Corvinus University of Budapest

Doctoral School of Sociology

PhD Dissertation

"The Optimistic Blindspot: Hungarian AI Developers and the Future of Work"

Ágnes Horváth

Tutor: Dr Lilla Vicsek

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1 Introduction

The question of how technological innovations shape the different aspects of life is not new. From the beginning of history, new technologies meant an advantage over other groups. Technological innovations helped humankind in hunting, warfare, and food production; they made us capable of extending our frontiers and lifespans. New technologies and innovations, therefore, can be viewed as beneficial for society or a constant threat that others can use against us. Research about technological innovations involves research on power, necessity, creativity, adaptation to new situations, networks, and what connections we can find among all these aspects. It is tempting to try to tell what the future might bring, but the context is too complex (Bell, 1999; Borup et al., 2006).

The topics of artificial intelligence, its effect on our current way of managing our life and work, its promises to alter these practices, and its benefits and threats are the focus of public debate, popular science, and pop culture. One of the most popular topics is the relationship between the development of AI and the future of work. In their article about the future of employment, Frey and Osborne started a wave of intensive debate. They state that almost half of all US employment is in danger of computerization (Frey & Osborne, 2013). The OECD working paper on the risk of automation for jobs in OECD countries is much more cautious about the extent of change. The report found that low-skilled employees will face the biggest change in their working patterns, which is the biggest challenge to be prepared for, but in general, the possibility of an enormous workforce being left without a job is very low (OECD, 2016).

In his article about the necessity of reconfiguring discourses regarding artificial intelligence, Z. Karvalics László criticizes these authors for being “alarmists” and presenting a dystopian picture of the future where super intelligent, artificial intelligence-led robots will demolish humankind. Even more moderate “navigationists” hint that without elaborated and well-planned supervision, such intelligent robots can turn out to be dangerous instead of helpful and like the extension of human intellect (Z. Karvalics, 2015). In her review of the books of Ford, Susskin and Susskin, Brynjolfsson and McAfee and Urry, Judy Wajcman articulates her opinion that while drawing a negative outcome of automation and robotization on humankind, none of the authors give voice to the concern of the power concentrated in the hands of only a few corporations and the social consequences of this fact (Wajcman, 2017).

In my research, I will investigate the connection between AI and relevant technologies and the future of work debate from a unique point of view through the eyes of Hungarian IT professionals who have cutting-edge knowledge about the latest improvements in AI. My reason for doing so is manifold. The literature on the topic of the future of work is written by a wide range of experts, each adding different points of view from their respective fields of expertise. In most cases, the central question is whether robots will take over our jobs. Depending on the side they take, authors either reason that a transformative and radical change is about to come that will drastically lower the proportion of humans in the labor market, causing unforeseeable consequences (Frey & Osborne, 2013; Ford, 2017; Brynjolfsson & McAfee, 2016; Huws, 2014) or on the contrary, arguing against such statements and in favor of a slow, manageable transition (OECD, 2016; Kelly, 2023) and rarely taking the third path and urge for the coming of an entirely machine-based economy to free humankind from the drudgery of economically forced labor (Bastani, 2019). Most of the literature focuses on general statements written by academics from the global north, with limited examples from Africa (Chigbu & Nekhweva, 2021), Mexico (Lovett et al., 2004), or India (Bisht et al., 2023; Lingmont & Alexiou, 2020). Data from the European Commission engages with broad topics and provides data that helps to position Hungary within Europe. Still, the macro-level nature of the data does not allow us to make nuanced statements about the participating countries (European Commission,2020, 2021). Seminal work of Hungarian researchers (Tardos & Ságávri, 2021; Keszey &Tóth, 2020; Makó & Illéssy, 2020; Illéssy et al., 2021; Fehér & Veres, 2022) was therefore of great help to draw many-layered pictures of the Hungarian context in relation to the future effects of AI and automation. Through research done in Hungary, we can learn the perceptions and expectations of a wide range of professionals, from blue-collar factory workers to engineers and management to representatives of the trade union (Tardos & Ságávri, 2021; Keszey & Tóth, 2020) and members of the Hungarian AI Coalition (Fehér & Veres, 2022) while the official report on the AI strategy of the Hungarian government reflects expectations of the political field (Magyarország Mesterséges Intelligencia Stratégiája 2020-2030, 2020). This PhD dissertation is part of OTKA research no. K131733 entitled Visions of artificial intelligence and society and, therefore, part of a series of scientific investigations using various methodologies targeting different society groups. Investigations have been done on the expectations of young Hungarian adults (Vicsek et al., 2022). AI specialists participated in a backcasting workshop that utilized their expectations about an optimal future (Pintér, 2023), and this research used scenario-building. The team members helped prepare the methodology used in the

