# LIVING IN A SMART WORLD. A STUDY OVER EMPLOYEES` PERCEPTIONS ON THE USAGE OF INTELLIGENT DEVICES

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**Abstract:** *Technological developments, fostered by scientific discoveries, have always contributed to changes concerning the work domain, business models, communication, peoples` interactions, in one word reshaping the world. Taking into account the rapid spread of new, smart technologies in several domains and their usage at a large scale, both in industrial context and by individual users also, we aimed in the present study to explore employees' perceptions regarding the usage of intelligent devices and platforms. Results showed different patterns among respondents, concerning their previous experience or the amount of time spent using each kind of technology. Answers varied, depending on the type of interaction questioned, from experienced users regarding smartphones, to basic users when it comes to laptop/desktop usage and no experience in interacting with assistive systems and platforms using virtual reality.*

**Key words:** *artificial intelligence; work; human centricity; training; virtual reality.*

## 1. Introduction

The contemporary society is unquestionably defined and shaped by artificial intelligence (AI) and the development of new technologies. AI is visible in many domains, impacting industry, economy and society. A working definition for artificial intelligence could be provided by the Oxford Dictionary, according to which we can understand AI as the "theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making and translation between languages" (Oxford Dictionary (online) available at https://www. lexico.com/en/definition/artificial_intelligence). Artificial intelligence is embodied in different apparatus around us, gadgets, applications that we use, both at work, at home or during our leisure time. People manage nowadays to accomplish several tasks and activities faster, easier, cheaper and less risky than twenty years ago due to the smart devices that surround us – smartphones, smart cars, autonomous guiding systems, searching engines or chatbots.

The benefits of artificial intelligence are unquestionable when analyzing them from the perspective of now-a-days consumers` society, as shopping, finding a destination, communicating a message become easier than ever before and our desires are fulfilled in a blink of an eye. Nevertheless, questions, worries and skepticism also find their place in this equation. Thus, employees worry about their jobs, consumers feel insecure about the personal data they share to a voice assistant and there also are voices that see the development of autonomous, intelligent technologies as dangerous for humanity itself, discussing about the "crisis of the anthropological project" (Kravchenko and Kyzymenko, 2019: 120). Other authors (Yilma, Panetto and Naudet 2019: 12) draw attention upon the importance of the human factor in this equation. They consider mandatory a cognitive interaction, besides the task execution part and notice the necessity of merging the social and technical part. Furthermore, they acknowledge the complexity of this challenge, given the unicity of each human being.

Taking into consideration both the benefits and the challenges that accompany the spread of technology and artificial intelligence, in the following lines we will address the main concepts of the domain from a theoretical perspective, followed by an empirical approach also.

**2. Conceptual Framework**

Humanity, in its never-ending movement, has always tried to conquer new frontiers and technological developments are the ones that sustain this permanent process of change. Theory distinguishes between four industrial revolutions, seen as steps in developing mass production, automatization or smart devices that portray industry as we know it today (Xu, David and Kim, 2018; Pogan, 2019; Hirschi, 2018: 193). Thus, back in the 18th century, the steam power engine revolutionized production, attracting people from farms and small villages to flourishing bigger settlements (ACATECH, 2013). This early technological turning point is seen as the first industrial revolution. Electricity use fostered these trends towards industrial development and manufacturing increased. Industrial cities developed across the western world, as production moved outside the houses and communities, in the factories, at the beginning of the 1900`s. The use of electricity at a large scale, sustaining thus mass production is considered to be the motor of the second industrial revolution, that contributed to a greater independence of mankind from nature.

New steps towards faster and more efficient industrial production chains were possible starting from the 1970`s, as information technology used at a large scale in factories allowed automatization. This is considered to be the third industrial revolution, that brought affordable goods for large categories of consumers, eliminated risky jobs, made communication easier, transportation faster and replaced humans with machines for those routine, repetitive tasks, in the production chains.

