

# Public Acceptance of Robots: Drivers and Barriers

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**Abstract** — Robots as companions, domestic assistants and nurses have great potential for the care of people who need assistance. At the same time in popular culture, technological progress is often represented as a threat to human distinctiveness. Studies demonstrate limited confidence of individuals in robotics and artificial intelligence. The author will consider how perceived risks and benefits, attitudes toward science and technology, social bonds and other individual socio-demographic characteristics influence on the public acceptance of robots.

**Keywords** - public acceptance of technologies; robots; social attitudes; social bonds; trust; digitalization.

## I. INTRODUCTION

Technology is one of the main factors of socio-economic development [7] that produces various effects: robotization and digitalization of production and organizational processes, increase diversity of digital goods and services, growth of demand for digital skills [12]. The spread of robotics in industry, as well as in everyday life is bringing us closer to the future described in science fiction. People are increasingly relying on artificial intelligence to process large amounts of data, make decisions about the solvency of borrowers, select staff and choose the best couple on dating sites.

Robots as companions, domestic assistants and nurses have great prospects for the care of people who need assistance (e.g., the elderly or sick people). At the same time studies demonstrate limited confidence in robotics and artificial intelligence [5][14]. In popular culture, technological progress is often represented as a threat to human distinctiveness [2][3]. The culturally ingrained fear of autonomous technologies has been called the "Frankenstein syndrome" [8]. A similar aspect is evident in the Uncanny valley effect of perception of technological objects, which was firstly described by Japanese robotics scientist and engineer Masahiro Mori [10][11]. The phenomenon implies that humans tend to dislike and detest robots and other objects that look or act roughly like humans (but not exactly like the real ones).

It is worth noting that this effect is not universal and has gender and age variations. Moreover some studies support its existence [9], while others do not [16]. Perhaps if the place of technology in our lives and attitudes to it changed, this effect would also disappear.

Thus, there is a certain paradox in public opinion. On one hand, the development of robotics and artificial intelligence is on the way to improving the capacity for self-learning and independent decision-making. On the other hand, people fear the autonomous technologies and are not ready to rely on them.

The remainder of this paper is organized as follows. Section 2 describes research approach and the applied methods, as well as presents key results of the analysis. Section 3 summarizes the main outputs of this study, encompass the limitations of the study and possible avenues for future research.

## II. MAIN IDEA

The purpose of this research is to analyze social attitudes toward the use of artificial intelligence and robots for various tasks and the factors that have an influence on the public acceptance of autonomous technologies. The model of this study is based on the conception of public acceptance of technologies that is defined as the readiness to use a technology to solve tasks assigned to it [1]. Factors influencing technology acceptance are defined at micro- and macro-level. In this research, we analyze the effects of micro-level factors, which includes the indicators of the perception of robotics and technologies in general and social characteristics of the user. Studies of technology perception highlight such determinants as perceived risks and benefits, level of knowledge, attitudes toward science and technology, trust, values, and other individual socio-demographic differences [6]. Attention to the risks posed by the diffusion of new technologies (in reality or in imagination) contributes to the rejection of innovation, while understanding the benefits/benefits of use reduces the level of anxiety about it [4][13].

Data was collected in December 2018 – January 2019 during the 27th wave of the Russia longitudinal monitoring survey, which is a series of national representative surveys based on probabilistic stratified multistage territorial sample. The sample size is 7584 respondents aged 18-65. Method – face-to-face interviews.

The public acceptance of robots was assessed through respondents' estimations of 10 situations representing a robot in different roles. Situations were differentiated by the type of tasks (functional and social) and by the strength of influence on the user (assistance or dependence). Respondents were asked to rate the degree of perceived

comfort/discomfort in each of these situations on a four-point scale. The author used a binary logistic regression method to identify factors that influence robot acceptance in different situations.