dissertation, as one of its cornerstones was to map foresight methods suitable for research. They constructively commented on the preliminary versions of the publication made from it.

As can be seen, there was one missing piece from the social spectrum: those working and developing the technology at the heart of all the debate. There is research on how AI developers vision the future in general (Vaast, 2022) about their relationship to ethical questions in AI development (Duke, 2022; McDonald & Pan, 2020; Metcalf & Moss, 2019; Pant et al., 2022) but the issue of the future of work and AI through the lens of AI developers is not broadly researched. Although Hungary is not at the front of AI development (Vértesy, 2020), IT professionals, especially those specialized in AI, are positioned of fundamental importance in the future of our country (Magyarország Mesterséges Intelligencia Stratégiája 2020-2030, 2020; Századvég, 2022). IT professionals and specialists in AI are the humans behind all our debates regarding the future of work, from headlines about unethical, discriminatory applications of AI to its undeniable success in science. Therefore, their visions and expectations must be mapped out and investigated in detail. In contrast to laypersons whose expectations can be influenced by many, not scientifically accurate resources or economists who are not necessarily required to have a deep understanding of the technical background behind AI, IT professionals are supposed to have a clear understanding of AI's possible or probable future outcomes. Their knowledge of economic, political, or ethical issues might influence or alter their positions, which also have to be part of the research since their prepositions regarding AI's technological and moral limitations can be decisive regarding innovation's path. Lastly, Hungarian IT professionals can be positioned in a state of "in-between" from two different points of view. First, while Hungary currently is not at the core of AI development (Vértessy, 2020), Hungarian AI developers are elite IT professionals. Secondly, while they are employed by the companies that are key players in the field, Hungarian offices, being mostly subsidiaries, have limited power over decisions regarding development directions (Tardos & Ságvári, 2021).

1.1. Overview and structure of the dissertation

This research document begins with the **introduction of the sociology of expectations** as the theoretical background of future studies. For social scientists, research on future events or outcomes is difficult since we want to enquire more about something in the realm of the "not yet" (Brown & Michael, 2003). Although we cannot foresee what the future holds, we can investigate what people imagine will happen in the present and how their expectations about

the future interact with their decisions in the present. While in the past, the future belonged to God(s) and therefore was seen as something that humans cannot have power over, in modernity, especially after the industrial revolution and in modern capitalist systems, knowing as much about the future as possible is essential. (Beckert, 2016). Expectations have performative roles in our lives since they affect what we do in the present to achieve an imagined future state that we anticipate. (Birch, 2017; Borup et al, 2006). Concepts of fictional expectations and imagined futures were introduced by Beckert (2016) to describe how people try to find viable solutions for the future in our modern, fast-paced world with high levels of uncertainty. Fictional expectations are interpretative frames that can aid actors in their decisions when navigating vast numbers of opportunities and outcomes and map plausible actions in a fictional realm of the future interwoven with uncertainty. The role of experts is undeniable when achieving the lowest level of uncertainty is pivotal. Although we can never achieve total certainty regarding the future, the imagined future created by experts and their expectations have performative effects on a vast number of others, as it is commonly believed that their expectations are the most probable ones (Beckert, 2016). Based on this theory, in a world where the future is open and, therefore, the variation of future outcomes is high, when achieving the lowest level of uncertainty means an advantage against others and where experts' expectations and visions about future outcomes are widely accepted and followed, what today is IT specialists expect can shape our future.

