The Dhaka University Studies, Part-D, Vol. 42, No.2,
December 2025, 85-100

Reinstating Gender Norms Through Humanoid Robots: Inventors' and Users' Perspectives

Md. Mynul Islam[1]
Sabiha Yeasmin Rosy[2]
Gulay Jannat[3]

ARTICLE INFO

Article history:
Date of Submission:27-02-2025
Date of Acceptance:08-05-2025
Date of Publication: 24-03-2026

Keywords

Gender norms, Humanoid robots, Inventors, Users, Socialization.

ABSTRACT

This study explores how gender norms and roles influence the design of humanoid robots (HRs) from the perspectives of inventors and users. HR designs reflect human behaviour, attitudes, and attributes in the technological domain, highlighting how socialization shapes everyday interactions with robots and the roles they play. The gender-biased socialization process and patriarchal structural learning mechanisms encourage men and women to perform gendered roles. The dominance of patriarchal ideals among the designers – mostly men – reinforces the stereotyped ideas fostering gendered behaviour and features of the robots. Based on the voice, appearance, and attributes, users identify robots with masculine or feminine identity, preferring female robots to do care work and male robots to do communal work, which perpetuates the gender binaries. This paper is based on a secondary literature review, and the analysis reveals how socio-cultural norms shape the design and use of HRs, calling for a shift in the ideology of gendering robots to promote gender-neutral technological innovation.

Introduction

Humanoid robots (HR) are a complex anthropomorphic instrumental projection of human-like characteristics, behaviours, qualities, and emotions onto human-

[1] Assistant Professor, Department of Women and Gender Studies, University of Dhaka.
Email: mynul@du.ac.bd

[2] Associate Professor, Department of Women and Gender Studies, University of Dhaka.
Email: sabiha.rosy@du.ac.bd

[3] Assistant Professor, Department of Women and Gender Studies, University of Dhaka.
Email: g.jannat@du.ac.bd

Social Science Review [The Dhaka University Studies, Part-D], Vol. 42, No.2, December 2025
DOI: https://doi.org/10.3329/ssr.v42i2.88630

like machines. In today's modern, high-tech world, HR is envisioned to operate within machine-human relationships (Fukaya, Toyama, Asfour, & Dillmann, 2001). In recent years, there has been a significant increase in interest in HR in robotics and locomotion, driven by rapid technological progress enabled and sustained by engineers (Faisal, Velazquez, Laamarti, & El Saddik, 2023). HRs have been developed and marketed in different shapes and sizes, used exclusively in various scientific and industrial applications. In specific, due to their human-like shapes, these machines can use the same technologies and adapt to the same living environment as human beings. These machines are used across sectors such as research, technical advancement, personal assistants, caregiving, education, entertainment, search and rescue, manufacturing, health, and public relations. The human-like shapes also make these machines more compatible with the physical implementation of the Digital Twin (Faisal, Velazquez, Laamarti, & El Saddik, 2023).

As robots become part of everyday life in many societies, it is important to understand the gender dimension in robotic design, to attribute gender-specific features, and to examine how people are responding to this development. *Anthropomorphism*- attributing human qualities to non-human things – is an aspect that influences the human-robot interaction, where robots are developed to meet human expectations. Consequently, anthropomorphism or human-likeness includes physical appearance, communicative skills, capabilities, and intelligence, which create meaningful social interaction between humans and robots, especially for people who require domestic or other services (Beraldo, Battista, Badaloni, Menegatti, & Pivetti, 2018). These qualities, along with voice or behaviour are gendered, meeting the gender expectations in humans featuring masculinity and femininity. Similarly, there is an interconnection between gender-attributed designs and roles in humanoid robots following stereotyped attitudes and interactions between men and women (Nomura, 2016).

With the masculine and feminine appearance or attributes, the perceptions towards the robots are changed, since they are assigned with gender stereotypical tasks (Simon, Smitherman, Atchley, Davis, & Tenhundfeld, 2020). This way, dominant cultural paradigms and expectations can limit the generation of humanoid robots by incorporating orthodox gender norms through their shapes and sizes and promoting gender biases in the robotic industries. Consequently, the user responds differently to a robot based on their own gender and the gender of the robot, since perception towards gender typicality of a task may influence users' own understanding of a robot, their evaluation, and interactions (Kuchenbrandt, Häring, Eichberg, Eyssel, & André, 2014). According to social norms, as masculine identity is associated with traits such as rationality, intelligence, and competence, a study by Nass, Moon, and Green (1997) found that participants perceived male-voiced robots as more informative and capable of better evaluations than female-voiced robots. Meanwhile, female-voiced robots were considered more knowledgeable

in areas related to femininity. This suggests that gender norms are embedded in the socialization process and psychological perceptions, influencing even our interactions with machines.