The fourth industrial revolution, firstly described by the founder of the World Economic Forum, Klaus Schwab (2018), is seen as continuing the third industrial revolution. What differentiates these two stages, the third and the fourth revolution, is the fact that the machines, or robots that replace human beings will be able to act, decide, communicate, interact, learn, adapt to various situations on their own, independent from a human decider. Until this late stage intelligence was a specific feature only for human beings. But the last industrial revolution managed to embody intelligence in objects, devices, or other virtual entities. Thus, the Internet was built by people, was developed by people, content was added by people until a few years ago. Nowadays, we are using in fact IoT, the Internet of Things, as the contribution of human beings has been replaced by the contribution of smart things that can provide information. These smart things can be virtual machines, smart watches, searching engines, localization systems, guidance assistants or other types of bots that can send, receive and process information. Although at a first glance each industrial revolution affected the way work was performed, production units or transportation chains, as new technologies were firstly implemented in the industrial domain, each of these developments had strong social echoes, transforming the lives of individuals, families, communities and countries. The globalization context fosters the spread of novelty in any domain and the technological support improved through each industrial revolution contributed to a greater coverage of every discovery. These transformations made jobs easier and less dangerous for some professionals, but also brought lay-offs, as certain tasks were better or cheaper accomplished by machines. Each time employees had to adapt, reorientate, learn how to use new technologies or change their job or even domain. The actual context, defined by rapid transformations, recalls flexibility and

adaptivity more than ever before, as the contemporary changes will fundamentally reshape "the nature of work, business, and society in the coming decades" (Hirschi, 2018: 192). The same author draws attention to the possibility that plenty of the existing jobs will no longer exist in the upcoming future, while others will be seriously reconfigured, without neglecting the emergence of new occupations, professions and even entire work domains (Hirschi, 2018: 193).

Another trend analyzed by the scholar literature is the polarization of jobs, seen as a phenomenon characterized by a greater gap between lower-skilled jobs, in the service domain especially, as cleaning or care, for instance and higher-skilled jobs - teachers, managers, for example. Middle skilled professions, specific for domains as administration, financial services, customer care, that imply repetitive tasks, easily predictable, can be quickly undertaken by virtual machines or other intelligent apparatus, as clear procedures can be built for automatization and functional systems that integrate several operations are easy to put into functioning, due to the actual technology.

No matter the activity sector, current technological developments are implemented, to a greater or lesser extent, in order to facilitate workers` adaptation, training, remote communication, increasing productivity or avoiding accidents. Research analyzes assistive working systems that can be used in industry (Bertram et. al., 2018: 172-174), showing that human intervention and interaction are still needed, as the studied projects and prototypes are only in their first stages of usage. Besides such working stations, that aim to integrate artificial intelligence, facilitating thus human productivity, virtual reality (VR) and augmented reality (AR) are already used in organizational area (Pogan and Popa, 2020: 35). Virtual reality can be understood as "an interactive, participatory environment that could sustain many remote users sharing a virtual place" (Gigante, 1993: 3), relying on "three-dimensional, stereoscopic, head-tracked displays, hand/body tracking, and binaural sound" (Gigante, 1993: 3). The usage of VR is not possible without external equipment meant to create the virtual environment and augmented reality could be understood as a "softer" form of virtual reality. They are both used in organizational or military training, education, medicine, game industry or even therapy. Previous studies showed that the main domains where VR is used or where research was conducted are represented by the automotive industry, aerospace industry, industrial plants, followed by energy and military industry (Zhu, Fan and Zhang, 2019).

## 3. Methods

Taking into consideration the above mentioned characteristics of the industrial transformations affecting the work domain, the empirical part of the present study aims to focus on the experience and usage of smart devices (tablet, laptop, smart TV), intelligent working systems, VR, AR and AI that employees report.

We developed our research in the automotive domain, as this is considered to be among the areas that use smart, new technologies (assistive working stations, VR, AR, AI) to a greater extent than other sectors (Zhu, Fan and Zhang, 2019: 563).

The main research questions targeted through this study focus on:

a. What are the main smart devices in terms of preferences to be used in daily life in the case of employees?
b. What is the level of expertise that employees consider having when working with smart devices?
c. What is the usage level in the case of intelligent training systems at work from employees' perception?

d. What is the level of expertise in the case of intelligent training systems at work from employees' perception?

Our exploratory study followed an online survey using a Google Forms platform, conducted in the automotive industry domain. Initial data was collected from 120 participants, after correcting and applying filters to data, results from 100 responses were analysed and processed.

In terms of sample features, participants' age ranged from 19 to 56 years of age (M=31.96), divided into equal numbers of female and male subjects, 73% indicating an urban residency at the moment of the study.

