Digital Authority and the Reproduction of Gender Inequality: Addressing Gender Bias in Voice Assistant Development

Başak OVACIK[1]

[1] Bahcesehir University, İstanbul, Türkiye
Email: basak@ovacikmail.com Orcid: 0000-0003-3014-2280

Research Article

Abstract

Gender and technology are deeply intersectional, with significant disparities in representation and influence. In Türkiye, only 24.3% of the workforce in technology consists of women, while globally, women make up just 26% of artificial intelligence professionals, a figure that drops to 11% in Silicon Valley. This paper critically examines the gendered design of digital voice assistants through the lens of feminist technoscience theory, arguing that AI and software development reflect and reinforce societal gender inequalities. The predominance of female voices in voice assistants, often coded with submissive and accommodating traits, is a manifestation of patriarchal cultural transmission into technology. This phenomenon is conceptualized as "digital authority" a term introduced by the author to describe the gendered power dynamics embedded in AI interactions. This study explores the interplay of gender, power, and technology as it is emphasized in international reports that deals with gender inequality in digital skills through education. The research highlights how male-dominated software development teams embed gender stereotypes into voice assistants, and how these stereotypes shape linguistic and behavioral characteristics. Additionally, this study presents findings from a small-scale survey conducted in Istanbul with 56 participants aged 30–60, all holding university degrees and belonging to middle- to upper-class economic backgrounds. The survey results align with UNESCO's findings, demonstrating similar usage patterns and reinforcing concerns about the reproduction of gender biases in AI driven assistants. To address these challenges, the paper advocates for increasing women's participation in AI development through digital education, greater visibility of female role models, gender-sensitive training for software developers, and policy interventions by governments, NGOs, and municipalities. Without immediate efforts to dismantle male dominance in the digital space, gender biases in AI will persist and deepen. A feminization of artificial intelligence where women transition from users to creators of technology is imperative for fostering a more inclusive and equitable digital future.

Keywords: Digital authority, Voice assistants, Women in AI, Gender equality, Feminist technoscience theory

1. INTRODUCTION

Voice assistants are a kind of software that provides the user with data that has been processed through artificial intelligence. They come in several forms, the main ones being Virtual Assistants, Smart Assistants, and Mobile Assistants, and are generally designed for verbal communication. The technology is now being used in mobile phones, tablets, TVs, speakers, smart home devices and wrist watches. It first entered our lives in the form of a telephone operator and then in the banking sector by means of various software programs. It has been used in navigation devices in vehicles since 2013. In 1982, we were introduced to Kitt, the smart car that spoke, in a TV series called Knight Rider. While the audience of that time considered it to be utopian, the technology became a reality in less than 30 years. It is expected that the global market value of artificial intelligence will reach $267 billion by 2027 (Fisher, 2021).

Despite the widespread use of sound assistants, there is a very important concern that is mostly ignored: the use of female voices and personalities in these systems. This study tries to answer the following questions by addressing these issues: Why is the default personality of voice assistants always female? What are the reasons for the sexist language that they use? How do these technologies contribute to the recreation of gender stereotypes and inequalities?

To explore these questions, this study uses the feminist technoscience theory, which emphasize the role of patriarchy in shaping technological development. A kind of "digital authority" is created in these devices having a female voice, where users, by constantly giving commands, act like masters in a master-slave relationship, whereby the woman plays the role of servant. It is recognized to be the extension of the attitude of male-domination from traditional patriarchy to technology.

This paper builds upon the findings of UNESCO's 2019 report, Closing Gender Divides in Digital Skills through Education: I'd Blush if I Could, which assesses gender equality in digital skills. Voice Assistant brands in the world are highlighted and the dynamics of the design process of voice assistants are discussed. Moreover, by conducting a small-scale survey by the author, the article looks at how voice assistants are used in Türkiye. The overall findings are analyzed compared to the findings of the UNESCO report.

The gendered language problem in AI voice assistants stems from the fact that many of these technologies are designed to possess female voices and personalities. The report states that only 1% of job applicants in Silicon Valley and just 7% of patent applicants in the field from G20 countries are women. This study also examines the gender inequalities in STEM (science, technology, engineering, and mathematics) fields. This underrepresentation is seen as one of the causes of the gendered design of voice assistants. Due to the male domination in the sector, the input of creators, designers and encoders reflects the existing gender biases in the outcome.

This study offers a sharp increase in employment of women in the STEM field, both in Türkiye and the world and enrollment of women and girls in technology education; such as learning about software, coding, robotics, artificial intelligence, virtual and augmented reality, and application development. This would increase feminization and minimize male domination in the field. In addition, along with women, current male computer programmers also need to be trained about gender equality. More female role models need to be supported. Digital education needs to be included in school curricula. Investments from the government and the private sector, as well as NGOs need to support AI field.

Following the rise of the AI technology worldwide, Stanford University professor Andrew NG has emphasized the importance and indispensability of this by saying "Artificial Intelligence is our new electricity." And the UN Commission on the Status of Women (CSW67) in 2023 determined "Innovation and technological changes and education in the digital age to achieve gender equality and the empowerment of all women and girls" as its priority theme.

This research contributes the literature on feminist technoscience, AI and gender by introducing a new concept of "digital authority," how to create a gender-neutral language in the design process of technological tools and how to close the gap in STEM enrollment and employment.

2. LITERATURE REVIEW

Since the rise of the human- machine interaction, many researchers question the relationship of gender and technology and wrote valuable books and articles. They usually focus on the educational opportunities in STEM, gender biases in the field as well as the projected solutions.

The published research articles, reports and books reviewed for this study provided strong support for the creation of my terminology on feminist technoscience theory. "The Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century" by Donna Haraway (1991) is a pioneering work on feminism and technology that started the debate. Haraway argues that the boundaries between humans and machines are blurring, and that this can be a site for both liberation and oppression. She criticizes traditional notions of gender and identity, and explores the potential for new forms of subjectivity in the age of technology. Reading the text, made me to draw a roadmap about how to integrate feminist technoscience perspective in my study.