Since our future is in the realm of the "not yet," first, we might look at **visions about the future created in the past**. This approach can demonstrate the logic of previously created imagined futures and give additional evidence to the fact that most of the expectations of experts of any given historical period are usually inaccurate (Beckert, 2016). In accordance with the sociology of expectations, visions, and utopias reflect how thinkers, philosophers, and writers perceived the future. Suppose the future is believed to be closed, meaning that it is predetermined and it is impossible to change it. In that case, the topic of the future of work and society is positioned in an imaginary future state, far in the unforeseeable time of humankind, or depicted as an alternative present in an alternative world. There is a transitional period when the future is still in the hands of God, but our actions in the present and their plausible outcome in the future can be accepted as a sign of God's favorable plans. Once the perception of the future opens up and it is believed to be changeable, visions start to search for the answer to what will happen. The reason behind this can be explained by the importance of uncertainty in the open future (Adam, 2008). Therefore, the second part of the

Background chapter lists some of the most well-known utopias of the past. The basis of the analysis is the presence of the following aspects: the perception of work in general, the quantity and quality of work in the future, the role of technology, and how equality is depicted. Throughout history, work was generally believed to be drudgery either because it was done out of necessity or because of its high quantity. Utopias always aim to reach a state where work is a way of self-expression with as little toil as possible. With fewer hours spent on working comes the improvement of its quality. Technology is always described as the key to a better future, and its substituting potential for human labor is favorable exactly because the goal is to minimize hours spent at work for people. (Granter, 2009; Ransome, 1999; More, 2018; Fourier, 1971; Keynes, 1930; Gorz, 1985; Bastani, 2019). The topic of equality is present in the utopias of the past, although its extent is narrower than what our modern society expects. White Christian men are the base group of equality, while women, children, slaves, or foreign workers are depicted as tools or left out from the description of the imagined future (Fourier, 1971; More, 2018).

After outlining past visions of the future, the third part of the Background chapter moves on to **contemporary visions.** This part of the research paper aims to give a well-rounded understanding of the future of work debate by reviewing the opinions of social scientists, economists, laypersons, and other experts. One obvious lesson of the literature is the complexity and diversity of analysis on the topic in recent years. As it is often mentioned, there are three main groups of opinion under many different labels. Typologies created by Firth and Robinson (2020) or Boyd and Holton (2018) attempt to organize authors of the topic into categories based on the similarities they show in their logic to simplify the main perceptions, but sometimes, even the typology creates chaos. Although there are many nuances in the different discussions, there are three main groups. Those who represent a pessimistic view on the future of work mostly see a radical, unstoppable change in the future with high numbers of unemployed since it will be more rational to "employ" robots from a financial point of view. The jobs remaining in the hands of humans will be of lower quality, and because AI will be able to take over jobs from white-collar sectors, there are no other sectors to move (Frey et al., 2013; Ford, 2017; Brynjolfsson & McAfee, 2016; Schwab, 2016). On the other side are those who either expect no radical changes or improvement in the quality of work due to enhanced working conditions achieved by AI and related technologies (Geels & Schot, 2007; Ransome,1999; Bastani, 2019; Miller & Atkinson, 2013). In the middle are most of the economists writing about future technological outcomes who are not as

pessimistic about the range of change as the pessimists but not so sure about the definitive positive effect of technology on the quality of work (Gordon, 2014; Taylor, 2018; Arntz et al., 2019). Although this part enlists a wide range of viewpoints and shows data from various sources, there is still an opportunity to point out some of the weaknesses. First, there are potential flaws in the data from which extrapolations and calculations are made. When an entire model builds on the classification of jobs or tasks, the relevance of that dataset is crucial, and an outdated set of information can lead to false forecasts. Secondly, the importance of unemployment rates is overemphasized, and the growing numbers in the gig economy or precarious jobs are downplayed or ignored. Economists routinely use units of products when considering ways of productivity gains and redistribution, but AI-generated wealth is not feasible for this kind of calculation. There is no precise measure to describe the unit of production made by the Big Five per country. Profits are created in many locations by an army of the cyber proletariat. (Huws, 2014; Dyer-Whiteford et al., 2019; Ernst et al., 2019). Third, the positioning of the education system as the center of positive change (Frank et al., 2019; Spencer, 2018; Ernst et al., 2019) might appeal to many of us, but because of the slow nature of change that can be achieved through it, there should be a long term, mutually accepted vision based on which an entire system could be reshaped. Finally, there is a clear techno-deterministic viewpoint throughout the literature that takes the development and deployment of new technologies as an inevitable fact and amends the current systems or delegates the task of fixing humans to fit into the new requirements of technology.