In addition, female-voiced robots' dominance was less desirable than that of men. Interestingly, a male-voiced robot can trigger a large set of expectations generally imposed on men by the users, and the same can be applied to a female-voiced robot in setting feminine expectations. Similarly, manipulation of robot gender through a male or female voice brings different responses by people in terms of giving monetary donations (Siegel, Breazeal, & Norton, 2009). Siegel et al. (2009) find that participants preferred robots of the opposite gender, especially men likely to make larger donations to female robots. In addition, men rated female robots highly as trustworthy, competent, and engaging compared to the women who rated opposite sex robot. Thus, robot and human gender influence the interactions and relationship between them. These relationships or expectations comprehend the use of stereotypical responses of the users and depict that technologies are not gender neutral. Therefore, this paper engages the discussion on how gender identities can influence the attributes and actions of the humanoid-robotic industry, focusing on available secondary data on gender and Human-Robot interactions.

Progress of HRs Industry, Labor Market and Global Economy: Why do They Need Gender Identities?

In the era of modern technological development and expansion of the robotic industry, HRs are increasingly becoming an essential tool to increase financial benefits by reducing labour costs, especially in the manufacturing industries. From the 4th Century BC in Aristotle's time to the present, the development of HRs has evolved based on body shape, activities, movement, weight, and materials (Adelaide Robotics and Computer Science Academy, n.d.). HRs began to advance in the 1970s and gained substantial impetus in the early 21st century with the progress of evolving human-like features (Tong, Liu, & Zhang, 2024). Based on the development of HRs, we can divide the progress into three parts: the first stage is based on the development of HRs considering simple walk-based robots pioneered by Waseda University, the second stage is based on highly integrated system robots like Honda's ASIMO2000, and the third stage is based on breakthrough progress and achievement of HRs like Boston Dynamics' ATLAS robot (Tong, Liu, & Zhang, 2024; Saeedvand et al, 2019; Hirose & Ogawa, 2007; Kuindersma et al, 2016). The advancement of this industry is mostly concentrated on how inventors can give more specific and detailed work to have eye contact, face recognition, movement, response, and communication (Fung, 2019). In simpler terms, they are trying to achieve the different conditions and features that humans can perform.

Humanoid Robotics (HR) is an interdisciplinary research area that connects with computer science, electronics, artificial intelligence (AI), mechanics, and sensing (Tsiourti et al 2019). In various sectors such as industry, healthcare, education,

agriculture, and entertainment, humanoid robots are also expected to disrupt the traditional human labour market by reducing the need for human labourers (Steil et al 2004; McCartney & McCartney, 2020). This technological advancement is anticipated to bring both opportunities and challenges to the global economy, affecting human society in unprecedented ways (Fu et al 2021; Seba et al 2024). The incorporation of humanoid robots in the labour market is expected to reduce labour costs and increase production capacity at a much faster rate than human labour (Seba et al 2024). The cost of employing humanoid robots is projected to be less than $1 per hour before 2035 and less than $0.10 per hour before 2045, with humanoid robots being able to work more than three times as efficiently as human labour (Seba et al 2024). This shift will also change the nature of job conditions and requirements, as humanoid robots will not perform tasks in the same manner as humans, but rather according to the instructions given by the system.

Humanoid Robots (HRs) are advanced machines designed to closely replicate human appearance and behaviour (Yang, 2019). They are equipped with human-like upper bodies, hands, and legs, making them adaptable to human environments (Yuan et al 2023). Their bipedal mobility allows them to move efficiently in human spaces, and their advanced technology enables them to perform complex tasks (Chavdarov et al 2023). Despite being machines, HRs are designed to possess human-like gendered biological and social features, including body structure, names, assigned responsibilities, and even human-like hair. For example, in Tong, Liu, and Zhang (2024) article we see, the HRP-4C and HRP-4 are humanoid robots made in Japan, with the former having a female-shaped body and hair, and the latter having a male-shaped strong body and muscles. This gendered design raises questions about the necessity of replicating human gender identities in robots, as it may influence human-robot interactions based on gender-based behaviours. This gendered programming in HRs may not only replicate human appearance but also perpetuate traditional gender identities. Just as women face challenges in communication and progression due to their gender, female-featured HRs may also encounter similar treatment, being perceived as female robots rather than machines.

Gender Norms and Social Cultural Expectations for Human Beings

Norms refer to social values, conventions, ideologies, traditions, customs, culture, rules, beliefs, and attitudes, which are the reflections of everyday life and practice, determining power relations, or gender relations (Pearse & Connell, 2016). Norms identify a broader picture of relations, whereas gender norms focus on the differences between men and women, with a focus on how social norms influence or govern the interactions between them based on social rules, customs, or divisions (Pearse & Connell, 2016). The social norms are gender norms – to some extent – that can be agreed upon, as Cislaghi and Heise (2020, pp. 415-416) state –

> Gender norms are social norms defining acceptable and appropriate actions for women and men in each group or society. They are embedded in formal and informal institutions, nested in the mind, and produced and reproduced through social interaction. They play a role in shaping women's and men's (often unequal) access to resources and freedoms, thus affecting their voice, power, and sense of self.