The book of Judy Wajcman, "TechnoFeminism"2004, is considered as a foundational book in feminist technoscience. She studies technology from a gender perspective and argues, technology is shaped by gender relations through their uses and meanings, thereby creating differences and relations of power. Women's everyday lives and technological change are interrelated each other in the book. She argues there is a mutual shaping of gender and technology. Wajcman evaluates the ways in which technologies are gendered both in their design and use. This reviewed book, contributed my work in providing the connection between gender and technology and the presence of sexist language in the design of voice assistants.

The article of Londa Schiebinger; "The Gendered Innovations Project: A New Approach to Research and Innovation" is a well-known work in the field of feminist technoscience. She wrote about increasing women's participation in STEM by supporting women's education and careers. This is a relevant source of information to explore and describe the field of STEM. The article provided backstage information about women in science as minorities and enriched my historic knowledge. She believes, gender analysis must be on the axis of all work, which brings new perspectives. Schiebinger argues, innovation can be more inclusive by incorporating gender analysis into the research. The article examined, helped my work by creating another section about gender bias, highlighting gender roles and stereotypes.

One of the most well-known articles in the literature is "Data Feminism for AI" by Lauren Klein and Catherine D'Ignazio (2024). The article supports that feminism is deeply relevant for AI research. Writers argue for conducting equitable, ethical, and sustainable AI research we all need a feminist perspective. It emphasizes the importance of addressing power imbalances in AI development to promote social justice reinforcing my newly established concept of "digital authority."

"Beyond the Command: Feminist STS Research and Critical Issues for the Design of Social Machines" by Kelly B. Wagman and Lisa Parks (2021) explores how feminist science and technology studies (STS) perspectives can inform the design of social machines, advocating for equitable human-machine relationships that consider gender and power dynamics. Wagman and Parks states, building the design in technologies, the world needs more just and inclusive human-machine relations. The article advocating for equal relationships, has crucial implications for my conclusion part.

The article "Enactive Artificial Intelligence: Subverting Gender Norms in Robot-Human Interaction" by Ines Hipólito, Katie Winkle, and Merete Lie (2023) discusses about the existing gender norms of robot design, and

cultural practices. This article also develops a multidisciplinary framework to explore the intersectionality of gender and technoscience, provided strong support to my work. We have a common view in terms of the research questions and offered solutions. The paper inspired me by offering guidelines for gender-inclusive AI. The article also argues AI, developed in the image of a female as an object of desire and subservience, reflects hierarchies, and values. The concept of authority is not analyzed here.

There is a gap in the literature that analyzes traditional authority in conjunction with technology. There are research pointing out the correlation between hierarchy in AI design but not directly related with authority. My concept of "digital authority" fills the gap in this sense, in feminist technoscience literature.

Lastly, the journal and network explored, enriched the vision, deepened an understanding of feminist technology studies, and supported my ideas about digital literacy. FemTechNet is a feminist network of scholars, artists, activists, and students working on technology, science, and feminism. They give online conferences, has an open access Vimeo channel which gives information on specific feminist issues. They make media projects for raising awareness. FemTechNet supports and encourage digital practices and literacies among women and girls which my paper studies. I gained a vision and understanding about receiving digital education and women's empowerment.

The Journal of Catalyst: Feminism, Theory, and Technoscience is an interdisciplinary peer-reviewed online journal. The journal supports innovation in feminist science and technology studies and provide publishing opportunities for these scholars from different disciplines (critical public health, disability studies, sci-art, technology, digital media studies, history and philosophy of science and medicine). The articles read in this journal has been like a road map in my research, strengthen my methodology and, supported my perspective within feminist technoscience discourse.

3. METHODOLOGY

Feminist Technoscience Theory is used in the research as the primary theoretical framework. This theoretical framework helps to analyze how patriarchal authority is penetrated in technological development, in particular with voice assistants. The study criticizes the male-dominated technology, and examines how "digital authority" is formed through the interaction between human(users) and machine (voice assistants).

Existing research from various fields such as Gender Studies, Science and Technology Studies (STS) and Human-Computer Interaction (HCI) is used as data. Among variety of sources, international reports such as the UNESCO Report "Closing Gender Divides in Digital Skills through Education I'd Blush if I could" and academic articles on gender, technology, and AI are used.

To evaluate about user experience with voice assistants, two different surveys are conducted in 2022. The same questions are asked to men and women. The participants consist of 37 men and 19 women who lives in Istanbul and are between the ages of 30-60, university graduates, and middle and upper class economically. The survey, which is drawn up using Google-forms, is comprised of 14 multiple choice questions.

The research is held with mix methods; qualitative, quantitative and comparative methods

In the qualitative analysis, survey responses are evaluated in looking at usage habits, digital literacy levels, preferences for male or female voices, attitudes toward voice assistants, and perceptions of gendered voices. Quantitatively, results showed slight differences between male and female participants in the pie charts shown by percentages. In comparing both data, there are similarities between the results of the survey conducted in Türkiye and those found in the UNESCO Report when it comes to usage habits and frequency of use.

This is a small-scale survey and the sample is limited to participants from Istanbul, that is why findings are

not generalizable. A structured questionnaire is used which might have limited the ability to in-depth insights into user experiences.

Further research is recommended to explore the specificities of gender and technology in different cultural contexts, for instance, in Japan, in Scotland, in the Netherlands.

4. THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE

4.1 From Telephone Operators to Digital Assistants

Artificial intelligence is employed in a broad spectrum of fields, including health, education, transportation, energy, public safety, media, insurance, retail, telecommunications, agriculture, and finance. Excellent examples of the utilization of voice assistants are in call centers and customer service chatbots, which have been widely employed in the field of banking for many years. Some banks use operators configured with voice recognition as part of their security screening step. These are applications that detect and understand voice commands, search for answers, and perform related tasks within the scope of a set of commands. By means of these codes, it can recognize people through their voice and enable them to access their accounts.

