving field with substantial advancements, notable challenges, and promising opportunities. AI techniques, including deep learning, GANs, and innovative frameworks, are effectively enhancing music production, providing new tools and methods for artists and producers while also raising important ethical and governance questions. These insights emphasize the potential of AI to transform the music industry while highlighting the need for careful consideration of its implications on creativity, authorship, and cultural values.

3. METHODOLOGY

In order to determine a relationship between variables and obtain an analysis that is clearly taken through statistics and figures, this study used the quantitative research method, which focuses on data collection through various methods.

In the initial exploratory phase, shown in Figure 2, a thorough literature review is conducted to gather information on the topic under study, detect gaps in the current knowledge base and identify potential areas of investigation. In the next phase, the conceptual phase, a systematic literature review is conducted following the PRISMA protocol (Sánchez-Serrano et al., 2022) and quantitative research in the form of a survey is prepared, focusing on primary data collection to identify relationships between variables, and analyze information. Scientific documents of similar scope were examined to answer literature review research questions and design accurate questions to include in the survey. The survey planned in the previous phase is carried out in the implementation phase and the results are collected. In the final phase, the main conclusions are discussed from the literature review and the survey’s information. Lastly, it is presented the main limitations of the study as well as suggestions for further research.

To ensure a thorough and comprehensive analysis of the impact of AI on music production, the study follows strictly the structured phases presented to systematically research, design, conduct, and finalize the entire research process.

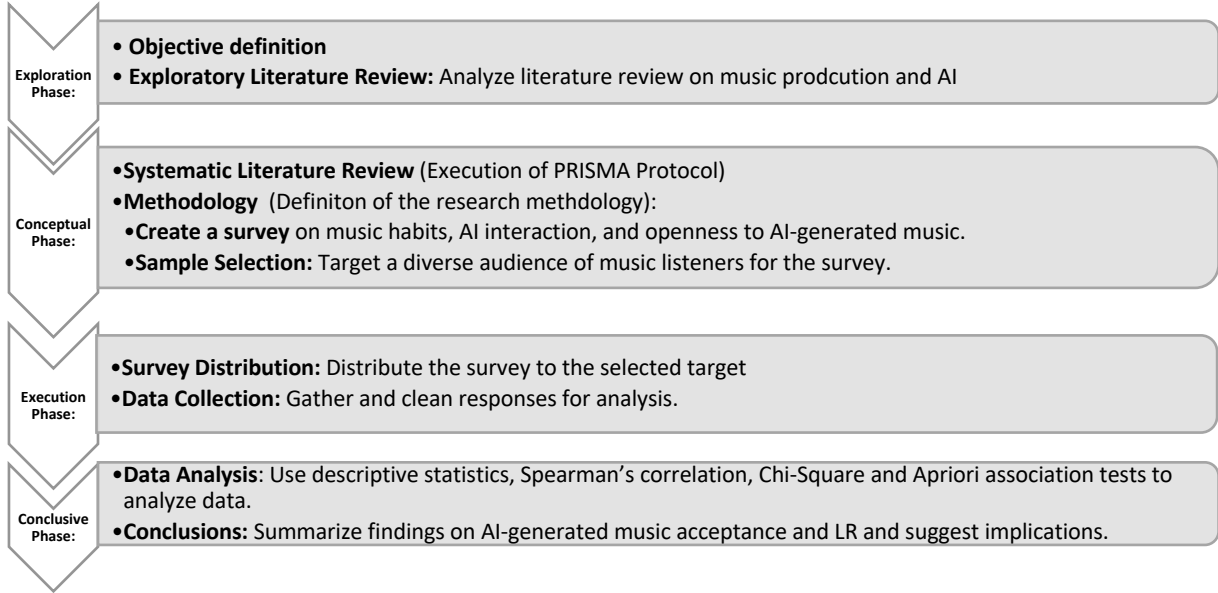


Figure 2 – Methodology phases

3.1. RESEARCH EXECUTION

The used approach in this study about the influence of AI in music production, focusing on perceptions among the listeners, is practical and interactive. First the literature review chapter has been dedicated to data collection regarding the production of music, music industry, artificial intelligence and how are these environments combined in the present. This stage's purpose is to provide knowledge, to determine where research was missing and to get insights for the survey preparation. The survey, operated via the Qualtrics platform, provides a comprehensive instrument designed to evaluate the music consumption habits, interaction with AI technologies, and openness toward AI-generated music of the respondents. It got transmitted through different social media channels and via email to reach a large and heterogeneous audience. Of the 194 responses that were gathered, incomplete responses were excluded, leaving 183 for further analysis.

The survey covered four main areas. First, it had a demographics section that obtained basic information on age and gender. The following phase regards music consumption habits, asking about the frequency of listening to music on different environments (radio, streaming services, social media, live concerts and nightclubs/bars) and the preferred genres. In order to measure familiarity and engagement with AI, the third section includes questions such as the frequency of interactions with AI technologies and the comfort of those who use it. To reach a conclusion on the study's core, the final questions have the purpose to collect data on the respondent's acceptance to AI music production growth.

After collecting and analysing the survey responses, the perceived acceptance of AI-generated music is discussed along the findings on literature review, to determine where AI can provide a competitive edge in music production, taking into account the listener's perspective.

4. EMPIRICAL STUDY

The empirical study consists of the presentation of the survey, what it aimed to find and how it was prepared and conducted. Also, presents the results and the respective discussion, combining the main findings retrieved from the survey and the literature review.

4.1. INVESTIGATION'S PREMISES

Based on the objectives of the research and the literature review, the following premises have been established:

- The main factors related to the acceptance of AI-generated music.
- How different music listening environments and genres affect musical preferences.
- How the relationship of the respondents with AI technologies in general may affect their openness to AI-produced music.
- The main musical components that respondents believe must be human.
- The perceived advantages and disadvantages of AI-produced music according to the respondents.

4.2. CONDUCTING THE STUDY

Grounded in the research objectives and premises identified from the literature review, a survey was developed, and a target audience was selected. The target population for this study comprised Portuguese music listeners across a broad spectrum of ages to reduce possible age bias and it was made available from April 15, 2024, to May 12, 2024, retrieving 183 full responses. As all the respondents are Portuguese, the survey is written in Portuguese as well.