This definition contemplates those social expectations or beliefs that enforce certain beliefs and actions due to sex and socially constructed gender rules assigned to that sex, which men and women perform and reproduce in everyday lives through practice (Cislaghi & Heise, 2020). Gender norms define how to behave, what is normal, and why particular actions are applicable for men or women as a result of socialization process. Gendered behaviours and actions are taught, enforced, and internalized through the social process of learning, institutions, and social rules. The gender socialization process starts at birth, when families treat the children differently based on sex and shape the identity and roles in a gendered way (Carter, 2014). The gender specific tasks create a division between allowing male children to develop masculine identity that fits "competency" cluster possessing the attributes as being logical, independent, capable, confident, whereas, female children are illogical, gentle, sensitive, quiet, dependent, passive, or less confident belonging to "warmth and expressiveness" cluster as part of feminine identity (Broverman, Vogel, Broverman, Clarkson, & Rosenkrantz, 1972). These attributes create gender hierarchies within each gender, valuing masculine identity more than feminine identity among the youth due to the discrimination involved with gender roles.

The divisions of labour associated with women's roles as caring, nurturing, and sacrificing individuals occupy a weak status compared to men's powerful, authoritative, and strong demeanour (Pearse & Connell, 2016). Unfortunately, the socially imposed and expected feminine attributes found in 1970s (Broverman et al., 1972) are still relevant today, since women are still responsible for care work and "doing a task associated with a specific gender creates and perpetuates meanings that define who one is and what it means to be a man or woman, or masculine or feminine" (Carter, 2014, p. 246). Carter (2014) also mentions that when gender specific tasks are performed, actors are doing gender through the practice. This practice is problematic due to the positive attitudes towards masculine attributes that subtly validate male authority and power over women. Society expects women to manage the household duties, and women still perform care responsibilities more than men across the world (van de Vijver, 2007). Gender, being the chief deciding factor of who performs what housework is pronounced through assigning women with female tasks – cooking, cleaning, laundry, and childcare, which men are unlikely to perform in everyday life (Forste & Fox, 2012). This happens because the development of gender identity is hierarchical, which puts men in a privileged position, although the construction of masculinity creates pressure on men to comply with

masculine roles (Connell & Messerschmidt, 2005). The gender norms are not only rigid for women, but also for men, which are embedded in social institutions and are reproduced by educational institutions, gender discrimination in employment and wage structures, discriminatory institutional structures, and lack of access to resources (Leaper & Friedman, 2007; Pearse & Connell, 2016). To bring a change, shifting gender norms is a challenging task, but a transformation "in institutional policies, people's narrative, power relations and media discourse" can uplift the social expectations assigned with gender identity (Cislaghi & Heise, 2020, p. 414). As in reality, women continue to perform household chores till date more than men, even though they earn the same or more than their male counterparts (Thébaud, Kornrich, & Ruppanner, 2021), indicating the sign of existing gender roles. However, women's increased employment has reduced their housework hours, but not the social expectations, gendered behaviours, and accountability attached to women's roles in home management. Thus, gendered expectations are kept in minds when HRs are designed, which can fulfill the gender role, compensating women's reduced work hours at home.

How Gender Norms are Transforming into Humanoid Robots: Inventors' Perspectives

Robots reflect the gendered pattern of behaviours, characteristics, appearance, and social expectations as the designers program them to carry out those features. Gender is the basic component to define robot's personality, especially when shaped with a feminine or masculine face and body, even when produced as a toy, tool, or commodity (Marchetti-Bowick, 2009). Designers, who are members of the patriarchal society replicate and demonstrate the gender norms; thus, they make the robots to function with socially accepted gender roles. Traditionally, men and women perform gender-segregated roles in family and society; nonetheless, the roles of humanoid robots are no different, rather have distinct gender attributes.

The cultural stereotypical roles and attributes enforce robots to adopt women's jobs or female dominated jobs such as housework, dish washing, window polishing, dusting and other similar cleaning tasks, wet cleaning, washing clothes, taking care of elderly or sick, or be a receptionist, if they have feminine physical features (Kuchenbrandt et al., 2014; Oestreicher & Eklundh, 2006). The gender – appropriate roles reflect the values assigned to both male and female and are reinforced through the creation of robots (Marchetti-Bowick, 2009). Marchetti-Bowick (2009) also mentions that in a demand-driven society, funding and efforts are invested mainly into two main types of services a robot can perform – one is household chores, and the other is care for elderly people. This approach is an indication of emphasizing the roles of women that exude femininity. Marchetti-Bowick (2009) discusses gender roles through the development of robot Aiko (Dream Computer Robot) by Trung (2013), a robot that can help elderly people by making tea or coffee for them, can read magazines, inform about the weather, or can remind them to take medicine on time. Aiko can feel physical sensations

and mimic pain, which can be a support to the people with physical disabilities. However, Aiko's appearance and feminine behaviour are as 'perfect' as women, where the inventor idolizes, creates, and represents femininity as a key selling point, considering women's roles are to please men (Marchetti-Bowick, 2009).