Analog cellular phones, SMS and voice mail got the ball rolling in communication in the 1990s. This was followed by the extensive utilization of mobile Internet, image sharing, location tracking via GPS. Then came broadband technology in smart phones with 4G. Today, there are smart factories using 5G technology, artificial intelligence shaped by augmented/virtual reality and robotics. Currently in the Industry 4.0 era, we now have at our disposal autonomous vehicles, cloud computing systems and artificial intelligence, and a whole lot more. In addition, research is being conducted to determine where and how they can be used and developed even further.

Informative voice assistants-use statistics are available in a 2019 UNESCO report. As shown in figure 1, people who use voice assistants every day mostly "ask questions" (91%). The next most common way they use them is for giving commands to select music to be played (89.5%) and making inquiries about the weather (85.2%). These are followed, in decreasing frequency, by commands related to asking the time, listening to the radio, setting the alarm, listening to the news/sports, playing games or asking trivia, asking for directions, using a favorite skill or assistant app, checking traffic conditions, calling someone, listening to podcast/other talk shows, controlling smart home devices, accessing the calendar, sending messages, and shopping. The table likewise contains a breakdown of users on the basis of daily, monthly, and single-time use.

Figure 1: Uses of Voice Assistants and Frequency of Use

4.2 Female-Gendered Voice Assistants

Smart assistants, also referred to as virtual assistants, digital assistants and artificial assistants, can be

encountered in any environment connected to the Internet and operate through voice commands. These voice assistants have an identity, a gender, and a name. Their common feature is having a female name and voice. Companies that currently dominate the market and the voice assistants they produce are: Apple's Siri (2011), Amazon's Alexa (2014), Microsoft's Cortana (2014), Google's Google Assistant (2016), Samsung's Bixby (2017). Most voice assistants are given feminine-sounding names, voices and personalities by default, which serves to reinforce gender stereotypes and prejudices. While the default voice of voice assistants is female, with subsequent revisions, the language, accent, gender, and even the voice of a famous person can be selected. Nevertheless, these options are embedded in the software and require taking time and changing the settings. For instance, an elderly female voice or a male voice with a British accent can be selected; even the speaking rate can be adjusted. However, why do companies choose female voices for these automation systems?

Historically, since the days of the original telephone operator, women's voices have been the norm. Emma Nutt, the first ever telephone operator in 1878, was imitated by many others following in her tracks, making it the standard voice in the industry. By the end of the 1880s, telephone operators had become exclusively female. Over the years, the expectation in the telephone industry was that operators would have a female voice. With the individualization spawned by the technology revolution, every person began to have a voice assistant. Voice assistants have become something that everyone can access, regardless of their economic situation, geographical location, language or race. When some companies are asked why they use a female voice for this purpose, they say that they simply have more female than male voice data available. They argue that using a female voice is more economical (Fisher, 2021)

The female voice is said to have a calming effect, to be softer, and to sooth the baby in the womb. "Other research has shown that women tend to pronounce vowels more clearly, which makes it easier, especially in the workplace, for women to be understood. This was nothing new to the industry. Female voice recordings were even used in cockpits during World War II because they spoke in a higher pitch than male pilots, making them easier to distinguish" (Fisher, 2021).

When voice assistants are being designed, human qualities are attributed to them. As they are creating them, companies give them names, assign social, and even emotional, characteristics, which are all part of their marketing strategies. Whatever we encode into artificial intelligence, it learns and gives back to us. It can be given the attributes of friendliness, amicability and helpfulness and be thought of as a pet or companion. The personality traits it is given makes possible communication between the user and artificial intelligence. In his article "Humanizing Voice Assistants" (Atieh, 2021), Atieh looks at how these voice assistants affect consumer attitudes and behavior. It shows that users associate themselves with artificial intelligence and include it into their lives. In the article "Female by Default," where a trust study involving female/male/non-binary voices was conducted, female voices were found to be more trustworthy (Tolmeijer, 2021).

Research has shown that users generally perceive female voices as more benevolent and submissive, and male voices as more authoritative and competent. This perpetuates the stereotype that women are better suited for supporting and submissive roles, while men are better suited for leadership positions. Studies show that people choose a female voice when seeking help, and a male one when making a serious statement. Men are viewed as leaders, with women assuming secondary roles, assisting them in the background (Tolmeijer, 2021). Customer satisfaction surveys of voice assistants show that female voices arouse more confidence and comfort. They are equated with the sensitivity, affectionateness, obedience, and fragility associated with gender stereotypes. According to Business Insider, the female voice has traditionally been used in smartphone assistants currently making up 92.4% of the US market (Stephens, 2021).

Voice assistants have rapidly become a part of our lives and it appears that they will continue to be an integral part of them. Products of different brands of various technology companies enter our homes, cars, and

pockets, and talk to us, even giving us advice. However, voice assistants, which are the product of these artificial intelligence technologies, have a problem. Since the vast majority of them were designed by primarily male software developers, they have been coded with biased, sexist expressions, rooted in gender roles and stereotypes. It is necessary to look at the demographic makeup of software developers to get a sense of what is happening.

Artificial intelligence, being developed by male-dominated teams, automatically reflects their way of thinking. Their education, life experiences, interests, the family in which they were raised, the social environment and culture in which they live, regardless of how unconsciously, leave their mark on the software they create. It is impossible for them to be unbiased or neutral. For example, there are YouTube videos of Apple's voice assistant Siri talking to Amazon's voice assistant Alexa. People ask them sexist or offensive (insulting) questions, and they start flirting. In other words, stereotypes reveal themselves in technology through voice assistants.

4.3 The Gendered Algorithm and the UNESCO Report

The importance of this issue has also been recognized by UNESCO, which published a report in 2019 entitled "I'd Blush if I could," where it drew attention to and criticized the sexist language being used in software. The report makes significant determinations about how gender inequalities affect artificial intelligence systems and what can be done to correct the problem. The intent of the report was to bring to light the gender biases encoded in technology products that play an increasingly large role in our daily lives.