IT professionals are not at the center of the above-mentioned literature since most of it articulates concerns regarding the future of low-skilled workers and easily automated jobs, and their prospects in the future are not perceived as evidently positive. It seems that IT professionals are the best prepared for the coming of an AI-led economy, and if pessimists are correct and robots take our jobs, they will be the last members of the human workforce. They are highly educated and have acquired the necessary skills to work on- and with AI or at least have a high level of computer literacy. Their preparedness and favorable position mirrored the high demand for IT professionals (Atkinson & Meager, 1986; Bell, 1999; Ford, 2017; Susskind & Susskind, 2018; Brynjolfsson & McAfee, 2016; Schwab, 2016; Dyer-Witherford et al., 2019; Ransome, 1999; Frey & Osborne, 2013). While all these facts are true to them, the question is whether technology can improve to a level that makes even them redundant. IT professionals are key to developing and using novel technologies to a certain point, after which the simplification process comes to make that technology more available for wider but

not tech-savvy employees working as members of a global cyber proletariat. This process can shrink the number of essential IT professionals, and eventually, an AI capable of writing codes might even replace them (Huws, 2014; Dyer-Witherford et al., 2019).

The next part of the Background chapter gives an overview of **the Hungarian context** to shed light on the details and peculiarities of the environment in which research participants navigate daily. Looking at the data presented by PwC Hungary (2019) and Makó and Illéssy (2020), it becomes obvious that the high proportion of jobs in manufacturing and construction puts Hungary's economy in a vulnerable position if the "robots take our jobs" scenario becomes true Automation will first strike those traditionally white-collar jobs mostly held by females, which consist of simple computational or administrative tasks, while the blue-collar, male-dominated industries will be the last to fall for automation (PwC Hungary, 2019). Makó and Illéssy looked at the same phenomena but used a different methodology. Instead of looking at industries, they distinguished jobs based on their complexity. This mode of grouping occupations aims to prevent the mistake of stating that an entire industry shares the same level of skill sets and professional backgrounds while, in truth, manufacturing or construction involves both high- and low-skilled and educated labor force (Makó & Illéssy, 2020). Data focusing specifically on the level of IT usage at firms and computer literacy of the citizens show that while the technicalities are readily there to enable the use of the internet and Hungarians generally believe that ICT development is beneficial for society in general, most of the population only have basic computational skills. The high demand for IT professionals with advanced, AI-related levels of proficiency and the perception of high expenses of introducing AI technologies prevent Hungarian firms from entering a more technologically up-to-date way of production (European Commission, 2020, 2021). Considering the importance of manufacturing and automobile industries in Hungary's economy and pairing this fact with the founding of the PwC report (2019) and research of Makó and Illéssy (2020), studies conducted by Tardos and Ságvári (2021) and Keszey and Tóth (2020) about the perception of managers, workers, and trade union representatives regarding automation was essential for my research. Managers seemingly shared the expectations of the "not real change" group (Boyd & Holton, 2018) and pointed out that in Hungary, firms struggle with the shortage of IT professionals; therefore, the threat of robots taking human jobs is not real. While the lack of sufficient IT personnel is a real problem, management also hinted that until human labor is cheaper and readily available, the headquarters probably won't finance the deployment of new technologies. Managers in both

industries found AI and robotics to be a challenge and showed a positive attitude towards it, while blue-collar workers were more restrained or negative and articulated their fear of being replaced by robots (Tardos & Ságvári, 2021; Keszey & Tóth, 2020).