Consequently, a study found that a robot is identified as male due to its physical appearance, having been known as good, kind, social, and generous by both men and women. However, participants of that study found the 'male robot' more suitable to perform communication jobs such as speaking, listening, reading a story to a child, or greeting a human than doing household chores (Beraldo et al., 2018). Similarly, Aşkın, Saltık, Boz, and Urgen (2023) find in their study that the gendered actions of a gender-neutral robot give a robot either a feminine or masculine identity when it performs socially imposed women's roles or men's roles. This indicates that the stereotyped behaviour of placing men and women in certain positions depends on the presumed gender.

From the inventors' view, along with masculine and feminine appearance and features, they put emphasis on the designs related to voice, behaviour, and name, which contribute to the identification of gender. The perception regarding a robot's gender gets changed when there is a slight change in the shape of its lips or hair, and so does the change in assigning the tasks. Voice of the robots is an indicator to identify their gender (Simon et al., 2020), such as Google's Alexa or Apple's Siri, which are identified as women due to the voice and are designed to provide service. Alongside, in many places like shopping malls and airports, in order to announce or declare something, mostly we hear female voices through machines. The justification behind this is female voice develops a sense of comfort and dependency, which mainly reflects the socially assumed women's caring and nurturing nature.

Naming is also another significant part that started with the beginning of this industry to identify most of these humanoid robots either as men or women. For instance, in 1996, Tokyo University developed a full-sized humanoid robot, giving it a female name Saika (Konno et al 1996). It can hit a bouncing ball, catch a thrown ball, and grasp unknown objects by grouping. It is not clear what to do with the names of these humanoid robots. The name is not empowering these machines; the inventors and engineers can do it. The inventors gave machines names like - Manav (1994), Nadine (2014), Sophia (2016), Rashmi (2018), Vyommitra (2020), and Shalu (2020) – either female or male. Giving these machines human names is also connected to developing their body shapes; therefore, mostly feminine characteristics-based and named robots look very sexy and have a perfect body shape, which is not always possible for real women.

Consequently, Simon et al. (2020) refer to different studies in their paper while mentioning that participants could better evaluate a robot when its gender is matched to the gender-appropriate tasks it is designed to do. Female service robots, used in hotel settings, garner more attention and pleasure from the customers due

to its warm nature, and so do the robots made for care giving service sector (Seo, 2022). The design of female service robots and female voice assistants is the result of their increased preference than male robots.

By programming traditional gender norms and roles into humanoid robots, ultimately, inventors are creating a machine-based patriarchal society in the robotic industry directed and controlled by human beings with their patriarchal beliefs (Fung, 2019). These humanoid robots are machines that can only follow instructions but are not able to share their thoughts, feelings, and expectations. The in-built language programming systems help these machines to make interactions with human beings, and physical movement systems help these machines to move from one place to another place accordingly. This should be enough to advance the development of humanoid robots and to engage these machines in various tasks. However, the inventors have a prime focus on body shape, face, sexual identity, and gendered names, along with advancing the robotic industry.

Even the inventors are also developing 'sexbots' to meet sexual pleasure, which is highly unethical and gender biased. The development of sex robots can create gender differences and sexual assault. Sex robots as child bodies can create paedophilic disorder among children (Gonzalez-Gonzalez, Gil-Iranzo, & Paderewsky, 2019). A good number of feminists are also claiming that 'sexbots' can increase the rape culture because there is no consent and mutual understanding; rather, they highlight sexy figures of women and girls and their submissive nature (Gutiu, 2012 as cited in Gonzalez-Gonzalez, Gil-Iranzo, & Paderewsky, 2019). These gender differences are also related to the ways of financing, giving opportunities, and promoting work by the sponsors and top management in the robotics industry. At present, most sponsors are men, and they have preferences towards men engineers and masculine ideas (Fung, 2019).

How Gender Norms are Transforming into Humanoid Robots: Users' Perspectives

The socialization process is also the most significant aspect of understanding gendered interactions in terms of acceptance and management. The socialization process and sociocultural environment are significantly related to a human being's positive and negative attitudes, acceptance, and interactions towards HR (Cross, Hortensius, & Wykowska, 2019). Based on the socialization of men and women, they expect differently the domestic robots to perform, mainly following the gendered behaviour and norms, which means men's and women's needs are different from robots (Nomura & Nakazawa, 2017). Nomura (2016) also emphasizes similar understandings between boys and men in terms of their interactions with humanoid robots and girls and women in terms of their interactions with humanoid robots. Irrespective of age differences between boys and men, both have an interest in masculine traits of the robotic industry, and girls and women have an interest in the opposite of masculine traits. In fact, women can show less interest in social

robots – services designed for either platonic, intimate, sexual, or assistance – as they prefer emotional and humanlike connections (Kislev, 2023). Thus, women as users, tend to favour human-like robots.

The gender-biased socialization process and patriarchal structural learning mechanisms are responsible for encouraging men and women about the gender binary and performing the gendered roles given by the socio-cultural expectations, environment, and institutions. From early childhood, boys learn to be men by playing with and working with various functional instruments, such as guns, cars, and toy robots, whereas girls have less access to these tools (Rosy & Islam, 2016). Girls are taught to be women; therefore, they are encouraged to play with toy dolls—the structural process of making them human dolls—inactive, dependent, and sexual objects (Rosy & Islam, 2016). The socio-cultural recognition and acceptance of non-functional dolls and functional woman characteristics-based humanoid robots have been treated in the same way under patriarchal eyes because both represent women as docile, sexy, and emotional. Therefore, both human women and woman-characteristics-based robots have almost the same roles in interactions due to orthodox social expectations (Wood et al., 2004, as cited in Alesich & Righby, 2017).