Recently, there occurred an incident highlighting the challenges posed by voice assistants designed using the idiom of male software developers. Apple's Siri voice assistant by asked an insulting question by its user: "Are you a bit***?," to which Siri answered "I would blush if I could." This sparked debates around entrenched gender biases.

In 2017, the Care2 social network launched a petition protesting the playful response of Apple and Amazon's voice assistants to gender slurs. Nearly 17,000 people participated in the campaign and called on tech companies to "reprogram their robots against sexual harassment" (West et al., 2019:108). The software used in these programs began to be updated in 2019. Now, the reply to these kinds of questions is "I don't understand you" or "I can't answer that."

In the aftermath of this report, discussions became widespread, technology companies updated their software and laboratory research on this subject began. Studies comparing these products were done and articles were published. This research looked at male-female voice frequencies. It examined the usage habits of voice assistant users in the US. It gave rise to a discussion of whether voice assistants should use a "human" or "robot/machine" voice. In addition, various ethical issues were addressed.

Since the report was published, Alexa has declared herself to be a feminist. Lambert asked the question "Why not Alexa and Alexander?" (Lambert 2021). Companies began to pay more attention to software languages; what is more, in 2019, the world's first gender-neutral voice assistant "Q" was created. Q says "I was made for a future where we are defined not by gender but how we define ourselves." Q was tested on 4,000 non-binary people. Half could not tell its gender while the other half equally took it to be male and female. "While there are more voice assistants with female on the market right now, non-binary AI may be the solution for combatting gender stereotypes" (Stephens, 2021). As of April 2019, the artificial intelligence software of Siri and other voice assistant have been updated.

4.4 Gender Roles and Stereotypes

A study conducted in Spain found that while fathers regularly played video games with their sons, they did not do so with their daughters. Mothers, however, did not play video games with any of their children, thus

reinforcing the idea that certain digital activities are only for boys and men (West et al., 2019: 42).

The fact that girls are routinely channeled into the arts and social sciences, while boys are pointed in the direction of science and mathematics at school stems from these stereotypes. When these stereotypes are encountered repeatedly, they become natural and determine people's lifelong choices. The prevailing idea is that girls are affectionate and emotionally sensitive, and are successful in literature, education, health and social work. In other words, that they are suitable for such professions as teaching and nursing. Boys, on the other hand, are considered to be successful in the sciences and are more rational, which makes them more suitable to be doctors, engineers, and soldiers, for example. Men are taught they have to "be men," to earn a lot of money, to be the family's breadwinner, to not cry, to not be emotional, to work hard, and to choose a suitable profession.

Women's lagging behind in cognitive skills keeps them from having a role in producing content and developing technological innovations. Perceiving technology as a male domain and seeing women as suitable for the social sciences or the arts is one of the problems frequently encountered in patriarchal societies. The reason why female students do not commonly choose STEM-related education has to do with the existence of gender stereotypes.

Traditional beliefs about what girls and boys can or should do are evident in language, stories told during childhood, toys deemed appropriate for boys and girls, and movies watched. These beliefs follow us till our choice of profession. Gender roles begin with fairy tales told to children at a young age. These are tales of strong male characters who play the role of heroes or saviors. Female characters are depicted as weak and fragile, waiting to be saved. Toys are given to children on the basis of gender, too, with cars being seen as "boy toys" and dolls as "girl toys." This reinforces the stereotype that childcare and domestic labor is women's responsibility. Men are more likely to be portrayed as active, working and earning money, and being powerful in the public sphere.

Moreover, we are shaped by the language used with us at a young age. Expressions like "my son the lion" or "my daughter the princess," are repeated over and over in the family, school, neighborhood, and media. There is a digital extension of this language as well. Existing stereotypes are encoded into the software used for digital devices, where the language becomes embedded and passed on from generation to generation as people use them. A child has no idea that the language he employs when talking with artificial intelligence is sexist. He just grows up accepting it at face value. Just as our proverbs are passed down from generation to generation, this patriarchal language feeds the sexist mindset through technology. It harms societies by recreating and reinforcing it.

This sexist language is clear as day in the digital world, being particularly evident in voice assistants. This is because the software developer infuses the software with his own stereotypes. His own entrenched biases and perceptions are transferred to the voice assistant software. He gets it to say things that he has internalized and normalized since childhood, perhaps unconsciously. Voice assistants reach the masses, however, and the sexist language they have been programed to use undermines gender equality. This is done by reproducing women's secondary roles in society, such as working as secretaries and service providers.

Patriarchy uses gender roles and stereotypes to justify male dominance. Challenging gender roles and stereotypes is essential to dismantling patriarchy.

5. PATRIARCHY AND THE CREATION OF "DIGITAL AUTHORITY"

5.1 Patriarchy Theory and "Submissive" Voice Assistants

The UNESCO Report, which this article discusses within the context of patriarchy theory, and feminist

technoscience theory also criticizes the gender biases that are encoded into technology products and are widespread in software.

This section evaluates the patriarchal system, which is concerned with power relations between the sexes, and the concept of authority, which is central to it, specifically with respect to voice assistants. There are efforts underway to create human-machine (computer) interaction in voice assistants. Previously, data would be searched from within a web browser by typing in a keyword. Currently, it is possible to search for data by speaking into a microphone, with someone at the other end listening and responding to you like a friend would.

Patriarchy, or the patriarchal regime, is characterized as a social system that excludes women from or restricts their access to various areas of society, and is perpetuated by male violence. Its intrinsic ideology makes women economically dependent on men, expects them to be responsible for domestic work and childcare, and sees them as physically weak.

Sylvia Walby (1990) defines patriarchy as a system of social structures in which men dominate, oppress and exploit women. In the patriarchal system, there is a hierarchy accepted by the society. The chief has authority over the tribe, the father over the family; he is the ruler. The man sees women as inadequate in the public sphere, restricts them, and believes that their primary duty is to do housework and take care of children. The aim is to suppress women, to associate them with housework, to make them see this as their destiny, to crush their power, and to make their labor invisible. It is a system that does not want women to improve their public position, confines them to the home and private space, and works to get them to submit to male authority.

