

The relationship between technostress and self-driving cars

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Abstract: Technological advances have occurred in every era, but they are not always seen as beneficial. Technostress refers to the negative effects of technology on human behaviour and decision-making, as well as the physical effects on the body. The constant flow of information and the need to learn and use different tools and devices contribute to technostress. Not everyone is receptive to new technologies and finds it difficult to adapt, which can increase inequalities in society. In the 21st century, technological developments are having a significant impact on people's lives and this article examines whether society is ready to use these tools effectively or whether it is fearful of the industrial revolutions underway. We use a quantitative study focusing on young people's perceptions of technology to analyse the impact. The paper also discusses coping mechanisms and possible solutions to mitigate the problems caused by modern technology.

Keywords: technostress, self-driving cars

1 Introduction

Technostress is a problem that describes the stress and pressure caused by technology in people's lives. This problem is caused by the inexperience of new technologies, where people make mistakes or rush to use technology, which reduces efficiency and quality of work. Technostress can trigger long-term mood swings and acute depression, and can increase people's insecurity and social isolation at work. Information overload is one of the main factors contributing to technostress. People are unable to distinguish between important and irrelevant information and often have to deal with too much information at once, leading to confusion and decision-making difficulties. [1] [2] [3] [4]

And brain freeze occurs when the brain becomes overloaded and cannot function properly. The rise in technostress is a consequence of technological advances over the past decades. People are increasingly exposed to the demands of machines and new technologies, which contributes to the development of technostress. The easy accessibility of information and the constant flow of data put additional pressure on people. People's bad feelings about new technologies often stem from a lack of

understanding of these technologies. Rapid changes in technology also make it difficult for people to keep up and learn how to use them. New technologies require more and more processing and memory, which may be beyond the typical capabilities of humans. Technostress is a growing problem due to the rapid development of the ICT industry. People have to adapt constantly to new technologies, which are becoming increasingly complex and alien. This increases stress and uncertainty in people's daily lives. [5] [6] [7]

In sum, technostress is a problem of stress and pressure caused by technology in people's lives. Information overload, technological invasion, rapid technological change and technological inexperience all contribute to technostress and exacerbate negative feelings. It is important for people to be aware of technology and learn to adapt to new developments to reduce the impact of technostress on their lives. [8] [9] [10] [4]

Technological progress is impacting people's lives in the 21st century. New technologies create opportunities to expand knowledge and skills, but not everyone is able to respond and learn quickly to new changes. New technologies can improve society's well-being and quality of life, but they can also increase generational and socio-economic disparities and create individual inequalities. I used a quantitative study to analyse young people's perceptions of technology, to see if we are ready to use sophisticated devices and systems or if we are more apprehensive about the process of industrial revolutions. [11] [12] [13] [14] [15]

2 Technostress

We were always suspicious of the technology because of its reliability. Although we use advanced technologies that can be flawed, we do not consider them reliable because of their unreliability. For people, technology creates unpleasant memories and fear because it can betray and violate their lives. Undesirable technological advertising causes difficulties and fears for people because it can easily violate their privacy. People today are afraid of social media and online presence as personal information can be easily accessed and leaked. However, jobs, friends and families are putting pressure on people to be present online. The use of ICT is now essential for efficiency and connectivity, and people can miss important events and information if they do not use it. The Covid19 epidemic has exacerbated this situation, where people need the use/assistance of a computer or other smart device to work. [16] [17]

Technostress is a complex phenomenon that is perceived differently by different demographic groups. Older generations are generally less accustomed to new technological developments than younger generations. Educational attainment may also influence the level of technostress, as those with lower levels of education tend to experience less technostress. This is probably because lower educated people

work in areas where they use less advanced technological tools and are therefore less exposed to technostress. Employed people tend to experience higher technostress than unemployed people, as work stress and information overload are part of their daily lives. The unemployed tend not to have the latest technological tools, so they feel less unreliable and can cope with technostress more easily. Positive perceptions of individuals' lives can also influence technostress, as those who have a positive view of their lives are less likely to feel stressed by technology. [18]

In addition to technostress, techno-fatigue is also experienced by those who experience technostress. Technostress is also associated with work flexibility and work-family problems. People who are satisfied with their lives, identify with their profession or are ambitious in their career are less likely to experience technophobia. [19] [20]

It is important to emphasise that it is not only demographic characteristics that influence the level of technostress, but also the relationship between different areas of an individual's life and technological difficulties. Therefore, individuals need to develop strategies to help them cope with technostress. This could include, for example, a positive view of life as a whole, work-life balance, flexibility and career development opportunities. [21] [22] [23]

In conclusion, technostress has different effects on different demographic groups and a number of factors influence its perceived level. Age, education and different aspects of individual life all play a significant role in the development and management of technostress. It is important for individuals to find their own stress management strategies in order to be able to deal effectively with technology stress and maintain a healthy balance.