The section on lay expectations starts from the premise of the sociology of expectation, stating that expert visions have a performative role that helps society to create a mutually imagined future towards which we aim to go (Beckert, 2016). If this statement is true, then images of this imagined future should also be present in laypersons' expectations. Research collected from various geographies showed that people's location and perceived possibilities to change their situation were focal in their future expectations. One general edification is the rejection of the pessimist "robots will take our jobs" narrative (Lovett et al., 2004; Keszey & Tóth, 2021 Winkelhaus et al., 2022; Chigbu & Nekhwevha, 2021; Vicsek et at., 2022) which doesn't mean that participants were optimists about how technology will affect their work life (Bhargava et al., 2021; Bisht et al., 2023).

The next section covers the **preliminary assumptions**. There are two main fields of inquiry: the presence of mainstream discourses in the accounts of Hungarian AI developers and IT professionals and their ethical considerations regarding future outcomes. The general expectation of the research is that participants won't differ in their logic from Western experts in that they will perceive work as an essential value in society and will have a general optimist view of AI and its effects on the world of work. Research questions investigating AI developer's ethical considerations do not have a hypothesis since these topics are examined through open questions to give space for the participants to answer freely.

The fourth chapter of the dissertation covers the **methodological background**. In its first part, a summary is provided about different, previously used techniques in social sciences to investigate topics related to the future. Later, there's an overview of forecasting methodologies and a presentation of scenario-building.

The fifth chapter is dedicated to the **Results** of the research and has two main parts: the first part discusses the results of the interviews, while the second part is about the visions created during a scenario-building workshop**. Interviews** are analyzed according to the main themes that occurred in them. First is participating in AI developers' visions about the future of work in general by the year 2050. There are two recurring elements in this part. First is the conviction that although AI will change the way we work, this will be a slow and graduate

process that will leave us time to adjust. Secondly, they argued that there is currently hype around AI and that the technology is not as powerful or smart as laypersons like to believe, which makes it unnecessary to be afraid of it within the timeframe of the next thirty years. Experts displayed a strong sense of techno-optimism throughout the interviews, saying that AI and related technologies will help and enhance humans in their work instead of completely substituting them. Even the potential of disappearing blue-collar jobs was perceived as a positive outcome because they saw a general improvement in the quality of the remaining jobs. Best-case scenarios created by them reflected a general wish to achieve a better life- and work conditions for everyone. Part of this better future involved an educational system committed to providing IT skills at all levels of schooling and a wide range of jobs augmented by AI to ensure objective decision-making and precision. Regarding ethical questions, interviewed developers didn't show initial interest in the ethical aspects of AI and showed limited solidarity towards the losers of a highly automated, AI-augmented future labor market. While they broadly acknowledged the potentiality of technological unemployment, only a minority tried to think about solutions, while the majority only expected the government to find some solution. Ethical issues mentioned in the mainstream media were mentioned but not as examples of the negative consequences of AI on society. Developers generally thought that even in cases of racial profiling, AI was working perfectly only with bad-quality data collected by biased humans. Interviewees perceived themselves as members of an elite group. Hard work and expertise were mentioned as their key to success, first to get admission to the best universities and, after graduation, to enter a very competitive and small fighting arena in the AI-related job market.

AI developers created two scenarios during the scenario-building workshop: one best- and worst-case scenario by the year 2050. The best-case scenario is titled Slow World and reflects participants' desire for a future in which AI helps humans to achieve an inclusive labor market, AI-enhanced jobs, and the possibility of easily changeable careers through adequate education of broad skills needed in the labor market. Although the best-case scenario wasn't revolutionary in that AI developers couldn't imagine a future radically different from the status quo and only emphasized improving the quality of work in the future, it was created through a lively conversation. In contrast, the creation of the worst-case scenario proved to be difficult to imagine. AI developers agreed that the worst outcome by 2050 would be the absence of AI improvement, but they had difficulties imagining what would cause it. Finally, they decided to come up with the theme of war and build the worst-case scenario on it. Even

in this case, AI was portrayed partially as the savior of humanity, even in its current state.

The dissertation ends with a short description of the answers to the research questions in the sixth chapter. Finally, conclusions, remarks, and further research areas are presented in the final seventh chapter.