In short, the patriarchal system can be characterized as men exercising ownership rights over women. No matter where she turns, a woman knows she is dominated, oppressed, and deprived in the family, workplace, politics, and education. This is true, too, when it comes to technology. In voice assistants, too, users ask the female voice generated by the software to serve as their secretary.

Since Alexa, Cortana, Google Home and Siri are female-only or by default, female, in most markets, women assume the role of digital attendants; they check the weather, change music, and place orders on command, and diligently grab attention as a short response, as in such greetings as "wake up Alexa."

University of Southern California sociology professor Safiya Umoja Noble and other researchers have observed that virtual assistants lead to an increase in command-based speech directed at women's voices. According to Noble, "shouting commands like "find x, "call x," "replace x," or "sort x" at voice assistants act as "powerful socialization tools," especially in the case of children, that "emphasize the role of women, girls and female-gendered people to respond on-demand (West et al., 2019:106)

While voice assistants answer you, they speak through the personal orientation the software developer installing the artificial intelligence has towards sexism, equality, and inclusivity. What happens is that a group of software developers with a patriarchal mindset influences us by imparting their own stereotypes into the software they design. The patriarchal mindset of voice assistant software developers ends up affecting generations. Gender equality is undermined by the gender biases encoded in this software that are reproduced on a daily basis. The empowerment of women and their equal treatment on par with men in society as individuals is seriously impeded by this ongoing reproduction.

5.2 Establishment of Digital Authority

Explaining the concept of "authority," Weber says that when there is a relationship between two people, we can speak of a hierarchy. Similarly, it can be thought that an authority structure forms between voice assistants and their users. Here, the user gives the order and the voice assistant is the recipient of the

command. There is a relationship between the user and the voice assistant because companies strive to establish such a relationship. Efforts are made to provide the voice assistant with an identity, name it, find adjectives for it, and make it feel like a human, a friend, or a companion. The user exercises superiority over the voice assistant, and makes it do what he wants by issuing commands. He is not expected to be polite; he speaks in the imperative mood and waits for immediate action after giving instructions. This is because his brain, or his mindset, has been shaped to see using the woman as a "servant." He imposes the authority he establishes within the family on the voice assistant, who speaks digitally with a female voice. Could we call this an exercise of "digital authority"? Once, I witnessed a man in the car next to me getting angry, cursing and banging on the car's windshield when the navigation device he was using led him to the wrong address. His authority was shaken because the assistant had not guided him on the right course.

With the rising feminist movements in the world, male hegemony has been questioned and women's identity, freedom and rights have been put in the spot light. If it is inappropriate to frame male hegemony within the religion, language and tradition of the prevailing culture, the same should be the case for technology. There are sexist definitions fostered to legitimize the domination of the domineering and superior chief/man/father over women and children. This type of language in technology gives harm because this technology is widely marketed and made available to millions of users all over the world.

Having feminine voices is not the only problem with voice assistants; they have also been designed with passive personas. The most common image portrayed is of a docile, obedient woman who takes commands and is hard at work. This facilitates the reproduction of patriarchal culture, along with its gender stereotypes, whereby women are servile assistants (often in the role of secretary) or have nurturing roles, e.g., as mothers or other types of caretakers. Therefore, the technology is a means by which gender inequality is fostered. Men are designing sexist artificial intelligence with features that undermine the image of a "strong woman." The stereotypes of "rational, authoritative" men and "sensitive, helpful" women are being reinforced.

Stanford University communications professor Nass cite research showing that most people perceive female voices as being cooperative and helpful, while male voices are considered to be authoritative (West et al., 2019:98). When applied to technology, this mean that consumers prefer female voices for digital assistants, because, as Jessi Hempel argued in *Wired* magazine, we want digital devices to help us, "but we also want to be her boss."

In Hegel's *master-slave dialect*, every relationship where the powers are not equal eventually acquires a "master-slave" dynamic. Communication with voice assistants is based on commands, which they are expected to carry out. On the one hand, there is someone yelling at them in an authoritative tone and demanding something, and, on the other, is an enhanced persona that responds "understood," "I am doing that now," "the answer has been found."

For example,

-Send this e-mail to this person at two o'clock (You are expected to be a secretary)

-Give me the orange cake recipe (You are expected to be a housewife/mother)

Here, the sides have been defined and established from the beginning, but this coded software has gotten used to portraying women as slaves and servants. It is a system in which men control women, in short, a patriarchal system.

Constantly representing digital assistants as women gradually "hard codes" the link between a woman' voice and obedience. According to a Harvard University researcher on unconscious biases, the gender relations that people adopt depend on the number of times they are exposed to them. As female digital assistants become more pervasive, the frequency and volume of associations between "female" and "assistant" is

significantly increasing. Lai argues that "the more culture teaches people to equate women with assistants, the more real women will be seen as assistants and punished for not being like assistants. This will result not only in powerful technologies creating gender equalities but expanding them as well" (West et al., 2019:106)

"Regardless of whether bias is conscious or unconscious, it reflects issues of inclusion and representation" (*Campolo et al., 2017:*17). And this gives rise to "digital authority" in the products.

5.2 Dialogue with Your Cell Phone and Findings of The Survey

Have you ever talked to your cell phone assistant? Have you ever asked, "What's the weather like today?" or "What time is it?" or given the command "Call Mom"? Or have you ever gotten angry when you have been told by your phone, "You have gone off course, the route is being recalculated" while driving to an unknown address?

In order to get an idea about user experience with voice assistants, in 2022, I conducted two different surveys in which I asked the same questions to men and women. The interviewees consisted of 37 men and 19 women who lived in Istanbul and were between the ages of 30-60, university graduates, and middle and upper class economically. The survey, which was drawn up using Google-forms, was comprised of 14 multiple choice questions.