3 Self-driving cars

Autonomous vehicles are currently available for both public and private transport, although their use is limited and their take-up is not growing rapidly. Presenting data from an international study, the paper discusses the trust in autonomous vehicles and the factors influencing it. The study identifies the main threats, quantifies their prevalence and explores the reasons for fear of autonomous vehicles. People who have not yet adopted autonomous vehicles express concerns about the potential negative consequences, such as hacking, system failures or lack of control. [24] [25]

At the same time, advocates of autonomous vehicles promise positive effects, such as faster reaction times and increased computing power. They claim that these vehicles can fit well into the transport network of smart cities and have a positive impact on society, carbon emissions and the natural environment. [24] [25]

Self-driving car technology still raises many questions. While a fully autonomous car is unlikely, autonomous vehicles aim to demonstrate modes of transport where human supervision is not essential to perform certain tasks. Autonomous vehicles are capable of performing their tasks autonomously, but a human driver must always be present, unlike autonomous systems, which do not require human involvement. [26]

There are six different levels of autonomy, with level 5 being the highest, where the vehicle performs all tasks autonomously. Legal and moral concerns make people less willing to hand over control of their car to an autonomous system. However, the introduction of autonomous cars in the EU is controversially influenced by the 1968 Vienna Convention on Road Transport, which requires all vehicles to have a driver. In the US, however, the day of self-driving cars is approaching and the National Highway Traffic Safety Administration (NHTSA) has issued new guidelines for self-driving cars. [26] [27]

All car manufacturers must ensure that self-driving cars are safe for both passengers and road users. Standards have been revised and clarified to ensure that cars meet federal motor vehicle safety standards. These standards specify the characteristics, capabilities and test procedures that vehicles must have. [28]

Self-driving cars are becoming increasingly available, but there are still many questions about their reliability and legal framework. Autonomous vehicles still require human driver assistance and EU laws restrict their deployment. In the US, however, government regulations and policies are increasingly supporting the development of self-driving cars. Safety and adherence to standards will play an important role for car manufacturers to create reliable and safe self-driving vehicles in the future. [29]

Like all new technologies, self-driving vehicles raise some concerns in people. People have always feared the emergence of machines and industrial revolutions, especially the loss of jobs. But the concerns are not just about protecting jobs. Although self-driving cars may be the way of the future, it is not yet known whether they are safer than traditional modes of transport. While driving, unexpected situations often arise where sudden decisions have to be made. These decisions can be minor, such as whether to go through a yellow light, but there are also situations where decisions have to be made to risk lives. People are uncertain and nervous about new and unfamiliar means of transport. The history of automobility bears witness to this. Although the Wright brothers' flight in 1903 in the United States did not lead to instant air travel, there were similar questions about the reliability and safety of self-driving car technology. Car manufacturers are investing billions in the development of self-driving vehicles, but studies have shown that people are less enthusiastic about the introduction of new technology and more concerned. A study from the University of Michigan found that drivers still desire certain automated capabilities, but are reluctant to completely hand over driving to a vehicle. [30] [31] [32]

According to Accenture's consumer survey, nearly half of those surveyed would prefer to drive a self-driving car, while the other half would prefer a technology that allows them to take control if necessary. People are also concerned that the operation of a fully autonomous system is not fully regulated. In 2014, majorities in the US, UK and Australia expressed concerns about driverless vehicles. Interestingly, they were not willing to pay more for such convenience. However, the future of driverless cars is promising, with more than two-thirds of respondents predicting that 50% of cars will be self-driving by 2050, according to research. However, widespread adoption is still to come and user attitudes will change over time. It is important to consider the readiness and expectations of users to understand the barriers to the uptake of self-driving cars. Public perceptions of public transport are more positive, as people are more interested in cleanliness and comfort than in self-driving cars. Passenger satisfaction levels differ between men and women. Overall, although car manufacturers are constantly developing self-driving technology, people's attitudes and readiness are still slow. [25]

Among the technical developments, the readiness of users and observers is as important as the functioning of the technology itself. The readiness of users determines their willingness to participate in the testing and adoption of new technologies. In the case of self-driving vehicles, users' confidence in the technology is particularly important. Trust is a key indicator of ICT readiness. Building trust is a key step for the uptake of autonomous cars, as users perceive risks and expect increased safety when using intelligent systems.