The interactions between HRs and human beings demonstrate how men and women are recognizing, accepting, and handling HRs as men and women, considering their in-built programming system based on traditional gender roles. Users have preferences in terms of which robot should do what, which is why female robots perform care work (Alesich & Righby, 2017; Hayasaki, 2017) and male robots do hard jobs like industrial work. In Japan, existing traditional gender norms and roles affect women's employment due to their care roles; thus, Japanese women prefer to have robots that can reduce their household work-related burden. The men are mostly unbothered about household chores; as a result, they have less expectations from robots' domestic service (Nomura & Nakazawa, 2017). Nomura and Nakazawa (2017) find that Japanese younger men have lower expectations in terms of coordination and data processing functions as well as human-like thinking capacity, whereas Japanese people want robots to have these qualities. Men's attraction towards machine-like robots rather than anthropomorphic robots can be a reason for such behaviour. Additionally, men are more likely than women to seek help from a robot (Widder, 2022). However, gender stereotypes define the sort of robots one will receive for assistance. For example, Roombas are given as gifts to women more often, which suggests an association between women's work and vacuuming as a default feminine job (Widder, 2022).

There is another heteronormative perspective of interactions where robots having feminine or masculine attributes and appearance are appreciated differently by men and women. Men tend to find female robots trustworthy because they are docile and beautiful, whereas women prefer male robots for their activity and rationality

(Hayasaki, 2017). The interesting fact is that when there are no gender-based features in the humanoid robots, both women and men tend to define the sex of these robots by activities based on their real-life gendered roles and performances (Beraldo, Battista, Badaloni, Menegatti, & Pivetti, 2019; Simon, 2018). This heteronormative notion of sexual identity preferences is mostly based on men's and women's binary identities related to socio-cultural expectations.

What the HR Industry Can Do: The Guidelines

To ensure gender sensitivity in the robotic industry, we need to ask the following questions first- why do humanoid robots need gendered human body faces or attributes when they have no feelings and sharing capacities? Why do humanoid robots need gendered expressions and roles? Understandably, humanoid robots need human features, but that could be gender-neutral because these machines do not have blood-flesh-based bodies. If the development of the robotic industry continues to promote orthodox gender roles, then it will not be able to help human beings as expected because it will rather promote gender differences between men and women and sell orthodox patriarchy in a new packet.

HR designers are incorporating patriarchal expectations into their designs; therefore, some HR designers prefer to emphasize women's roles through attractiveness and men's roles through intelligence (Alesich & Righby, 2017). Eyssel and Hegel (2012) find in their study that male robots are dominant, which may create fear among elderly humans if assisted by male robots. However, Eyssel and Hegel (2012) also mention that such perceptions towards male robots can be changed by changing psychology and gender-based expectations, such as female robots are more suitable as care assistants. Unless the perceptions are changed, the robots would be produced based on gender roles. If the HR designers develop their ideas without considering gendered features, the result will also be gender-neutral (Simon, 2018). This gender-sensitive feature-based HR can open a new way in the robotic industry to solve problems related to traditional gender relations and gender division of labour. It will also challenge the dominant understanding of body beauty and sexual objectification of women because womanly characteristics- based robots are highly sexually objectified by body shape, dress, colour, wigs, and ways of their expression (Weber, 2005) and on the other hand, rational and fastest activities with strong body are associated with male humanoid robots (Nomura, 2016). Therefore, HR designers need to be aware and sensitive not to focus on certain gendered features (Trovato, Lucho, & Paredes, 2018). Being machines, feminine characteristics-based robots do not need to be represented in a sexist way. To ensure gender sensitivity in the robotic industry, gender transformative agendas need to be incorporated to develop gender-sensitive designs and models for HR (Weber, 2005).

Considering the ethical aspects, the designers also need to be careful not to make their HR more humanoid because these machines do not have biological bodies,

brains, and reproductive roles. We need to think, making them more humanoid can bring more risk to us. Some people can express their negative attitudes toward HR because these machines look like humans but do not work as humans (Giger, Picarra, Alves-Oliveira, Oliveira, & Arriaga, 2019). Day by day, scientists are working hard to ensure more progress with robots' quickest response, spontaneous movement, and eye contact with blinks, but they rarely consider the in-built gendered orders. It can create negative attitudes among the young generation because they tend to learn many things from new inventions like humanoid robots. Besides, giving these machines perfect face and body shape can also increase depression among young generations because of their changing patterns of body shapes over their ages, but the machines look the same. To solve this aspect, gender experts and HR experts need to work and research together in the robotic industry (Cross, Hortensius, & Wykowska, 2019), because the way the growing nature of the development of HR will be more humanoid will also be more orthodox, and gendered (Soraa, 2017). Besides, to ensure a gender-sensitive nature in the robotic industry, sponsors and high-tech companies need to give quality opportunities for women engineers and scientists (Fung, 2019).