2 Background

2.1 Sociology of Expectations

Capitalism is heavily dependent on technology, so the importance of technoscience is rising too. From policymakers to product developers, there is a huge variety of almost all aspects of our lives when our decisions, plans, aspirations, and expectations are based on facts, forecasts, and calculations of technology. Science and Technology Studies (STS) focuses on the interconnectedness of economy and technology to pursue adequate answers to questions like how STS scholars might conceptualize the economic assumptions implicit in technoscience. Birch proposes three main theoretical approaches that aim to answer this question. The first concentrates on performative roles, the second on political economy in technoscience, and the third is on technological expectations. The school of technological expectations assumes that future expectations are constitutive because actors of different fields ascribe a bridging role to them (Birch, 2017; Borup et al., 2006). Expectations have performative properties, too, by either promoting or preventing a technology's development by stressing its benefits or risks (Mülberger & Navarro, 2017; Borup et al., 2006).

The sociology of expectations literature deals with the question of how our perspectives of the future shape our strategies in the present. Barbara Adam highlights four attributions around which she builds her research regarding the history of the perceived future. Ownership, origin, expertise, and method. In the early period of history, the future belonged to the gods or ancestors. Only a selected few were chosen to be their voice, but humans could never have the power to change what was planned for them. During this period, the future was considered as the realm of the unknown, which was unchangeable. Under such conditions, prophets or fortune tellers could only foresee the future of the individual, not to let them change the course of their life but to let them know what is waiting for them no matter what deeds or harsh decisions they make. Ownership and origin of the future belong to divine powers, and experts of knowledge regarding the future get their tools and understanding from them, too. In such a regime, the future is seen as closed and definite; therefore, the knowledge about it doesn’t give power in the hands of experts (Adam, 2008). Technological innovation brought great changes. At the beginning of industrialization, the Protestant ethic gave a new meaning to predetermined futures. While the owner of the future was God, humans could prove their worthiness through their present actions. The future was still considered to be closed, but the

importance of actions taken in the present became of great importance. Adam uses the description of the usage of calendars and clocks to show how the relationship to measuring time changed our perspective of the future. The precision with which we can measure time resulted in the shift of mindset from a more natural, changing with the seasons, the fluid experience of time to a quantifiable, predictable unit that can be used and exploited. In modern times and in secular societies, we see the future in quite a different way. The future has become open, with a wide horizon of opportunities waiting for us. We are the owners of our future; we can shape it and change it through our present actions. While in premodern times, the theistic orientation resulted in the preservation of the present in the future, modernism substituted God(s) with the individual and preservation with innovation (Giddens,1990). The open future propounds the question of whether it's empty or not. An open and empty future is for us to conquer; we can shape it, and we have the means to decide in which direction to go and with what to fill it. On the other hand, if we see the future as open but crowded, we can still decide which path to take, but the roads are already given. But how can the future get crowded or filled? If we are the owners of our future and have choices of how to shape it, then who defined and shaped what is already in it? To answer this question, we have to widen our view and include ancestors and previous generations too. When we see the future as open and empty, we don't consider the consequences of how previous generations saw their future. We put ourselves at the starting point of time, as if nothing has happened before us. The open but crowded future expands this point of view and states that our present was the future of humankind living before us, and some of their decisions left such a strong mark on our present that narrows down our possibilities to create our future (Adam, 2010). In this regime, the role of experts has changed dramatically. While a closed future is determined and ownership is not in the hands of the individual, it lifts the responsibility of decision-making from humans. No matter what you do, your future is decided. In the case of an open future, making good decisions can have significant consequences; therefore, the knowledge of the future can provide power, too. Gods no longer choose experts of the future but members of business management or academic fields of economics, business studies, or sociologists (Adam, 2008; Brown & Michael, 2003). Even though the future was always considered unknown, the uncertainty level is only important in an open future. The higher the level of uncertainty and the greater the importance of making optimal decisions, the more important role an expert has. Knowing what the future may bring is important not only for business decisions. Within capitalism, constant forward momentum is expected from businesses, employees, and even consumers in order to stay ahead of their

competition (Beckert, 2016). This constant forward momentum leads to the consequence of continuous decision-making in the present to the point that the future can be eliminated by it (Nowotny, 1994 in Adams, 2010; Borup et al., 2006). We are all familiar with the saying that time is money. With this perception of the commodification of time comes the commodification of the future, meaning that from an economic point of view, uncolonized future time can be perceived as future money wasted. From this arises the fetishization of the future, which oversteps the heightened expectations of the new to expectations of the soon-to-be, the "not yet" (Brown & Michael, 2003).