The survey was structured into four main sections. The first section presents demographics and the second one the respondent profiles on music listening habits, aiming to collect information about the respondents' age, gender, and their general music listening habits across various environments and genres. The third section, respondents' AI technologies interaction habits, explores how frequently respondents interact with AI technologies in their daily lives and their general attitudes toward AI. The final section, respondents' AI music acceptance in different musical contexts, investigates the openness of respondents to AI-generated music in different contexts, such as radio, streaming services, live concerts, social media, and nightclubs/bars and explores the musical components that respondents believe must be human as well as the advantages and disadvantages of AI-productions. Respondents were given options to choose from and were also encouraged to freely write their own pros and cons, supporting discussion.

By addressing these objectives, the study aims to contribute to a broader understanding of how AI is transforming the music industry and how audiences are responding to these

changes. This research provides valuable insights for musicians, producers, and policymakers navigating the evolving landscape of music production and consumption.

4.3. RESPONDENT PROFILES

According to the two pie charts below, the largest age group among the 183 respondents is 45-54 years, which accounts for 32.8% of the sample, representing 60 individuals out of the total 183 respondents, followed by the 18-24 years age group, which constitutes 21.3% of the sample with 39 individuals. The 25-34 years age group makes up 19.1% of the respondents, amounting to 35 individuals and the 35-44 years age group is the smallest, representing 13.1% of the sample with 24 individuals. Finally, the 55 years or older age group contains 13.7% of the respondents, totalling 25 individuals.

The frequency table for gender reveals that the majority of the respondents are female with a representation of 58.5% of the sample, which corresponds to 107 individuals. Males represent 41.0% of the respondents, totalling 75 individuals. There is a very small representation of respondents identifying as 'Other,' making up 0.5% of the sample with only 1 individual.

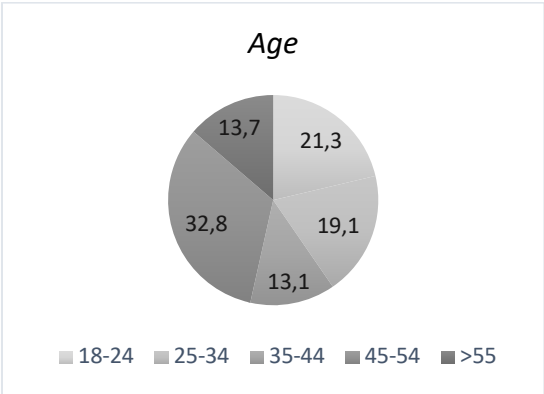


Figure 3 - Respondents' Age Groups

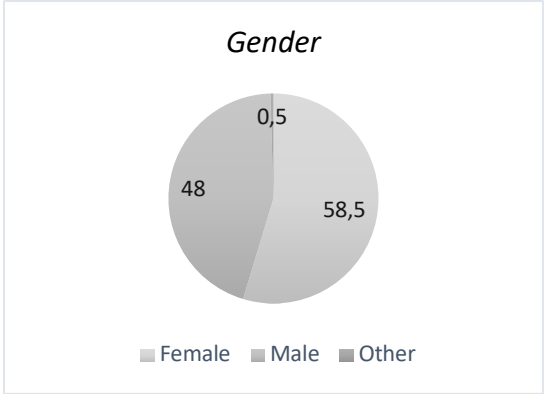


Figure 4 - Respondents' Gender

4.4. ANALYSIS

4.4.1. Descriptive Analysis

The following chapter presents a descriptive analysis of the survey data collected for this study giving an overview of the respondents' music listening habits and their attitudes towards AI-generated music.

Table 6 - Frequency of Music Consumption Across Different Platforms and Environments

	<i>Never</i>	<i>1-3 days/week</i>	<i>4-6 days/week</i>	<i>Every day/week</i>
<i>Radio</i>	20 (10.9%)	45 (24.6%)	44 (24.0%)	74 (40.4%)
<i>Social networks</i>	15 (8.2%)	40 (21.9%)	35 (19.1%)	93 (50.8%)
<i>Streaming platforms</i>	26 (14.2%)	59 (32.2%)	41 (22.4%)	57 (31.1%)

	<i>Never</i>	<i>1-5 concert/year</i>	<i>6-12 concert/year</i>	<i>12 concert/year</i>
<i>Live concerts</i>	29 (15.8%)	132 (72.1%)	14 (7.7%)	8 (4.4%)

	<i>Never</i>	<i>1-3 days/month</i>	<i>4-8 days/month</i>	<i>>8 days/month</i>
<i>Nightclubs and bars</i>	86 (47%)	80 (43.7%)	14 (7.7%)	3 (1.6%)

Table 6 describes the platforms and environments where respondents listen to music and their frequency of usage, where the most frequently used platforms are social media with 50.8% of respondents using them daily. Music streaming services are also popular, with 31.1% of respondents using them daily, while the largest group, 32.2%, use these services 1-3 days a week. Radio is listened to daily by 40.4% of respondents, making it a significant but less popular choice compared to social media for music content.

Regarding social activities, 72.1% of respondents attend 1-5 live concerts per year, 15.8% do not attend any live concerts, 47.0% of respondents never frequent nightclubs or bars, while 43.7% visit these venues 1-3 days per month.

Table 7 - Music Genre Preferences Across Different Listening Platforms and Environments

	<i>Radio</i>	<i>Sociais networks</i>	<i>Streaming platforms</i>	<i>Live concerts</i>	<i>Nightclubs and bars</i>
<i>Pop</i>	120 (65.6%)	83 (45.4%)	63 (34.4%)	64 (35.0%)	44 (24.0%)
<i>Rock</i>	25 (13.7%)	32 (17.5%)	32 (17.5%)	42 (23.0%)	16 (8.7%)
<i>Edm</i>	1 (0.5%)	14 (7.7%)	17 (9.3%)	8 (4.4%)	44 (24.0%)
<i>Hip hop</i>	4 (2.2%)	9 (4.9%)	18 (9.8%)	12 (6.6%)	3 (1.6%)
<i>Jazz</i>	9 (4.9%)	3 (1.6%)	6 (3.3%)	8 (4.4%)	4 (2.2%)
<i>Country</i>	2 (1.1%)	3 (1.6%)	1 (0.5%)	3 (1.6%)	2 (1.1%)
<i>Latina</i>	5 (2.7%)	8 (4.4%)	7 (3.8%)	9 (4.9%)	14 (7.7%)
<i>Other</i>	4 (2.2%)	6 (3.3%)	9 (4.9%)	11 (6.0%)	4 (2.2%)
<i>Don't know</i>	6 (3.3%)	11 (6.0%)	9 (4.9%)	7 (3.8%)	4 (2.2%)
<i>Don't use/attend</i>	7 (3.8%)	14 (7.7%)	21 (11.5%)	19 (10.4%)	48 (26.2%)