Self-driving vehicles also raise a number of ethical and societal issues. For the adoption of autonomous cars to be successful, it is important to take into account public concerns and ethical issues. In addition to reliability and safety, other factors such as user experience and comfort should be taken into account when designing autonomous vehicles. The automotive industry needs to be alert to the needs and concerns of the public so that the technology can truly achieve widespread acceptance.

Programming autonomous vehicles involves particularly difficult ethical choices. One example is how the car should behave during the inevitable accident. Research and debate on the ethical issues of autonomous cars can help to make such decisions. Moral Machine is a platform developed by the Massachusetts Institute of Technology that gathers human opinions on moral issues related to autonomous cars. The answers to moral dilemmas have a major impact on the acceptance of autonomous vehicles. [33]

Research shows that people generally agree that autonomous cars should cause fewer accidents. However, the results change when respondents imagine themselves as the person sitting in the car. It is therefore important to take into account the perspective of the people concerned when making ethical decisions. Not only the reliability and efficiency of the technology, but also the trust of users and society are key to the uptake of self-driving vehicles. Making ethical decisions and taking

into account public concerns is essential to increase the acceptance of the technology. [34]

Self-driving cars are being developed and deployed in the transport industry. The hardware and software for these vehicles have already been created and the software is constantly being updated to make it as responsive as possible to its environment. The self-driving system can assess traffic conditions, select car behaviour and use the data to identify upcoming scenarios. However, the cars' software could pose a risk of hackers gaining access to the data and taking control of the vehicle. Therefore, developing and protecting security systems is a major challenge for car manufacturers and consumers. [35]

Self-driving cars also pose ethical dilemmas and problems related to collisions, where self-driving cars have to give way to other vehicles. However, because of this, self-driving car "drivers" often encounter obstacles in normal traffic, which can be a disadvantage when making purchasing decisions. The confidence of road users is key to successful uptake, but lack of information and technological uncertainties can reduce this confidence.

Information and communication about self-driving cars is important to convince and understand users. People need to become more familiar with these systems to overcome information gaps, reduce stress and anxiety, and increase perceived knowledge. User acceptance is influenced by the user's perception of the technology as user-friendly and useful. In the case of self-driving cars, the evaluation and criteria of benefits may differ for each user. [36] [37] [38]

Overall, the development and adoption of self-driving cars poses many challenges and questions. Security and software protection is a key concern, as hackers can compromise the safety of cars and passengers. Solutions to ethical dilemmas and collisions also need to be found to ensure that self-driving cars respond appropriately. Social acceptance and people's trust are key to successful take-up, so information and communication about self-driving cars is important.

4 The research

We launched a quantitative study using an online questionnaire to examine the individual opinions of potential users/customers. The data cannot be considered representative as the sampling was based on convenience. However, the data can be considered relevant to the subject of our survey, as we were able to reach 666 people in the three-month period from January 2022 to April 2022. In order to determine whether there is a difference in responses by country of birth, we collected responses from 116 additional foreign respondents in addition to the majority of Hungarian respondents (N=550). Despite the relatively small number of non-Hungarian respondents, there were no significant differences in any of the countries surveyed

(Albania, Finland, Germany, Kazakhstan, Mongolia, Poland, Romania, Serbia, Slovakia, Poland and Mongolia). As a result, all the data collected are now presented together. Ten respondents chose not to disclose their gender, leaving a sample of 368 male and 288 female respondents. The survey was able to reach a wide range of people aged between 12 and 70 years, but the average age of respondents was 27.366 years, with a standard deviation of 10.978, indicating that respondents were largely young.

Figure 2 shows how respondents were distributed by age.