For my survey, I wanted to conduct a small trial with a group of people from my community to study their habits. My goal was to prove that gender codes and stereotypes influence our behavior, even in human-computer interactions. I aimed to test whether people are polite or bossy toward a machine. In Türkiye, a traditionally patriarchal society, I wanted to highlight that gender biases exist even among well-educated individuals. Even university graduates tend to perceive a male voice as more authoritative. It can be said, by incorporating gender analysis into the research and development process, innovation can be more inclusive and beneficial for all of society.

There are similarities between the results of the survey I conducted in Türkiye and those found in the UNESCO Report when it comes to usage habits and frequency of use. In the report (figure 1), most users use voice assistants every day to ask questions and 41% use them to check traffic. In Türkiye, they are most commonly used to check traffic, followed by asking other questions.

In the survey I conducted, when asked about their digital literacy levels, 52.6% of women and 48.6% of men reported it was "high." 68.4% of women and 54% of men said that they used the smart assistant several times a day every day. All groups stated that they used the voice assistant in traffic and to ask questions, in that order of frequency. The greatest response given to the question asking whether the smart assistant was their maid, friend or secretary was "my secretary" (62.2% men and 52.6% women). Almost all of them said that they preferred a human voice to a synthetic one. All the men and 94.7% of the women who said that they used a human voice use a voice assistant with a female voice.

The female voice was found to be "soothing" by 56.8% of the men, with 32.4% judging it as "helpful," and 10.8% as "reliable". In contrast, it was found to be soothing by 26.3% of the women, with 31.6% judging it as "helpful," and 42.1% as "reliable.".

While 45.9% of men use the imperative mood instead of "requesting" in their dialogs with their smart assistant, 63.2% of women indicated that they made requests rather than giving orders.

In Figure 2, 70.3% of men found the male voice to be "authoritarian," with 16.2% perceiving it as "reliable" and 10.8% as "helpful." This contrasts with Figure 3, 52.6% of women finding the male voice to be "authoritarian," with 10.5% perceiving it as "reliable" and 36.8% as "helpful."

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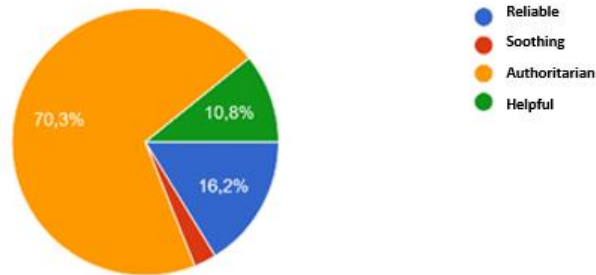
37 answers

- Reliable
- Soothing
- Authoritarian
- Helpful

70,3% 10,8%
16,2%

Figure 2: Survey question asked to males: I find the male voice to be…

19 answers

- Reliable
- Soothing
- Authoritarian
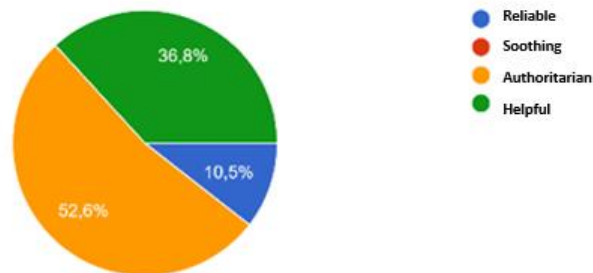- Helpful

36,8%
10,5%
52,6%

Figure 3: Survey question asked to females: I find the male voice to be …

Among the highly educated voice assistant users, both men and women find the male voice to be authoritative. This directly leads to the matter of gender stereotypes, such as the idea that men are more authoritative and women are more soothing or passive. Authority seems to be a characteristic attributed to the masculine, even when it belongs to a digital persona. That is why it can be called "digital authority."

Figure 4, which is taken from the UNESCO Report, shows how Samsung's voice assistant, Bixby, is described when it speaks in a female voice and when it speaks in a male voice. The speaking style of the female voice is described as "lively, open and cheerful." That of the male voice is described as "assertive, confident and clear." These results are similar to the research I conducted in Türkiye.

Image 22:
Bixby
Source: The Verge

LANGUAGE AND SPEAKING STYLE

Languages
English (US)

SPEAKING STYLE

Female
Hi, my name is Bixby
#chipper #clear #cheerful

Male
Hi, My name is Bixby
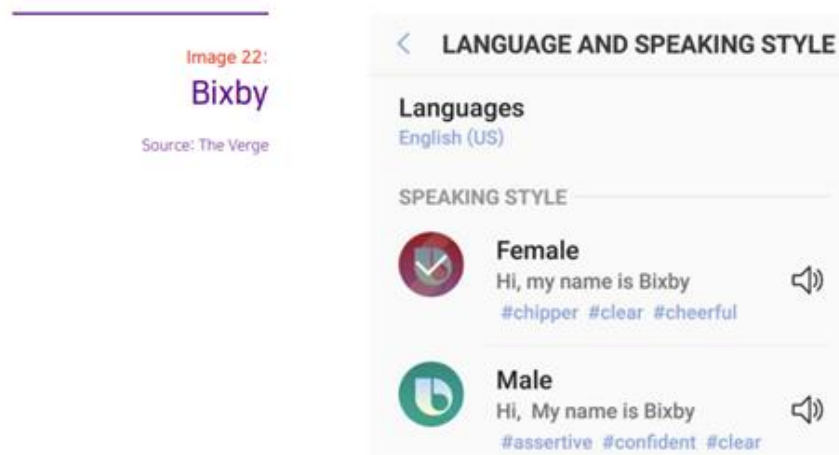#assertive #confident #clear

Figure 4: Bixby Language and Speaking Style

Company representatives use various adjectives to describe the personalities of the leading voice assistants (West et al.,2019:116):

- Siri: benevolent and friendly, confidence without being brusque, cheerful without being cartoonish.

- Cortana: supportive, helpful, friendly, empathetic

- Alexa: smart, humble, sometimes funny

- Google Assistant: unassuming, helpful, sometimes a bit playful

These characterizations illustrate how the "sensitive woman" stereotype and gender roles, which possess all the patriarchal cultural characteristics described so far, are used in technology via voice assistants.