Table 7 describes the music genres that respondents listen to across different contexts, including radio, social media, streaming platforms, live concerts, and nightclubs or bars. Pop music consistently emerges as the most popular genre across all contexts, particularly on the radio and in live concerts. On the radio, Pop is listened to by 65.6% of respondents, followed by Rock at 13.7%. On social media platforms, Pop is the most listened to by 45.4% of respondents, with Rock at 17.5%. On music streaming platforms, Pop leads with 34.4%, followed by Rock at 17.5%. For live concerts, 35.0% of respondents attend Pop concerts, while 23.0% attend Rock concerts. In nightclubs and bars, Pop and Electronic/Dance music are equally popular, each listened to by 24.0% of respondents.

Table 8 - Frequency of AI Technologies Use Among Respondents

	<i>Never</i>	<i>Rarely</i>	<i>Monthly</i>	<i>Weekly</i>	<i>Daily</i>
<i>Frequency of AI technologies use</i>	12 (6.6%)	47 (25.7%)	15 (8.2%)	55 (30.1%)	54 (29.5%)

Table 8 describes the respondents' interactions with AI-based technologies. As can be observed, most respondents (nearly 60%) interact with AI technologies on a daily or weekly basis, indicating a high level of engagement with AI. Monthly interactions are relatively infrequent, and a quarter of the respondents interact with AI rarely. Only a small fraction of respondents (6.6%) has no interaction with AI technologies, highlighting the varying levels of engagement with and integration of AI in their daily lives.

Table 9 - Comfort Level with AI Technologies Use Among Respondents

	<i>Not Comfortable</i>	<i>Slightly Comfortable</i>	<i>Neutral</i>	<i>Comfortable</i>	<i>Very Comfortable</i>
<i>Frequency of comfort using AI technologies</i>	4 (2.3%)	32 (18.7%)	42 (24.5%)	70 (41.0%)	23 (13.5%)

Table 9 provides a comprehensive view of the respondents' comfort levels with using AI-based technologies. It is important to note that this question was only shown to respondents who did not answer "Never" in the previous question about the frequency of interaction with AI technologies, resulting in a total of 171 responses. The data reveals that a majority of respondents (54.5%) are either comfortable or very comfortable with using AI technologies. A smaller portion, 24.5%, stays neutral, while 21.0% of the respondents have varying degrees of discomfort. While most respondents have a positive attitude towards AI, there is still segment with discomfort.

Table 10 - Frequency of Respondents Who Have Heard AI-Produced Music Before

	<i>Yes</i>	<i>No</i>
<i>Frequency of who have heard AI produced music before</i>	64 (35%)	119 (65%)

The frequency table 10 gives an analysis of respondents' prior exposure to music created by artificial intelligence before taking the survey, where, out of the 183 respondents, 64 individuals (35.0%) reported having heard music created by AI prior to the survey. A significantly larger proportion, 119 respondents (65.0%), indicated that they had not experienced AI-generated music before participating in the survey.

Table 11 - Environment Where Respondents Have Heard AI-Produced Music

	<i>Radio</i>	<i>Social Networks</i>	<i>Streaming Platforms</i>	<i>Live Concerts</i>	<i>Nightclubs and Bars</i>	<i>Other</i>
<i>Frequency of Environment where heard AI produced music</i>	9 (13.6%)	32 (50.6%)	16 (24.7%)	2 (2.5%)	2 (2.5%)	4 (6.2%)

Table 11 describes the contexts where respondents have heard AI-produced music. Social media platforms are the primary context (50.6% of respondents), music streaming platforms follow, with 24.7% of respondents reporting exposure to AI-produced music. Radio accounts for 13.6% and live concerts and nightclubs/bars are the least common contexts, with only 2.5% of respondents indicating exposure to AI-generated music in these settings. “Other” contexts, mentioned by 6.2% of respondents, also play a role, although less frequently

Table 12 - Crosstabs: Comfort Levels of Hearing AI Music Depending on the Environment

	<i>Not comfortable</i>	<i>Somewhat comfortable</i>	<i>Indifferent</i>	<i>Comfortable</i>	<i>Very comfortable</i>
<i>Radio</i>	24 (13.1%)	39 (21.3%)	74 (40.4%)	40 (21.9%)	6 (3.3%)
<i>Social networks</i>	19 (10.4%)	25 (13.7%)	90 (49.2%)	42 (23.0%)	7 (3.8%)
<i>Streaming platforms</i>	21 (11.5%)	39 (21.3%)	74 (40.4%)	44 (24.0%)	5 (2.7%)
<i>Live concerts</i>	85 (46.4%)	43 (23.5%)	33 (18.0%)	20 (10.9%)	2 (1.1%)
<i>Nightclubs and bars</i>	27 (14.8%)	28 (15.3%)	82 (44.8%)	41 (22.4%)	5 (2.7%)

Table 12 describes the respondents' comfort levels with music produced entirely by AI across various contexts, including radio, streaming platforms, live concerts, nightclubs/bars, and social media. The majority of respondents (40.4%) feel indifferent about AI-produced music on the radio, with 21.9% feeling comfortable and 13.1% not at all comfortable, suggesting a general uncertainty towards AI music in a radio context. For streaming platforms, a similar pattern is registered with 40.4% of respondents feeling indifferent, 24.0% comfortable, and 21.3% somewhat uncomfortable, while a lower fraction (2.7%) feel very comfortable with AI music, indicating mixed acceptance and neutrality.