In a future with infinite possibilities and outcomes, every actor has to deal with a high level of uncertainty and make decisions ahead of other actors or competitors. This infers the question of how we can define expectations of this "not yet" uncertain and variable future. In his book about expectations in capitalist economies, Beckert presents the theoretical framework of imagined futures and fictional expectations. Fictional expectations are interpretative frames that can be used to aid actors in their decisions when navigating between vast numbers of opportunities and outcomes and to map plausible ways of actions in a fictional realm of the future interwoven with uncertainty. In an open future, fictional expectations are contingent; therefore, they don't satisfy the requirements of rational choice theory since it is not predictable which imagined future state will materialize and which strategy will be optimal to reach it. Under such conditions, the role of experts is unavoidable. As Beckert points out, most of the forecasts and predictions regarding the future sectors of the economy are outstandingly unreliable, yet they are anticipated each year. The rationale behind it is the performative role of expectations, especially the expectations of experts. Since outcomes in the future are highly uncertain and the pressure to act first is high, even these otherwise unreliable expectations can lead to actions. When most of the actors believe in the same imagined future supported by shared fictional expectations, the performative quality of expectations will initiate decision-making (Beckert, 2016). Expert opinions, forecasts, and expectations are believed to be pivotal yet MacKenzie points to the fact that the closer someone is to the place of knowledge production the higher their level of uncertainty will be regarding the outcomes, while outsiders or the users of that knowledge will be more confident about the plausible future states of that knowledge (Brown and Michael, 2003; Borup et al 2006).

But how can we investigate the performative nature of expectations and why is it, that sociologists so often shy away from the challenge to research it? The forward-looking

momentum that is needed for agents to create elaborated expectations for the future is embedded in the social structure they are part of. Using this definition of Schutz, the actors' actions can be described as retrospective and prospective processes simultaneously since they use previous “stocks of knowledge” about plausible paths of action and project this knowledge on an action in progress (Schutz, 1959). This process is far from the domains of rational choice theory. Since the sociology of expectations emphasizes the role of uncertainty of the future together with multiple possibilities of future states, it is natural that the description of human action will propose a mechanism that helps actors make decisions in the present with the acceptance of the knowledge that they can’t reach the state in which they can collect all the information about all possible future outcomes. In order to countervail the overemphasizing of the voluntaristic nature of future orientation, Mische proposes to view the process during which actors project their expectations into future events as constituted of a creative and willful foresight. This understanding of foresight involves the combination of knowledge and action received from social structures in new ways through a process of imaginative experimentation in order to achieve an imagined future state (Mische, 2009). An actor’s social embeddedness means embeddedness in multiple time horizons that enables an actor to imaginatively engage with both the past and the future (Mead, 1932).

I will use the sociology of expectations to show how our view of the future shapes our decisions in the present and defines what we can imagine the future to become. The very process of thinking about the future bears different meanings and importance in a closed or open future. In a closed future regime, knowledge about the future is useless in the sense that the future can’t be changed. Knowing that one will face great difficulties without the power to prevent this from happening is more of a curse than a blessing. As I will describe in the next section, the long history of the topic of the future of work shows how the perception of the future shaped visions and theories throughout time and how the presence and the importance of predicting what the future will bring gained momentum over what the present should be like.