The results demonstrate that there is a same dualism in public opinion in Russia, as in other countries. Positive attitudes toward robots as are a good thing for society are paired with an expectation of threat from it (54% vs. 63%) and a corresponding low level of acceptance of robots as autonomous actor. The use of robots in functional-assisting role as domestic helpers or delivery drones is rather acceptable (66% and 62% of respondents feel comfortable about these situations). At the same time, most respondents are unready for a high degree of robot autonomy and agency, and are not disposed to delegate responsibility for their lives or the lives of family members (driverless car, the use of robots in elderly parents care and in surgery seem comfortable for 21%, 19% and 14% of respondents).

According to the results of the regression, analysis general drivers of public acceptance of robots are confidence in one's own power and ability to influence the state of affairs, digital skills (as an indicator of digital adoption), engagement with science, positive attitudes to robots and belief in the robotization of human labor. General barriers to the public acceptance are science awareness and expectation of a threat from robots (lack of trust).

In addition, some factors enhance or reduce attitudes to robots only in particular situations. For example, gender have an effect (negative) only on acceptance of robots for assistance at home and delivery. Significant generational differences in attitudes are observed only in relation to driverless car.

Situation-specific predictors relate more to different aspects of well-being and personal characteristics. Health problems, selective trust in people and moderate loneliness contribute to a positive attitude toward the use of robots for assistance at home and delivery, while predisposition to trust most people and to value the spiritual aspects of life, exclusion from innovation consumption, living in low urbanized areas, an acknowledgement of the threat of human rights violations. Nevertheless, risks are not always negatively associated with the acceptance of robots. The effect depends on the type of risk and its specification. For example, understanding the risks of technology use by criminals has a positive effect on the attitude to robotic home assistants.

A significant negative effect of sensitivity to change due to technological advances on the acceptance of robots has been detected only in relation to their use for elderly care and surgery. Additional barriers to the adoption of robots for elderly care are traditional family ties and religion.

If the use of robots to care for the elderly is perceived in the context of social exclusion, robotic surgeon is too radical innovation in the eyes of the average person. Experience of innovation generation contributes to the acceptance of roboticization of surgery.

### III. CONCLUSION

Nowadays, the society accepts only the idea of automating (human-controlled) certain processes with digital technology, but is not ready for fully autonomous digital technology. In this context, social attitudes towards autonomous technologies can be seen as an indicator that reveals the depth of changes in public consciousness in the digitalization of the society.

Technocentrism as characteristic of modern civilization is an important prerequisite in the formation of society's readiness for autonomous technologies. At the same time, the determining role is played not so much by the "pro-science" values of the population, as by the presence of an active interest in scientific and technological progress and involvement in the system of communications in this sphere.

However, awareness of science news has the opposite effect - the development of critical reflection on the consequences of the introduction of new technologies in the conditions of growing consciousness and resistance to progress.

Another important barrier to social integration of robots is the social bonds between people, trust, patterns and norms of relationships. Adherence to traditional family values of cohesion and mutual assistance, and having close relationships with other people are at odds with the idea of using robots to care for the elderly, as it is perceived as exclusion.

The resolution of the paradox lies in the sociocultural field. The results of the study indicate that the transformation of the digital environment from alien to natural may be one of the signaling factors that contribute to a change in the perception of autonomous digital technologies. According to the data, people today still predominantly consider the digital environment as an artificial phenomenon, depriving the life of the sense of life or acting as a poor substitute. Such a worldview prevents the acceptance of the changing social role of robotics. Therefore, future studies need to estimate the influence of cultural values on acceptance of robots in different situation. In this research, we did not have direct questions on human values and used only proxy indicators of traditional family values and trust.

More research is also needed to uncover the public perception of different types of social robots. In this survey, we used personalized situation (elderly parents care). Probably, impersonal examples of robots (e.g. elderly care in general or elderly care in nursing homes or in health care facilities) will provide other results.

### ACKNOWLEDGMENT

The article was prepared in the framework of a research grant funded by the Ministry of Science and Higher Education of the Russian Federation (grant ID: 075-15-2020-928).

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