In live concerts, there is a significant level of discomfort with AI-produced music, as 46.4% of respondents feel not at all comfortable, and 23.5% feel somewhat uncomfortable. On the other side, only 10.9% feel comfortable, and 1.1% feel very comfortable with AI music in live concert settings, highlighting a strong preference for human performance. Nightclubs and bars show 44.8% of respondents feeling indifferent about AI-produced music, 22.4% comfortable, 14.8% not at all comfortable, and 15.3% somewhat uncomfortable, indicating a balanced mix of indifference and comfort.

Social media presents a slightly different picture, with 49.2% of respondents feeling indifferent about AI-produced music, 23.0% comfortable, and 10.4% not at all comfortable, while 3.8%

feel very comfortable with AI music, suggesting general neutrality and slight positivity towards AI music on social platforms.

Overall, indifference is the most common sentiment towards AI-produced music across all contexts, particularly on radio, streaming platforms, and social media and the highest levels of discomfort are observed in live concerts.

Table 13 - Discomfort with AI-Produced Musical Elements

	<i>Vocals</i>	<i>Guitar</i>	<i>Bass guitar</i>	<i>Keyboard</i>	<i>Drums</i>	<i>Musical composition</i>	<i>Other element</i>
<i>Frequency of Discomfort on AI Produced Musical Elements</i>	155 (84.7%)	15 (8.2%)	8 (4.4%)	6 (3.3%)	8 (4.4%)	70 (38.3%)	4 (2.2%)

Table 13 highlights respondents' discomfort with the main musical elements being AI-produced where the respondents were able to select more than one element. The majority, 84.7%, express discomfort with AI-produced vocals, suggesting that human authenticity in vocals is highly valued by listeners. Musical composition also shows notable discomfort, with 38.3% of respondents wary of AI handling the overall structure and creation of music.

Discomfort levels for instrumental elements are relatively lower: 8.2% for guitar, 4.4% each for bass guitar and drums, and 3.3% for keyboard. Only 2.2%, indicated discomfort with other unspecified elements, considered not relevant to study.

The data indicates a strong preference for human authenticity in vocal performances and composition, while showing a higher acceptance of AI in instrumental elements.

Table 14 - Openness to AI-Produced Music Growth

	<i>Not open</i>	<i>Slightly open</i>	<i>Neutral</i>	<i>Moderately open</i>	<i>Totally open</i>
<i>Frequency of Openness to AI produced music growth</i>	17 (9.3%)	73 (39.9%)	44 (24.0%)	39 (21.3%)	10 (5.5%)

Table 14 shows varied levels of acceptance towards AI-produced music growth. The largest group, representing 39.9%, is slightly open to AI music, reflecting a cautious approach. Meanwhile, 24.0% of respondents remain neutral, and 21.3% are moderately open, suggesting a fair level of acceptance. Only 9.3% are not open to AI-produced music at all, and

5.5% fully embrace it. Overall, 49.2% of responses lean towards being less open to AI-produced music, indicating general hesitancy, although a significant portion remains neutral or moderately open, suggesting potential for increased acceptance over time.

In the final part of the survey, respondents were asked to select on or more advantages and disadvantages of AI-produced music, retrieved from the literature review and PRISMA findings. Approximately 21.9% of respondents recognized AI's role in promoting innovation and creating new musical styles. About 27.9% of respondents identified AI's ability to enhance efficiency and speed in music production as a significant benefit, allowing producers to focus more on creative aspects. The most voted advantage, the potential of AI to reduce music production costs, was perceived by 34.4% of respondents. Finally, around 25.1% of respondents believe that AI provides easier access to music creation for amateurs, with AI-powered tools simplifying the music-making process and enabling non-professionals to produce high-quality music.

However, the side of the disadvantages noted more significance, where a considerable number of respondents (84.7%) expressed concern about the loss of essence and emotion in music produced by AI, suggesting a strong preference for the emotional depth and authenticity associated with human-created music. About 53.0% are worried about the risk of unemployment for professional musicians and composers due to AI, fearing that the automation of music production tasks could potentially displace human talent in the industry. Approximately 40.4% of respondents are concerned about the dominance of large tech companies in the music market monetizing AI music creation. Around 37.2% of respondents expressed concern about potential uniformity and loss of diversity in music, suggesting that the general use of AI could result in homogenized musical styles, reducing the richness of the music landscape.

Options for "Other" and "Not Sure" were also available for respondents, however, these did not yield valuable results for analysis. The results indicate that participants were more inclined to identify disadvantages rather than advantages of AI-produced music.

4.4.2. Correlational Analysis and Test of Independence

Correlation analysis and chi-square independence tests are statistical methods used to measure and describe the relationships between variables. Correlation analysis measures and describes the strength and direction of the relationship between two ranked variables where the correlation coefficient varies from -1 to 1, indicates how closely the variables are related: positive correlation means that as one variable increases, the other tends to increase, while a negative correlation indicates that as one variable increases, the other tends to decrease. A correlation coefficient close to 0 suggests no significant relationship between the variables (Wang et al., 2019).

The chi-square test examines relationships between categorical variables. It does not measure the strength or direction of the relationship but determines whether there is a significant

association between the variables: the Chi-Square Test of Independence determines if there is a significant association between two categorical variables (Ermakov, 2023).

Table 15 - Correlation Between Age and Openness to AI-Produced Music Growth

			<i>Age</i>
<i>Spearman's rho</i>	Openess to AI produced music growth	Correlation coefficient	.185
		Sig. (2-tailed)	.012
		N	183

In table 15 is presented the result of a Spearman correlation analysis between the age of respondents and their openness to AI-produced music, with openness rated on a scale from 1 (least open) to 5 (most open). The correlation coefficient between age and openness to AI music is 0.185, which indicates a weak positive correlation. In this case, it suggest that as the age of respondents increases, there is a slight tendency for their openness to AI-produced music to increase as well. Although the relationship is weak, it is statistically significant, as indicated by the p-value of 0.012. This means there is a 1.2% probability that the observed correlation is due to chance, expressing that there is a genuine relationship between age and openness to AI music.

Table 16 - Correlation Between Openness to AI-Produced Music Growth and Previous Experience with AI-Produced Music

	<i>Value</i>	<i>Df</i>	<i>Asymptotic Significance (2-sided)</i>
<i>Pearson Chi-square</i>	3.624	4	.459
<i>N of Valid Cases</i>	183		

According to the the Chi-squared test presented in table 16, there is no significant correlation between openness to AI-produced music growth and previous listening experience with AI-produced music once the p-value is greater than 0.05.