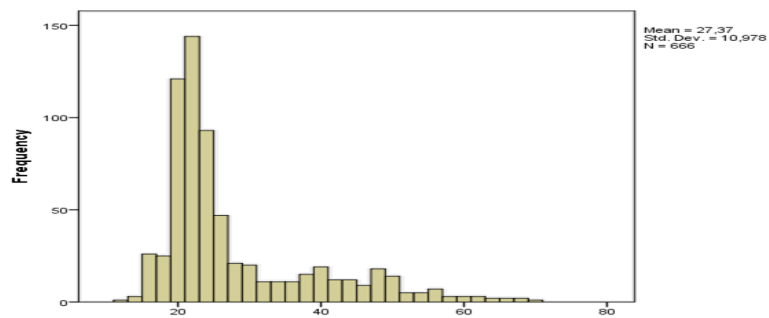


Figure 1.
Age distribution of respondents

The average age of the female population was slightly higher than the average age of the male population (28.326, standard deviation: 11.989), but this difference was not statistically significant due to the wide age range. Respondents' views on autonomous vehicles in general and self-driving cars in particular were mixed. The following distribution can be obtained by measuring the degree of confidence people have in such cars using the six autonomy phases mentioned earlier.

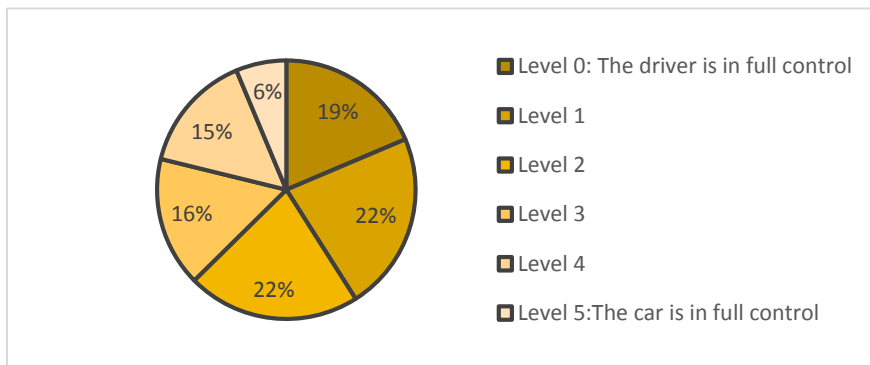


Figure 2.
The 6 stages of autonomy

The majority of respondents, as shown in Figure 2, were only interested in the lower level of autonomy offered to their car. Only 6% of people would be interested in

using self-driving cars if the car had full control, and 15% would want to use the car if they could still take back and seize control if needed. These findings are in line with the global research described earlier. The vast majority of people are not yet ready for self-driving cars.

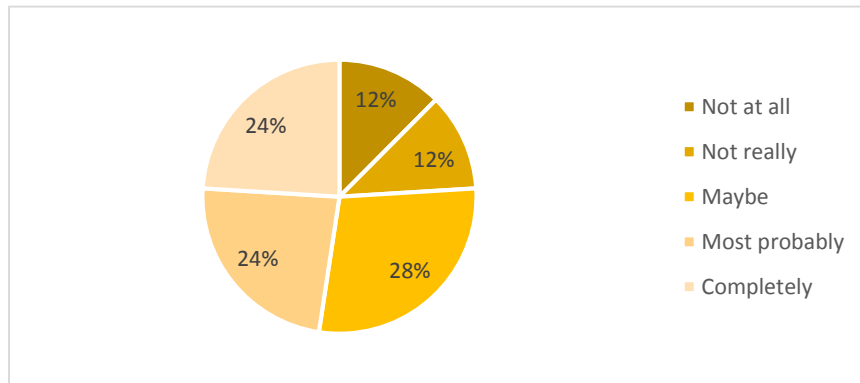


Figure 3.
Distribution of respondents

The main question is whether there is a pattern of who is in favour of self-driving cars and who is against their introduction on roads. To assess this, we used the responses to the question "I would support the introduction of autonomous vehicles". Figure 4 shows the distribution of respondents.