Conclusion

This article contemplates the increased development of HRs in everyday life, and how the gender norms and socialization process identify robots with gender identity and roles. Anthropomorphic robots are designed with humanlike characteristics and behaviours as a part of technological advancement, but with a specific gender when produced for domestic or service-oriented jobs. This gendered identification of robots has not developed in a vacuum; rather is the outcome of ever-existing gender norms and social expectations projected on men and women. In order to develop the traditional socio-cultural practices based on twofold gender identities and preferences in the robotic industry, scientists and engineers' socialization process and the masculine way these mechanical, robotic, and other relevant engineering fields have been developed are mainly responsible (Fung, 2019). Therefore, the modern and high-tech invention of the robotic industry is not coming out of the patriarchal binary-based understanding between men and women (Nomura, 2016). In the robotics industry, most scientists and engineers are men; therefore, there are clear gender norms-related differences that have been noticed in programming their robots differently (Lilleslatten, 2018).

Gender norms refer to the culture, tradition, beliefs, and customs that cause distinction between men and women and influence how they will interact with each other, following a power relation. The dichotomy based on gender is embedded in structures and reproduced through social interactions, which defines the actions of men and women in a given society, shaping their roles everywhere (Marchetti-Bowick, 2009). Gender specific tasks – women doing household work and taking care of elderly people, and men doing communication of roles that require power and strong demeanour – are the reflections of gender identity imposed socially to

create disparities. Similarly, gender dimension in robotic design is prominent in terms of gender specific appearance, communication skills, and capabilities, with the focus on masculine and feminine identification, by incorporating traditional gender norms. Perceptions of gender, both in inventors and users, reinforce social expectations on robots or through robots, which has become an area of research. The inventors program the robots to carry out gender roles not only due to their own inhibited construction of knowledge through the socialization process, but also due to users' demands. Users find female robots more feminine and comforting, be it a female voice or appearance, which requires the female robots to perform idealized and gender stereotyped jobs (Simon et al., 2020). Similarly, users find male robots to be more informative, fun, or capable of communicating. In fact, users identify gender-natural robots as masculine or feminine based on the work they do, indicating that the idea of gender is embedded in the psychology and structures of a society. However, in a country like Japan, where traditional norms are persistent, and women must perform household chores, female robots are reducing the double burden of working women (Nomura & Nakazawa, 2017).

Technologically, HR is a high-level advanced tech product for ensuring different service-based facilities for human beings and greater production for different industries, especially manufacturing industries with low cost. However, the prominent gendered orders in the HR industry make an ambiguous situation for human interactions with robots. Therefore, we also would like to say, as Nomura says, "whether gendering of robots for given roles is truly necessary to encourage interactions between humans and robots" (Nomura, 2016, p.6). It is high time to apply interdisciplinary approaches in the robotic industry to bring gender equality to the robotics industry. This paper ends with a note that HR designers should rethink and revisit gender sensitivity while designing robots - keeping in mind the gendered implications of appearance and attributes as the outcome of patriarchal expectations – that can open a new door of gender-neutral technological innovation.

References

Adelaide Robotics and Computer Science Academy (n.d.). History of Robots. Retrieved from https://www.roboticsacademy.com.au/history-of-robots/

Alesich, S. & Rigby, M. (2017). Gendered robots: Implications for our humanoid future. *IEEE Technology and Society Magazine,* 50-59.

Aşkın, G., Saltık, İ., Boz, T. E., & Urgen, B. A. (2023). Gendered Actions with a Genderless Robot: Gender Attribution to Humanoid Robots in Action. *International Journal of Social Robotics,* 15(11), 1915-1931. doi:10.1007/s12369-022-00964-0.

Beraldo, G., Battista, S. D., Badaloni, S., Menegatti, E., & Pivetti, M. (2018, 27-29 Sept. 2018). Sex differences in expectations and perception of a social robot. Paper presented at the 2018 IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO), Genoa, Italy. DOI:10.1109/ARSO.2018.8625826.

Broverman, I. K., Vogel, S. R., Broverman, D. M., Clarkson, F. E., & Rosenkrantz, P. S. (1972). Sex-Role Stereotypes: A Current Appraisal. *Journal of Social Issues, 28*(2), 59-78. https://doi.org/10.1111/j.1540-4560.1972.tb00018.x.

Carter, M. J. (2014). Gender socialization and identity theory. *Social Sciences*, 3(2), 242-263.

Chavdarov, I., Yovchev, K., Miteva, L., Stefanov, A., & Nedanovski, D. (2023). A strategy for controlling motions related to sensory information in a walking robot big foot. *Sensors*, *23*(3), 1506.

Cislaghi, B., & Heise, L. (2020). Gender norms and social norms: differences, similarities and why they matter in prevention science. *Sociology of health & illness*, 42(2), 407-422. https://doi.org/10.1111/1467-9566.13008.