**4. Results**

Data showed that the telecommunication devices (e.g. smartphones) occupy the highest percentage of time usage (49% use the phone between 1-3 hours; 34% use the phone over 3 hours) and respondents self-evaluate their experience level as between advanced users (35%) or experienced (34%) as shown in Table 1.

**Table 1: Levels of experience in terms of communication devices usage**

| | Basic user | Intermediate user | Advanced user | Experienced user | No answer |
|---|---|---|---|---|---|
| % | 13 | 17 | 35 | 34 | 1 |

Following close, results also underlined that the usage of entertainment devices with focus on the smart tv, reserve another high level of time (27% between 1-3 hours; 25% over 3 hours), 37% of respondents considering they are advanced users and 18% experienced users. A high percentage of the participants do not use the tablet (38%) as a smart device in their daily life, while on the opposite side their experience level self-evaluation for computer (60%) or laptop (61%) utilization, consists of experienced or advanced user profiles. Results also showed some interesting features, 31% of employees not using the computer daily while 29% using it over 3 hours, while 49% using the laptop over 3 hours (see Table 2).

**Table 2: Levels of time usage percentage concerning calculations devices**

| % | Never using | Not using daily | Over 3 hours |
|---|---|---|---|
| Tablet | 38 | 44 | 1 |
| Computer | 26 | 31 | 29 |
| Laptop | 12 | 20 | 49 |

From another perspective, results showed another trend concerning other intelligent devices in terms of low levels of experience and time spent working with them.

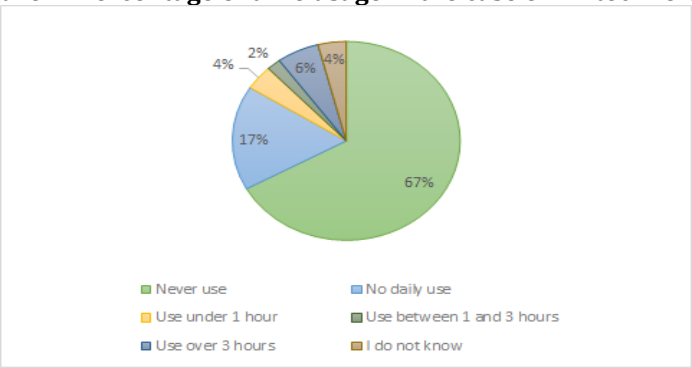
**Table 3: Levels of experience with intelligent devices**

| % | Never using | Basic user |
|---|---|---|
| Game console | 59 | 11 |
| AR technology | 59 | 14 |
| VR technology | 60 | 15 |

In this direction, 59% of the participants state they have no experience with game interactive consoles, 59% have no experience with augmented reality (AR), while 60% have no experience with virtual reality (VR), in Table 3.

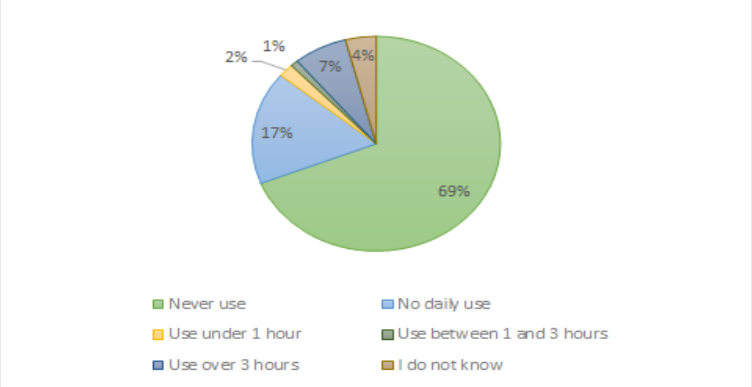
In terms of time spent on using the intelligent devices with focus on AR technologies, results show very low levels of utilization or none (see Figure 1).

**Figure 1: Percentage of time usage in the case of AR technology**




When analyzing the amount of time spent on using the intelligent devices with focus on VR technologies, results show very low levels of utilization or none (see Figure 2).

**Figure 2: Percentage of time usage in the case of VR technology**




In terms of experience with intelligent training stations at work, 55% declare they never used this type of system, 60% never experienced working with an automated simulator or with a virtual simulator (68%), in Table 4.