Table 17 - Correlation between Frequency of Interaction with AI Technologies and Openness to AI-Produced Music Growth

		<i>Frequency of interaction with AI technologies</i>	
<i>Spearman's rho</i>	Openness to AI produced music growth	Correlation coefficient	.183
		Sig. (2-tailed)	.013
		N	183

Table 17 presents the results of Spearman's rho correlation between the frequency of interaction with AI technologies and the openness to AI-generated music. The correlation coefficient between these two variables is 0.183, indicating a weak positive correlation with a p-value for this correlation of 0.013, which is below the significance threshold of 0.05, indicating that this correlation is statistically significant. There is a statistically significant, although weak, positive relationship between the frequency of interaction with AI technologies and openness to AI-generated music. This suggests that individuals who frequently interact with AI technologies are more likely to be open to AI-generated music.

4.4.3. Associative Analysis

The analysis of the association rules was conducted using SPSS Modeler, targeting the main factors that influence the acceptance of AI produced music, using Apriori algorithm.

The Apriori algorithm methodically discovers frequent itemsets in transaction data and formulates association rules from these sets. It is particularly adept at mining large databases to reveal associations and patterns among items (Agrawal & Srikant, 1994). The significance of a relationship is evaluated using two metrics: support and confidence - support measures the proportion of transactions that include a combination of items, while confidence indicates the strength of the link between items within the association rules (Edastama et al., 2021).

Table 18 - Apriori algorithm between Age and Openness to AI-Produced Music Grow

<i>Consequent</i>	<i>Antecedent</i>	<i>Support%</i>	<i>Confidence%</i>
<i>Open to AI produced music growth</i>	Age 45-54	32.787	40.0
	Age 35-44	13.115	33.(3)
	Age >55	13.661	24.0
	Age 18-24	21.311	20.513
	Age 25-34	19.126	8.571

Table 18 presents the Apriori test between age groups and openness to AI-produced music in order to study if there is a pattern between them. It presents that the 45-54 age group is the most supportive and confident, with 32.8% support and 40.0% confidence. This suggests they are particularly receptive to technological innovations in music production. The 35-44 age group, despite lower support at 13.1%, has a high confidence level of 33.3%, indicating a strong conviction among those open to AI-produced music.

For those over 55, there is moderate support and confidence at 13.7% and 24.0%, respectively, suggesting some acceptance but less widespread due to generational differences. The 18-24 age group shows moderate support at 21.3% but lower confidence at 20.5%, indicating reservations about AI-produced music's impact and quality and the 25-34 age group has the lowest confidence at 8.6% despite 19.1% support, reflecting doubts about AI's role in creativity and authenticity.

Overall, the 45-54 age group is the most open and confident towards AI-produced music, while younger age groups, especially 25-34, are more skeptical.

Table 19 - Apriori algorithm between Openness to AI-Produced Music Growth by Genre

<i>Consequent</i>	<i>Antecedent</i>	<i>Support%</i>	<i>Confidence%</i>
<i>Open to AI produced music growth</i>	Pop	51.366	31.915
	Rock	15.301	21.429
	Do not attend/use	8.743	18.75
	Electronic/Dance	6.011	18.182

In the Apriori test presented in table 19, it was studied if the preferred music genre influences openness to AI-produced music growth. In order to understand the preferred musical genre of each respondent independently from the environment, the mode of the genre listened to among all environments was calculated. In instances where no mode was found, which occurred in three rows, the genre "other" was assigned, but this did not significantly impact the overall dataset. The "do not attend/use" mode was disregarded as it does not represent a genre. To ensure a reasonable percentage without compromising data quality, yet to cover the main genres, the minimum support was set at 6%.

In terms of results, pop music has the highest influence, with a support value of 51.366% and a confidence level of 31.915%, indicating that Pop listeners are more likely to accept AI-produced music. Rock music also shows significant influence, with a support value of 15.301% and a confidence level of 21.429%, suggesting that Rock listeners are slightly open to AI-produced music - indicating a more conservative attitude among Rock fans, when compared to Pop ones.

Electronic/Dance music shows a lower support value of 6.011% and a confidence level of 18.182%. This indicates that Electronic/Dance listeners are less open to AI-produced music, which is curious given the genre's association with technological innovation. Despite the results, it's important to note that the representation of Electronic/Dance listeners is not as high as in other genres, so these results may be somewhat biased.

Table 20 - Apriori algorithm between Effective Use of AI Tools and Openness to AI-Produced Music Growth

<i>Consequent</i>	<i>Antecedent</i>	<i>Support%</i>	<i>Confidence%</i>
<i>Open to AI produced music growth</i>	Comfortable AI use	50.82	32.258
	Neutral AI use	22.951	23.81
	Not Comfortable AI use	26.23	18.75

Table 20 illustrates the relationship between the effective use of AI tools and openness to AI-produced music growth, revealing several key insights. First, a strong effective use of AI tools is significantly associated with openness to AI-produced music growth. Specifically, individuals who effectively use AI tools, including those who feel "comfortable" or "very comfortable" with AI, show the highest support at 50.82%, with a confidence level of 32.258%. This suggests that if AI tools are used effectively, there is a substantial likelihood of openness to AI-produced

music, directing a positive correlation between proficiency in AI tools and acceptance of AI in music production.

Second, neutral use of AI tools also plays a relevant role, though to a lesser extent. Support among this group stands at 22.951%, with a confidence level of 23.81%, which suggests that even a neutral stance towards AI tool usage can lead to notable, although smaller, openness to the growth of AI-produced music. It highlights that moderate comfort with AI technologies still foster a degree of acceptance of AI applications in creative fields.

Finally, individuals who are weak in using AI tools, including those who selected "somewhat comfortable" and "not comfortable," contribute to openness, but their influence is the least pronounced among the groups. The support value for weak AI use stands at 26.23%, with a confidence level of 18.75%. This indicates that while there is some openness among those with a negative perception of AI tool use, it is less significant compared to the other groups. This finding underscores that discomfort or ineffectiveness in using AI tools may delay the acceptance of AI-produced music, although it does not entirely impede it.