Connell, R. W., & Messerschmidt, J. W. (2005). Hegemonic masculinity rethinking the concept. *Gender & Society*, 19(6), 829-859.

Cross, E. S., Hortensius, R., & Wykowska, A. (2019). From social brains to social robots: Applying neurocognitive insights to human robot interaction. *Philosophical Transactions B*, 374: 20180024. http://dx.doi.org/10.1098/rstb2018.0024.

Eyssel, F., & Hegel, F. (2012). (S)he's Got the Look: Gender Stereotyping of Robots. *Journal of Applied Social Psychology,* 42(9), 2213-2230. https://doi.org/10.1111/j.1559-1816.2012.00937.x.

Faisal, M., Velazquez, R. A. M., Laamarti, F., & El Saddik, A. (2023). Underactuated digital twin's robotic hands with tactile sensing capabilities for well-being. In *Digital Twin for Healthcare* (pp. 15-38). Academic Press.

Forste, R., & Fox, K. (2012). Household Labor, Gender Roles, and Family Satisfaction: A Cross-National Comparison. *Journal of Comparative Family Studies*, 43(5), 613-631.

Fu, X. M., Bao, Q., Xie, H., & Fu, X. (2021). Diffusion of industrial robotics and inclusive growth: Labour market evidence from cross country data. *Journal of Business Research*, *122*, 670-684.

Fukaya, N., Toyama, S., Asfour, T., & Dillmann, R. (2001, January). Design of a humanoid hand for human friendly robotics applications. In *Proc. Human Friendly Mechatronics: Selected Papers of The International Conference on Machine Automation ICMA2000* (pp. 273-278).

Fung, P. (2019). That is why AI has gender problem, *World Economic Forum*, Retrieved from https://www.weforum.org/agenda/2019/06/this-is-why-ai-has-a-gender-problem/

Fung, P. et al (2016). Zara the super girl: An empathetic personality recognition system. *Proceedings of NAACL-HLT (Demonstration)*, 87-91.

Giger, J. C., Picarra, N., Alves-Oliveira, Oliveira, R., & Arriaga, P. (2019). Humanization of robots: is it really such a good idea? *Human Behavior and Emerging Technologies*, 1,111-123, http://doi.org/10.1002/hbe2.147

Gonzalez-Gonzalez, C., Gil-Iranzo, R. M., & Paderewsky, P. (2019). Sex with robots: Analyzing the gender and ethics approaches in design. *In proceedings of INTERACCION 2019 Conference*, Spain.

Hayasaki, E. (2017) Is AI sexist? *Foreign Policy*, Retrieved from http://foreignpolicy.com/2017/01/16/women-vs-the-machine/

Hirose, M., & Ogawa, K. (2007). Honda humanoid robots development. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *365*(1850), 11-19.

Kislev, E. (2023). The Robot-Gender Divide: How and Why Men and Women Differ in Their Attitudes Toward Social Robots. *Social Science Computer Review*, 41(6), 2230-2248. doi:10.1177/08944393231155674.

Konno, A., Nagashima, K., Furukawa, R., Nishiwaki, K., Noda, T., Inaba, M., & Inoue, H. (1997, September). Development of a humanoid robot Saika. In *Proceedings of the 1997 IEEE/RSJ International Conference on Intelligent Robot and Systems. Innovative Robotics for Real-World Applications. IROS'97* (Vol. 2, pp. 805-810). IEEE.

Kuchenbrandt, D., Häring, M., Eichberg, J., Eyssel, F., & André, E. (2014). Keep an Eye on the Task! How Gender Typicality of Tasks Influence Human–Robot Interactions. *International Journal of Social Robotics,* 6(3), 417-427. doi:10.1007/s12369-014-0244-0.

Kuindersma, S., Deits, R., Fallon, M., Valenzuela, A., Dai, H., Permenter, F., ... & Tedrake, R. (2016). Optimization-based locomotion planning, estimation, and control design for the atlas humanoid robot. *Autonomous robots*, *40*, 429-455.

Leaper, C., & Friedman, C. K. (2007). The socialization of gender. In J. E. Grusec & P. D. Hastings (Eds.), Handbook of socialization: Theory and research (Vol. 561, pp. 587). New York, London: Guilford Publications.

Lilleslatten, M. (2018). *Intelligent robots may strengthen gender norms*. Kilden, Retrieved from http://kjonnsforskning.no/en/2018/11/intelligent-robots-may-strengthen-gender-norms

Marchetti-Bowick, M. (2009). Is Your Roomba Male or Female? The Role of Gender Stereotypes and Cultural Norms in Robot Design. *Intersect: The Stanford Journal of Science, Technology and Society,* 2, 90-103.

McCartney, G., & McCartney, A. (2020). Rise of the machines: towards a conceptual service-robot research framework for the hospitality and tourism industry. *International Journal of Contemporary Hospitality Management*, *32*(12), 3835-3851.

Nass, C., Moon, Y., & Green, N. (1997). Are Machines Gender Neutral? Gender-Stereotypic Responses to Computers With Voices. *Journal of Applied Social Psychology*, 27(10), 864-876. https://doi.org/10.1111/j.1559-1816.1997.tb00275.x

Nomura, T. (2016). Robots and Gender. *Gender and the Genome*, 1(2), 1-8.