About half of the respondents (perhaps not as direct users or owners) would be in favour of the introduction of self-driving cars, which is in line with the data presented in Figure 4 and shows the resistance to the adoption of autonomous vehicles. In comparison, only a quarter of respondents were opposed. Only the sample of 470 respondents is included in the survey, as those who answered "maybe" in the middle do not support or oppose the idea of autonomous cars. The proportion of those opposed to autonomous cars was interestingly balanced by gender, as shown in the table below. However, men were more likely than women to approve of driverless cars. Acceptance of autonomous cars can therefore be considered a gendered issue, which is fully supported by the global literature cited earlier.

	What is your name?		Total
	Male	Female	
Does not support the introduction of autonomous vehicles	78	79	157
Supports the introduction of autonomous vehicles	208	105	313
Total	286	184	470

Table 1.

Distribution of respondents by gender and attitude towards autonomous vehicles

Our study shows that those who want self-driving cars have a unique characteristic. In the table below, we present only those values examined in our questionnaire where the means for and against self-driving cars differed significantly.

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
I would be afraid of self-driving cars in my environment *	17,165	,000	13,567	475	,000	1,652	,122
Self-driving cars will have a positive impact on emissions *	19,269	,000	-14,127	475	,000	-1,499	,106
Self-driving cars will have a positive impact on society *	,971	,325	-21,211	311,78	,000	-1,980	,093
Self-driving cars will reduce the number of accidents *	14,153	,000	-22,519	475	,000	-2,023	,090

Table 2.

The difference between those who want self-driving cars and those who don't.

As the data above shows, proponents of automated vehicles believe that autonomous cars will have a positive impact on society, carbon emissions and ultimately our natural environment. This is because they will have much faster reaction times than humans, thanks to their improved sensing systems and computing power. On the flip side, individuals who oppose autonomous vehicles are also concerned about their ability to drive through their neighbourhoods.

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. 2-tailed	Mean Diff.	Std. Error Diff.
Fear: hackers tampering with your car	* 1,709	,192	4,07	328,46	,00	,55	,137
			1	8	0	7	
Fear: the self-driving system will break down	* 34,534	,000	7,57	475	,00	,81	,108
			4		0	9	
Fear: The car decides differently than I want it to.	* 13,075	,000	9,26	475	,00	1,04	,113
			4		0	8	
Fear: Fear of new technology	* 6,691	,010	7,63	475	,00	,92	,121
			9		0	8	
Fear: people (in different professions, such as drivers) losing their jobs.	* 3,473	,063	6,24	289,25	,00	,85	,137
			1	2	0	7	
Fear: control cannot be regained	* 17,769	,000	7,19	475	,00	,92	,128
			0		0	0	
Fear: losing the joy of driving	* 11,664	,001	7,15	475	,00	,97	,136
			0		0	4	
Fear: personal data security cannot be guaranteed	* ,467	,495	6,61	317,85	,00	,83	,127
			0	9	0	6	

Table 3.
Differences in the importance of different fear factors

Although there is typically a greater fear of possible bad outcomes, such as hacking, system failures or lack of control, among people who are not yet prepared for autonomous cars, the fear is activated differently depending on the specific concern. The table below highlights that anxiety varies significantly in all circumstances, although the difference is largest when decisions are made in a way other than by the manager and smallest when hacker risk is present. These concerns and potential benefits aside.

Summary

The emergence of self-driving cars as a new technological development has a major impact on society. In many cases, lack of acceptance is a barrier to progress. The use of autonomous cars in private transport is still in its early stages, although they have become an integral part of public transport in many cities. Although the hardware and software for autonomous systems have been developed, their use is still limited. The study also found that women were generally less receptive and open to autonomous cars, which is in line with their main perceived concerns. Manufacturers should therefore be prepared to serve the needs of both genders independently. The article also explores why more than half of respondents

expressed fears of autonomous cars and how these fears differ between men and women.

The results show that those who are not yet ready for autonomous cars are mainly concerned about potential negative outcomes, such as hacking, system failures and loss of control. However, it is not clear whether these concerns are the main cause of their pessimism or merely a consequence. On the other hand, proponents of autonomous vehicles believe they will have a positive impact on society and the environment, offering improved reaction times through advanced sensor systems and computing power. This different attitude could potentially be both a cause and an effect of the way individuals perceive autonomous vehicles.

Overall, this research helps demystify some aspects of trust in autonomous systems, providing valuable insights for manufacturers and policy makers. By addressing the concerns raised in this study, they can pave the way for the seamless integration of autonomous cars into the private transport networks of future smart cities.

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