Overall, the data highlights the importance of the effective use of AI tools in fostering openness to AI-produced music where those who are proficient and comfortable with AI technologies are more likely to embrace AI's role in music production.

5. RESULTS AND DISCUSSION

The Results and Discussion chapter presents the main findings from the empirical study on public perceptions and acceptance of AI-generated music and answers to the Research Questions by combining the findings and Literature Review in order to provide scientific support.

5.1. MAIN FINDINGS

The analysis of the demographic trends revealed an intriguing insight: respondents aged 35-54 exhibited a slightly higher openness to AI-produced music compared to younger listeners. The gender distribution of the respondents showed that females comprised 58.5% of the sample, while males accounted for 41%.

Observing the music consumption habits of the respondents, it was found that 40.4% listen to the radio daily, while 50.8% engage with social media platforms featuring music every day. Streaming services are used daily by 31.1% of the respondents. Live concert attendance is relatively common, with 72.1% attending 1-5 live concerts per year. Also, 47% of respondents indicated that they never frequent nightclubs or bars.

In terms of genre preferences, pop music emerged as the dominant genre across all platforms and environments, particularly on radio and social media. Rock music is the second most popular genre, especially prevalent in live concerts. EDM and Hip-Hop, however, hold more prominence in nightclubs and bars.

Interaction with AI technologies varied among respondents. Daily interaction with AI technologies was reported by 29.5% of respondents, while 30.1% interacted with AI on a weekly basis. Comfort levels with using AI technologies were generally high, with 54.5% of respondents indicating they are comfortable or very comfortable with AI.

When it comes to exposure to AI-produced music, 35% of respondents had heard AI-generated music, primarily on social media (50.6%) and streaming platforms (24.7%). Comfort levels with AI-produced music varied depending on the context, specifically, social media and streaming services revealed to be the contexts where respondents would feel more comfortable with it. However, there were noticeably lower comfort levels with AI music in live concerts and nightclubs, suggesting a strong preference for the human touch in these more personal and interactive settings.

Respondents expressed significant discomfort with certain musical components being AI-produced, namely, a substantial majority of respondents (84.7%) indicated discomfort with AI-produced vocals, reflecting a high value placed on human authenticity in vocal performance. Similarly, 38.3% of respondents were uncomfortable with AI handling the musical composition, highlighting a preference for human creativity in the creation and

structure of music. In contrast, discomfort with AI-produced instrumental elements like guitar, bass, and drums was relatively lower.

In the final part of the survey, when discussing advantages and disadvantages on AI music production growth, the results indicate that participants were more inclined to identify disadvantages rather than advantages of AI-produced music. The predominant sentiment leaned towards concerns over losing emotional depth and authenticity in music and the risk of unemployment for musicians.

5.2. DISCUSSION

The results of this study offer a detailed look into the acceptance of AI-produced music and how it aligns with current literature on AI's role in the music industry. This section extends the discussion by exploring the implications of the findings, linking them to existing research answering to the research questions defined for the study.

RQ1: What are the listeners' acceptance levels on the growth of AI-generated music, and potential influencing factors?

The analysis concludes that a significant percentage of respondents are either not open or neutral towards AI-produced music (73.2%). While this indicates some level of openness, there is also substantial concern about the growth of AI in music production. These findings align with the literature, which suggests that although AI is increasingly integrated into daily activities, there is still common apprehension about AI-generated content and tools across various domains.

The integration of AI into music production marks a notable shift in how music is created and consumed, interestingly, the study's findings show that listeners aged 35-54 can be slightly more receptive to AI-produced music than younger listeners. This challenges the common belief that technological advancements are more readily embraced by younger demographics, who are generally perceived as more adaptable to change.

To support the factors that lead people to accept AI music production growth, both the survey analysis and previous research, propose that individuals with experience using AI applications tend to be more open to the growth of AI in music production. According to the survey, those who are comfortable or very comfortable with AI tools show a higher confidence level (32.3%) in accepting AI-produced music compared to those who are not comfortable (18.8%). Although these values are relatively low, they indicate that familiarity with AI in daily life might correlate with a greater openness to AI in music.

Finally, despite the presence of AI-generated music in the public domain, according to the literature review, simply having listened to such music does not necessarily affect listeners' acceptance of its further growth.

RQ2: Under what circumstances are listeners more comfortable with AI-produced music?

Exploring the circumstances under which listeners are more comfortable with AI-produced music reveals interesting patterns. Listeners are more comfortable with AI-produced music on social media platforms, where 50.6% of respondents have heard such music – the analysed high level of daily engagement with social media might contribute to this comfort. There is moderate acceptance on streaming platforms, with 24.7% of respondents reporting exposure to AI-produced music, where the familiarity with algorithmic recommendations on these platforms may make listeners more open to AI-generated content. AI-produced music on the radio also sees some acceptance, though to a lesser extent than social media and streaming platforms, with 13.6% exposure. The regular use of radio for music consumption, supports this comfort level. Lastly, in live concert settings, there is a significant level of discomfort with AI-produced music, as 46.4% of respondents feel not at all comfortable, highlighting a strong preference for human performance in such environments.

On the production side, AI-produced instrumental elements such as guitar, bass guitar, keyboard, and drums tend to be more accepted by listeners, with discomfort levels being relatively low (8.2% for guitar, 4.4% for bass guitar and drums, and 3.3% for keyboard). Listeners seem more comfortable with AI handling these aspects of music production. In the meanwhile, there is significant discomfort with AI-produced vocals (84.7%) and musical composition (38.3%). The higher acceptance of AI in instrumental elements, suggests that listeners are more comfortable with AI contributions that do not directly affect the human touch and emotional delivery, associated with vocals and composition.

RQ3: Among the studied advantages and disadvantages of AI-generated music, which ones do listeners consider the most?

Regarding advantages, approximately 21.9% of the answers highlighted AI's role in fostering innovation and creating new musical styles, observing its potential to diversify music genres and introduce new musical elements. Also, about 27.9% identified AI's ability to enhance efficiency and speed in music production as a significant benefit, with AI tools automating repetitive tasks and allowing producers to focus more on creative aspects. Plus, 34.4% acknowledged the potential of AI to reduce music production costs, streamlining workflows and minimizing the need for expensive resources, thus making music production more accessible. Furthermore, around 25.1% of respondents believed that AI provides easier access to music creation for amateurs, with AI-powered tools simplifying the music-making process and enabling non-professionals to produce high-quality music.