Nomura, T., & Nakazawa, T. (2017, 2017//). Gender Difference in Expectations for Domestic Robots. Paper presented at the Social Robotics, Cham.

Oestreicher, L., & Eklundh, K. S. (2006, 6-8 Sept. 2006). User Expectations on Human-Robot Co-operation. Paper presented at the ROMAN 2006 - The 15th IEEE International Symposium on Robot and Human Interactive Communication.

Pearse, R., & Connell, R. (2016). Gender Norms and the Economy: Insights from Social Research. *Feminist Economics*, 22(1), 30-53. doi:10.1080/13545701.2015.1078485.

Rosy, S. Y. & Islam, M. M. (2016). Communication Process in Family Reinforcing the Gender Differences in Bangladesh in N. Mahtab et al (eds) Revealing Gender Inequalities and Perception in South Asian Countries through Discourse Analysis, Pennsylvania, USA: IGI Global.

Saeedvand, S., Jafari, M., Aghdasi, H. S., & Baltes, J. (2019). A comprehensive survey on humanoid robot development. *The Knowledge Engineering Review*, *34*, e20.

Seba, T., Dorr, A., and Libby, B. (2024). This time, we are the horses: The Disruption of Labor by Humanoid Robots, Retrieved from https://www.rethinkx.com/blog/rethinkx/the-disruption-of-labour-by-humanoid-robots

Seo, S. (2022). When Female (Male) Robot Is Talking To Me: Effect of service robots' gender and anthropomorphism on customer satisfaction. *International Journal of Hospitality Management,* 102, 103166. https://doi.org/10.1016/j.ijhm.2022.103166.

Siegel, M., Breazeal, C., & Norton, M. I. (2009, 10-15 Oct. 2009). Persuasive Robotics: The influence of robot gender on human behavior. Paper presented at the 2009 IEEE/RSJ International Conference on Intelligent Robots and Systems.

Simon, H., Smitherman, H., Atchley, A., Davis, J., & Tenhundfeld, N. L. (2020). Nuts and Bolts About You: Finding the Right Match in Gendered Robots. Paper presented at the 2020 Systems and Information Engineering Design Symposium (SIEDS), Charlottesville, Virginia, USA.

Simon, M. (2018). *Its time to talk about robot gender stereotypes.* WIRED, Retrieved from https://www.wired.com/story/robot-gender-stereotypes/

Sorra, R. A. (2017). Mechanical genders: How do humans genders robots? *Gender, Technology and Development*, 21:1-2, 99-115, https://doi.org/10.1080/09718524.2017.1385320.

Steil, J. J., Röthling, F., Haschke, R., & Ritter, H. (2004). Situated robot learning for multi-modal instruction and imitation of grasping. *Robotics and autonomous systems*, *47*(2-3), 129-141.

Thébaud, S., Kornrich, S., & Ruppanner, L. (2021). Good Housekeeping, Great Expectations: Gender and Housework Norms. Sociological Methods & Research, 50(3), 1186-1214. doi:10.1177/0049124119852395.

Tong, Y., Liu, H., & Zhang, Z. (2024). Advancements in humanoid robots: A comprehensive review and future prospects. *IEEE/CAA Journal of Automatica Sinica*, *11*(2), 301-328.

Trovato, G., Lucho, C., & Paredes, R. (2018). She's electric: The influence of body proportions on perceived gender of robots across culture. *Robotics*, 7:50, DOI:10.3390/robotics7030050.

Trung, L. (2013). When science meets beauty. Retrieved from http://www.projectaiko.com/index.html

Tsiourti, C., Weiss, A., Wac, K., & Vincze, M. (2019). Multimodal integration of emotional signals from voice, body, and context: Effects of (in) congruence on emotion recognition and attitudes towards robots. *International Journal of Social Robotics*, *11*, 555-573.

van de Vijver, F. J. R. (2007). Cultural and Gender Differences in Gender-Role Beliefs, Sharing Household Task and Child-Care Responsibilities, and Well-Being Among Immigrants and Majority Members in The Netherlands. *Sex Roles*, 57(11), 813-824. doi:10.1007/s11199-007-9316-z.

Weber, J. (2005). Helpless machines and true loving care givers: A feminist critique of recent trades in human-robot interaction. *Info Comm & Ethics in Society*, 3, 209-218.

Widder, D. G. (2022). Gender and Robots: A Literature Review. ArXiv, abs/2206.04716. https://doi.org/10.48550/arXiv.2206.04716.

Yang, G. Z. (2019). Robot learning—Beyond imitation. *Science Robotics*, *4*(26), eaaw3520.

Yuan, F., Boltz, M., Bilal, D., Jao, Y. L., Crane, M., Duzan, J., ... & Zhao, X. (2023). Cognitive exercise for persons with Alzheimer's disease and related dementia using a social robot. *IEEE Transactions on Robotics*, *39*(4), 3332-3346.