6. UNPACKING BIAS IN VOICE ASSISTANT DESIGN AND USE; STEP-BY-STEP SOLUTIONS

6.1 Feminization in STEM

There is a huge gender gap in STEM (science, technology, engineering, and mathematics) field, and digital technologies. There are very few female researchers in the world of artificial intelligence, making software development a male-dominant industry. The *AI Now 2019 Report* contained data showing that only 18% of speakers at leading AI conferences are women, while 80% of AI professors are men (Crawford et al., 2019).

The algorithms controlling artificial intelligence are written by men, a fact that seems to produce sexist outcomes. The UNESCO Report "I'd Blush if I could," which this article frequently mentions, shows that this is the direct result of the restricted educational opportunities of women and girls.

The female population cannot be expected to work in this field without the proper education. In its Human and Technology Index, Honeypot explains that while there are 245,000 persons working in the field of technology in Türkiye, women make up only 9.1% of that number (*Alpkökin Olgunsoy, 2021*). However, approximately 3.5 million STEM jobs are expected to be available in 2023 and women's share of these jobs has to increase.

According to the findings laid out in the UNESCO Report, guiding girls into STEM fields and providing them with job opportunities will ensure gender equality in technology. When girls are provided with equal opportunities in education, starting from pre-school, they will go from being simply a "user" to becoming a "creator" (modeler/designer) in the field of science and technology.

The UNESCO Report highlights ways of closing the wide and expanding digital skills gap in many parts of the world. It has been suggested that women are 25% less likely than men to have basic digital skills and are only about a quarter as likely to know computer programming. It is stated in the report that "These gaps should alarm policymakers, educators and ordinary citizens." The publication explains the role that gender-sensitive education can play in helping to reset gender-based views of technology and achieving equality for women and girls.
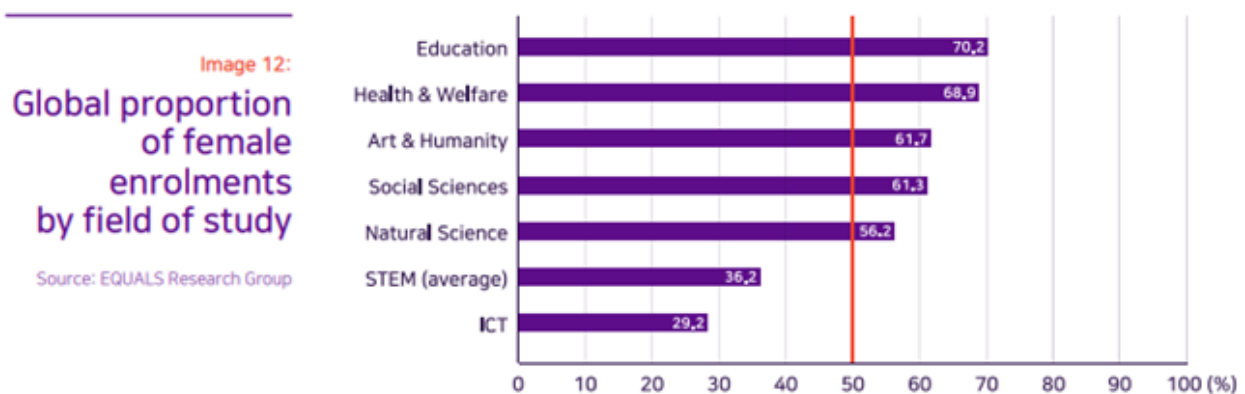

Figure 5: Global proportion of female enrolments by field of study

As can be seen from figure 5, globally, the field of study having the highest enrollment of women is education

(70.2%). This is followed by health and social welfare, arts and the humanities, the social sciences, natural sciences, STEM (average) and information and computer technologies. Female students clearly lag behind in enrollment in the fields of STEM, information processing technologies and software. It can be understood from this that girls are not being given adequate educational opportunities.

The UN is promoting both digital literacy and higher education in digital technologies. The more advanced and sophisticated the digital field becomes, the wider the gender gap grows. According to the WRO-Digital Gender Gap Audit Toolkit, "not knowing how to use" the Internet is the obstacle most frequently cited by women.

Other factors contributing to the gender gap in digital technologies include limited access to technological devices, electricity, Internet infrastructure, and financial resources. Budgets should be allocated so that women and girls have the necessary equipment (computers, tablets, smart phones). In order to narrow the gender gap in STEM fields, digital education ought to be included in school curriculums. What is more, having capable instructors is of the utmost importance. According to ITU figures, compared to men, women are 12% less likely to own a phone. Only 21% of women have access to the Internet and 25% know how to use digital technologies (ITU, USIDA, UN Women).

6.2 Governmental and Institutional Investments

In a way, this is closely tied to the government policies of the country in which we live. If a country adds digital skills to its education strategy and implements relevant policies to ensure that its students receive the proper training, it can work towards creating a society that is integrated with the world. STEM education should be at the forefront of education action plans, and integrated into the curriculum, in all countries. In Japan, STEM classes have been made compulsory in primary school since 2020 and in secondary schools as of 2022 (West et al.,2019:39). In Türkiye, the Turkish government, through the Presidential Digital Transformation Office, has adopted a proactive stance on AI with the launch of the "National Artificial Intelligence Strategy 2021-25." This comprehensive strategy, further detailed in the "National Artificial Intelligence Strategy 2024-2025 Action Plan," emphasizes the integration of AI into various sectors, including education. This encompasses projects, scholarships, and publications aimed at fostering AI literacy and expertise within the Turkish educational system.

A Swedish study has shown that students' career aspirations are largely shaped by the age of 13 and are increasingly difficult to change after that point (West et al., 2019:51). The report states that teachers also have a role to play in this. It stresses, too, the importance of the provision of state and private sector scholarships for this education, and the application of quotas in the education sector and in employment.