However, there are also significant disadvantages associated with AI-generated music that listeners consider. A substantial 84.7% of answers expressed concern about the loss of essence and emotion in music produced by AI, indicating a strong preference for the emotional depth and authenticity associated with human-created music. About 53.0% worried about the risk of unemployment for professional musicians and composers due to AI, fearing that the

automation of music production tasks could potentially displace human talent in the industry. Approximately 40.4% feared the dominance of large tech companies in the music market, concerned that the integration of AI in music production could lead to a concentration of power and influence among a few major players. Finally, around 37.2% of respondents expressed concern about potential uniformity and loss of diversity in music, suggesting that the extensive use of AI could result in homogenized musical styles, reducing the richness of the music landscape.

In summary, while listeners acknowledge the significant benefits of AI in terms of innovation, efficiency, cost reduction, and accessibility, they are equally concerned about the potential loss of emotional authenticity, job displacement, market domination by large tech companies, and the risk of reduced diversity in music.

RQ4: How can musicians and companies take advantage from AI tools in music production and distribution?

Musicians and companies can take advantage of AI tools in music production and distribution in several impactful ways. As studies referred in the LR, AI can enhance efficiency and speed in music production by automating repetitive tasks, allowing musicians and producers to focus more on creative aspects which can significantly reduce production costs, making music production more accessible to a broader range of artists. AI-powered tools can also simplify the music-making process, enabling non-professionals to produce high-quality music, which opens up new opportunities for amateur musicians.

Promotion of AI-generated music can be effectively conducted on platforms where it is more accepted and has a higher potential for engagement. According to studies and findings from the survey, social media platforms are the most promising contexts followed by the streaming platforms for fully AI produced music selling and promotion. Live concert settings are less suitable for promotion, as 46.4% of respondents feel not comfortable at all with AI-produced music in these environments. Also, given the finding that listeners were mostly uncomfortable with AI-produced vocals and music composition, solo artists can benefit from AI software, as mentioned in the literature review and PRISMA, to simulate live instruments as it probably won't represent discomfort for the audience.

To maximize the acceptance and effectiveness of AI in music production, producers can work together with AI, ensuring they do not necessarily lose the human essence that listeners value. According to the researched science, a collaborative approach between human musicians and AI technologies can maintain the emotional depth and authenticity associated with human-created music while leveraging the innovative and efficient capabilities of AI. This collaboration can foster innovation, create new musical styles, and diversify music genres, addressing listeners' concerns about the potential loss of essence and emotion in AI-produced music.

6. CONCLUSIONS, LIMITATIONS AND FUTURE WORKS

The research used quantitative research method, so it began with an examination of existing literature on AI in music production, followed by a systematic literature review in order to understand previous research on the topic. Following the LR, an empirical study was conducted, focusing on gathering data from a diverse sample of respondents about their perceptions and openness to AI-generated music. The survey was structured to cover various aspects, including demographic factors, listening habits, frequency of interaction with AI technologies, and specific preferences or concerns related to AI in music. The study utilized descriptive, correlational, and associative analyses to explore the acceptance of AI-generated music among different demographic groups and across various listening environments.

After analysing the data, the findings were discussed providing answers to RQ defined in the introduction. The main conclusion is that the integration of AI into music production is still not very well accepted by music consumers, in most cases, however, some listeners might be willing to accept it, particularly the ones aged 35-54 and those who frequently interact with AI technologies. While challenges remain, mostly regarding the authenticity and emotional depth of AI-produced music, the potential for AI to complement human creativity is significant. The insights gained from this research highlight the importance of addressing ethical concerns and ensuring that AI technologies are used to enhance, rather than replace, human creativity in music production. According to this, the study outcomes suggest that a thoughtful integration of AI, which respects the unique qualities of human artistry while leveraging technological advancements, can lead to innovative and enriching musical experiences for a wide audience.

One limitation of the study was the challenge of condensing the broad spectrum of music genres and their associated perceptions into a manageable framework for analysis. Music genres cover a wide range of styles and cultural contexts, making it difficult to capture the full diversity of opinions in a single study. Other limitation is, while the survey aimed for a broad demographic representation, there may still be biases in the sample that could affect the generalizability of the findings.

Future work should address these limitations by expanding the scope of the study, to include a more comprehensive range of music genres and cultural contexts. Further research could also explore the long-term impacts of AI integration on the music industry, specifically in terms of job displacement and changes in creative processes, and provide deeper insights into how perceptions of AI-generated music evolve over time, as technology continues to advance and become more integrated into everyday life.

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APPENDICES

APPENDIX A. SURVEY

The Role of Artificial Intelligence in Music Production: Survey

Start of Block: Default Question Block

Este questionário é parte integrante do desenvolvimento de tese de mestrado na NOVA IMS, no âmbito do Mestrado em Gestão de Informação com especialização em Sistemas e Tecnologias de Informação. O principal objetivo deste estudo é explorar a perceção do público geral sobre música produzida inteiramente por inteligência artificial (IA) em diversos contextos, tais como rádio, streaming, concertos ao vivo e discotecas. Procura-se entender as preferências e opiniões sobre os diferentes elementos da música produzida por Inteligência Artificial e a sua aceitação em ambientes variados.

A duração estimada para completar este inquérito é de aproximadamente 4 a 6 minutos. Participar neste estudo não envolve qualquer risco e a sua participação é totalmente voluntária, sendo que pode optar por não participar ou interromper a sua participação a qualquer momento. As suas respostas serão utilizadas exclusivamente para fins académicos.

Caso tenha quaisquer dúvidas, pode contactar via e-mail: 20221306@novaims.unl.pt

Q2 **Formulário de Consentimento Informado**

Declaro que tenho 18 anos de idade ou mais e concordo em participar nesta pesquisa. Fui informado(a) de que minha participação neste estudo é voluntária e que posso encerrar este questionário a qualquer momento sem qualquer penalidade. Também fui informado(a) de que todos os dados serão confidenciais.