**Table 4: Levels of experience with intelligent training stations**

| % | Never using | Basic user |
|---|---|---|
| Training station | 55 | 23 |
| Automated simulator | 60 | 21 |
| Virtual simulator | 68 | 13 |

The same low levels of experience are also reported in the case of augmented (69%) or virtual (73%) reality devices. A high percentage of participants (78%) declare they never used or have no experience with AI assisted training systems (see Table 5).

**Table 5: Levels of experience with smart reality training stations**

| % | Never using | Basic user |
|---|---|---|
| Augmented reality | 69 | 12 |
| Virtual reality | 73 | 12 |
| Artificial Intelligence | 78 | 9 |

**5. Discussion**

As seen in previous research articles and academic papers, the use of smart devices in everyday life has become an ascending trend, importing a wide variety of challenges to the daily user, work environment, company development, performance and adaptation to a new technology market. As a special sector in this domain, the intelligent systems start to cover a wider application platform.

Systems such as the AR, VR or AI platforms require a higher level of training, concept understanding and experience at work, in order for the employee to fully use their optimal applications and outcomes. On one hand, results showed that employees are now quite familiar with smartphones or smart television, and they reserve an important time from their daily activities using them, while being at advanced or experienced level. On the other hand, the same employees report low levels of familiarity when dealing with AR, VR or AI systems at work, with little or no experience to report. The same goes for their practice with intelligent training stations, automated or virtual simulators, where the levels are low or non-existent in the organizational environment or training practices. From this perspective, the research and company level management should consider for the future the implementation and development of intelligent device management systems, while supporting human centricity at work.

Structural modeling would be a must, just as in the case of mobile device management systems, where also other variables are monitored among which: system features and technical background analysis, threat agents and definitions, values and assets, vulnerabilities and actions (Rhee, Won & Jang, 2013). Moreover, productivity evaluation is required to be analyzed in detail when dealing with intelligent devices at work, following in comparison the case of mobile communication usage inside the organisation, with potential implications for work-life balance, increasing or decreasing performance and ethical guidelines for employee monitoring (Muhammad et al., 2013). Also, other literature works suggest the need for information systems evaluation not

only in terms of usage but also on the work-performance impact and perception of employees (Sundarraj & Vuong, 2004). In addition, the level of experience and time usage must be associated in future studies with the work-life balance concept and interactions. Adisa, Gbadamosi and Osabutey (2017) described also that concepts such as "boundaryless" or "borderless" work domains solicit a new re-examination with focus on the work-life theory in the future.

The intelligent platforms for training require a detailed attention from the research sector in terms of perceived usefulness from employees, reserved attitudes and fears of the unknown new technologies, lack of experience or direct contact with such devices, human centricity and ethical principles. Kim and Gatling (2017), outlined that a platform should provide useful functions to the user, in order to ensure engagement, alongside information recognition and posting, data sharing and distribution, alerts and notifications, recognizing achievements, all concurring to the job performance target. Moreover, smart devices and applications development should take into account topics regarding personal freedoms, data protection and privacy (Cambon, 2017), ensuring that the human user remains at the core concept, with respect to ethical, moral and relevant grounds.

## 6. Conclusions

The industrial sector is among the domains mostly impacted by the usage of new technologies. Work in such areas is transforming rapidly, as efficiency, productivity or cost reduction are targeted by any management. Therefore, new, performant systems, innovative solutions, autonomous devices are quickly implemented, and many times tested in the organizational domain. As shown before, human-centricity remains a core-concept, even though assistive, intelligent systems are steadily introduced, trying to help human operators and facilitate their work, contributing thus to better results for the entire organization.

Besides the practical use of such new technologies, the human factor also has a great contribution to the adherence to these new systems, devices, intelligent platforms or even totally innovative ways of work. Therefore, in the present paper we aimed to analyze the perceptions of employees from the automotive industry (considered to be one of the leading domains regarding the implementation of new, smart technologies) regarding such innovative aspects.

In the present study, data outlined the shift and polarised perceptions among employees between higher levels of usage and experience when it comes to specific communication and entertainment smart devices in contrast with low levels of usage and experience all the way to none when it comes to AR, VR and AI technologies and platforms.

The above mentioned perceptions of employees show the need for further research in this field, doubled by organizational programs and strategies aiming to foster human workers` adaptability to new technology, as the smart world we already live in makes everything surrounding us intelligent.

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