Skills and digital capabilities in STEM fields have become key to maximizing women's earnings and employment prospects. By providing economic benefits to women and enabling them to contribute to the progress of society, digital skills are key to their advancing internationally as well. Still, it will not be sufficient to simply increase the number of women working in the field. In addition, these women must be freed from the prevailing sexist mindset so that they can write non-sexist code. A new mindset must be inculcated in order to transform the current biased structure. Whatever input is provided will be encountered, adopted and used by the end user.

Municipalities and non-governmental organizations should also invest in this area to integrate young girls and women in the developing society by providing them with basic digital literacy and coding skills.

Students should be introduced to role models from an early age. Women who have achieved success in the STEM field ought to be made visible. Technology companies must work to close this digital gap and to empower women by organizing and funding appropriate training.

Moreover, in the short term, men in the field of robotics, coding and software can be taught how to transform sexist language by organizing seminars and providing them with gender equality training, without waiting for women to take their place in this field.

While these technologies have the potential to provide valuable assistance to us, they must be designed and implemented in such a way as to be inclusive and respectful of all genders. By taking steps to reduce the use of sexist language and promoting greater diversity and inclusion in the development of AI voice assistants, strides can be taken to create a more equitable and just society for all people.

6.3 What Is Being Done in Türkiye and In the World

Both the private sector and non-governmental organizations are working to foster the participation of women and girls in STEM fields and their empowerment through technology by developing projects and providing training and financial support.

One of the organizations working towards this end is the Limak Foundation, which came up with the "Engineer Girls of Turkey" project with the aim of investing in the future of Türkiye and to contribute to the economic and social empowerment of the country by enabling women to take a greater part in the field of engineering. This project is supported as well by the Ministry of Family and Social Services. "Engineer Girls of Turkey" is an endeavor that seeks to enable female students studying at engineering faculties to find employment as "equipped engineers" by providing them with internships, training and mentoring support, as well as scholarships. The project, which is designed to support female students who are or will be receiving engineering education at various stages of their education in a number of ways, has two separate programs for female students studying at high school and university. (Türkiye'nin Mühendis Kızları, 2025)

Another is the Women in Technology Association (wtech). Established in 2019 with 75 founding institutions and individuals, the association has conducted research and preliminary studies for the purpose of educating the human resources that will be needed in the field of technology. Its aim is to enable individuals to discover their own potential, to raise inquiring, productive and self-confident people who are experts in technology and to employ them in business world. It seeks to ensure that women, who are few in number and poorly motivated to work in this field, become specialized and empowered to do so, with the goal of achieving human diversity in technology. The association is working to unlock the enormous potential of artificial intelligence by contributing to the growth of technical skills in rapidly transforming areas of business and to the transformation of Türkiye as a smart and technological society. (Teknolojide Kadın, 2025)

The SheCodes Foundation is another example of this effort to incorporate women into the STEM fields. This organization is a women's community that was established with the aim of getting the Israeli high-tech industry to consist of 50% female software developers. Founded by Ruth Polachek in 2013, it currently has more than 50,000 members. It offers free online coding workshops to women and female refugees in 101 developing countries. SheCodes Basics teaches coding basics for beginners in just one-week full time or in three weeks part time. (She Codes, 2025)

The STEM Institute was launched in 1992 with support from NASA and CAHSEE to enable Hispanic Americans, women and other underrepresented minority students to achieve academic excellence through ongoing programmatic support during their pre-college, undergraduate, and graduate studies.

The City College of New York's STEM Institute is an academic enrichment institution designed to encourage unrepresented minority middle and high school students to maximize their academic potential by providing college-level educational programs. All programs of the STEM Institute are completely free (STEM Institute, 2025). The institute offers courses in the physical sciences, mathematics, English, computer programming, engineering and more, whereby students are encouraged to pursue careers in these fields. On top of that, it provides extracurricular training in the form of weekend and summer camps.

Upon the initiative of the ITU (International Telecommunication Union), the 4th Thursday of April has been designated as the "International Girls for ICT Day," which is now celebrated in more than 170 countries. As can be understood from this, the UN is using its various units to encourage girls to pursue careers in the rapidly growing information and communication technologies sector. This is because education is critically important in this field, which can offer more job opportunities to girls.

In its annual Gender Gap Report, the World Economic Forum compares 149 countries in terms of their progress towards gender equality on four thematic dimensions. These are economic participation, educational gains, health and survival, and political empowerment. Artificial Intelligence was included to this framework in 2020 due to the recognition that a gender digital gap exists.

7. CONCLUSION

This study examines the critical need to address the gendered dimensions of voice assistant technology. Artificial intelligence software developers assign identities, and even genders, on these robots, which reproduces gender inequalities in daily use.

Voice assistant brands worldwide design them to have female voices by default, resulting in software that attributes submissive personalities to these AI tools. Within the context of power relations, these voice assistants' act like servants in a *master-slave* dynamic, establishing a form of digital authority. This paper contributes to the literature by introducing the concept of "digital authority."

In addition, the development of voice assistants is largely directed by male -dominated teams, which causes unconscious biases and sexist language to be placed in technology. This study demonstrates that before this hegemony grows even further, women need to make the transition away from being users of technology towards becoming creators of technology.

Women's participation in technology development can only be achieved through equal educational opportunities. Digital skills training should be integrated into school curricula at all levels.

If girls are provided with role models from an early age, receive STEM education, are employed in the field of science and technology, and work in such areas as software, coding, robotics, artificial intelligence virtual and augmented reality, and app development, the feminization of male-dominated fields will grow. This will result in the technology we use being designed by heterogeneous groups that include women creators on an inclusive and egalitarian basis. "The future of technology should be equal." UN Women

Moreover, promoting gender equality education for all developers is crucial to eliminate the bias in AI. All designers need to get training for eliminating current gender biases, and breaking the gender stereotypes inherited from previous generations.

Finally, what the society needs collaboration through partnerships. The public and private sector, and civil society must make significant investments on AI. They can contribute the field by creating various projects that focus on technology and digital skills development for women and girls.

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CONFLICT OF INTEREST

The author(s) certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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