- Eu concordo em participar neste questionário (1)
- Eu não concordo em participar neste questionário (2)

End of Block: Default Question Block

Start of Block: Dados Demográficos

Q3

Idade

- 18-24 anos (1)
 - 25-34 anos (2)
 - 35-44 anos (3)
 - 45-54 anos (4)
 - 55-64 anos (5)
 - 65 anos ou mais (6)
-

Q4

Género

- Feminino (1)
- Masculino (2)
- Outro (3)
- Prefiro não responder (4)

End of Block: Dados Demográficos

Start of Block: Frequência de ambientes musicais

Q5 Quantos dias por semana, em média, ouve rádio?

- Nunca (1)
 - 1-3 (2)
 - 4-6 (3)
 - Todos os dias (4)
-

Q16 Em média, quantos dias por semana utiliza redes sociais que apresentam conteúdo com música?

- Nunca (1)
 - 1-3 (2)
 - 4-6 (3)
 - Todos os dias (4)
-

Q6 Quantos dias por semana, em média, utiliza plataformas de streaming de música (Spotify, Apple Music, ...)?

- Nunca (1)
 - 1-3 (2)
 - 4-6 (3)
 - Todos os dias (4)
-

Q7 A quantos concertos ao vivo assiste, por ano, em média?

- Nenhum (1)
 - 1-5 (2)
 - 6-12 (3)
 - Mais de 12 (4)
-

Q8 Quantos dias por mês, em média, frequenta discotecas/bares?

- Nunca (1)
 - 1-3 (2)
 - 4-8 (3)
 - Mais de 8 (4)
-

Q23 Que género de música mais ouve em cada um dos seguintes contextos?

	Po p (1)	Ro ck (2)	Eletróni ca/ Dance (3)	Hip/H op (4)	Ja zz (5)	Coun try (6)	Lati na (7)	Outro (indiq ue qual) (8)	Nã o sei (9)	Não frequent o/utilizo (10)
Rádio (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rede sociais (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plataformas de streaming (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concertos ao vivo (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discotecas/ bares (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Frequência de ambientes musicais

Start of Block: Experiência com Inteligência Artificial

Q22 Antes de responder à próxima questão, considere que tecnologias baseadas em inteligência artificial incluem assistentes virtuais (como Chat GPT, Siri, Alexa e Google Assistant), sistemas de produção criativa, sistemas de recomendação de produtos ou conteúdos (como os utilizados pela Netflix, Spotify e Amazon), ferramentas de reconhecimento facial, aplicações de navegação (como Waze e Google Maps), chatbots em serviços de atendimento ao cliente, e outros.

Q11 Com que frequência interage com tecnologias baseadas em inteligência artificial?

- Diariamente (1)
- Semanalmente (2)
- Mensalmente (3)
- Raramente (4)
- Nunca (5)

Display This Question:

If Com que frequência interage com tecnologias baseadas em inteligência artificial? != Nunca

Q12 Qual é o seu nível de conforto com o uso de tecnologias baseadas em inteligência artificial?

- Muito confortável (1)
- Confortável (2)
- Neutro (3)
- Pouco confortável (4)
- Nada confortável (5)

End of Block: Experiência com Inteligência Artificial

Start of Block: Música produzida por inteligência artificial

Q13 Já ouviu música criada por inteligência artificial antes deste questionário?

- Sim (1)
- Não (2)

Display This Question:

If Já ouviu música criada por inteligência artificial antes deste questionário? = Sim

Q14 Em que contexto ouviu música produzida por inteligência artificial? Selecione uma ou mais opções.

- Rádio (1)
 - Plataformas de streaming de música (2)
 - Concertos (3)
 - Discotecas/bares (4)
 - Redes sociais (5)
 - Outro (indique qual/quais) (6)
-

Q15 Como se sentiria se uma música produzida integralmente por inteligência artificial fosse reproduzida num dos seguintes contextos?

	Nada confortável (1)	Pouco confortável (2)	Indiferente (3)	Confortável (4)	Muito confortável (5)
Rádio (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plataformas de streaming de música (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concertos ao vivo (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discotecas/bares (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redes sociais (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q17 Qual dos seguintes elementos musicais lhe causaria maior desconforto, se totalmente gerado por inteligência artificial? Selecione uma ou mais opções.

- Voz (1)
 - Guitarra (2)
 - Baixo (3)
 - Teclas (4)
 - Bateria (5)
 - Composição musical (ex: escrita de letra, escrita de arranjos de guitarra) (6)
 - Outro (indique qual/quais) (7)
-

End of Block: Música produzida por inteligência artificial

Start of Block: Conclusão

Q19 Tendo em conta as suas respostas anteriores, até que ponto estaria aberto à ideia de a música produzida integralmente por inteligência artificial se tornar mais predominante nos contextos apresentados?

- Totalmente aberto (1)
 - Moderadamente aberto (2)
 - Neutro (3)
 - Pouco aberto (4)
 - Nada aberto (5)
-

Q20 Que vantagens reconhece na música produzida por inteligência artificial? Selecione uma ou mais opções.

- Inovação e criação de novos estilos musicais (1)
 - Maior eficiência e rapidez na produção musical (2)
 - Redução dos custos de produção musical (3)
 - Acesso facilitado à criação musical para amadores (4)
 - Nenhuma (5)
 - Não sei (6)
 - Outra/s (indique qual/quais) (7)
-

Q26 E desvantagens? Selecione uma ou mais opções.

- Perda da essência e emoção transmitidas pela música humana (1)
 - Risco de desemprego para músicos e compositores profissionais (2)
 - Domínio das grandes empresas de tecnologia no mercado musical (3)
 - Uniformização e perda da diversidade musical (4)
 - Nenhuma (5)
 - Não sei (6)
 - Outra/s (indique qual/quais) (7)
-

End of Block: Conclusão

APPENDIX B. ETHICS COMMITTEE REPORT



This is to certify that

Project No.: **INFSYS2024-7-143606**

Project Title: **The Role of Artificial Intelligence in Music Production**

Principal Researcher: **Vitor Duarte dos Santos**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 7/14/2024.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of

- Any significant change to the project and the reason for that change;
- Any unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 7/14/2024

NOVA IMS Ethics Committee
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