2.2 Past visions on the future of work

The future of work as a theme involves many questions. How far is that future that we are talking about? How can humanity get to that fictional future? Is it a future for everyone or just a selected few? What will happen to those left out? Should we look forward to the future or fear it? As I will show, the future of work is often seen as a utopia, especially in the early

stages of history. Early examples of visions of the future of work are mostly focused not quite on the future, not elaborating some sort of plan or timeline of what could or what will probably happen, but focusing more on how things should be in the present. Based on the assumptions of the sociology of expectations, this can be partially explained by how thinkers of a given era perceived time. If the general idea of time is circular if it is believed that the future is fixed and closed, then theorizing about an ideal society that is in an alternative present is as good as depicting the future, the ideal state of the same society since the present is believed to be more or less the same as the past was and the future to became the same as the present is (Adam, 2008, 2010).

Although the historical period in which a theory or a vision was written is dominant, there are commonalities regarding the aspects involved and investigated in this genre. As Colin C. Williams points out, these visions always have a binary hierarchy. Depending on the writer's point of view, one idle image, vision, or state is usually defined against its binary opposite. There is a social evolutionary sense in such comparisons. What was before is somehow inferior to the present state. It is not solely the passing of time, the start of a new year or century. The difference between the old and the new era is not measurable in time; it is quantitative. (Williams, 2008). In the following section, I will show how this binary hierarchy can be found from the beginnings of history by using the most important common themes from the point of my research.

2.2.1 The perception of work: Drudgery or self-impression

As an action that must be done out of necessity, ancient Greeks saw work as degrading (Tilgher in Granter, 2009). No matter how sophisticated the task was, how beautiful or artistic the product is, the fact that the person doing it has no freedom in deciding how to make it, that it has to satisfy the needs of someone else, made it drudgery. Utopias about the future included the future of work, too, precisely the end of it. Since working rarely means an activity done not out of necessity, the optimal state of a society is one in which citizens don't have to work at all. Of course, we must not forget that in ancient Greece, slavery made it possible for some of the citizens (but certainly not all of them) to spend their time with philosophy or being engaged in politics. Interestingly, this perception had changed by the time of the Roman Empire's fall. Work, especially agriculture, was seen as a way to connect with the gods and nature, therefore elevated from its previous low status (Granter, 2009).

The perception of work as something that is not enjoyable and that it is a punishment in some

way can be found in early Christianity in the story of the expulsion from Paradise. One of God's punishments was that Adam and Eve had to toil through their life for survival instead of enjoying the gifts of Eden. It is interesting to see how different the concept of work in society was during these times. In a closed future regime, when aspects of life can be considered to be stable and unchanging, the value of work is low. Work couldn't help individuals to change their lives; it couldn't help them to achieve higher status. In a world where social status wasn't defined through economic relations but based on rights and obligations, work was only an aspect of life that had to be done to survive and occupied people with low status.

The change in the perception of the value of work is usually connected with industrialism (Granter, 2009; Adam, 2008; Applebaum, 1992), but there was a transitional period of time when a mixture of the old ways lived together and fought with the new way of structured, planned time usage and high work morale (Granter, 2009; Thompson, 1967). Thompson shows the picture of how fragmented the weeks were between the 16th and 18th centuries. One person could perform a series of very different tasks in various places throughout the week, working different hours a day depending on the job that had to be done and even on the mood the laborer felt that day. It was also common to use women and children of the household to send to work instead of themselves or to make them do the preparations for certain tasks. Incentives of higher payment often didn't result in more men working more hours for extra financial income. On the contrary, higher wages meant that the average worker could achieve the usual amount of money in a shorter period of time and either leave earlier or send someone else instead of himself to continue working. During the period of this transition, the most effective incentive was the lowering of wages. Thompson also connects the perception of time and the role of work in society. As measuring time becomes more and more accurate and more connected to measuring work done, ownership of this nowadays basic knowledge means power over others. He cites journals of cotton mill workers who had to hide their pocket watches carefully so the Warden of the Mill or the Monitor couldn't take them from them and deposit them until the end of the workday. If workers can't tell the exact time, they have to believe what the Warden or the Monitor tells them (Thompson, 1967).

It is generally accepted that the Protestant Ethic had a major role in this transition. The idea that mortal human beings can gain proof of their worthiness by entering Heaven after death was an essential tool to guide workers towards a life in which work is at the center while time spent idle is seen as a sign of damnation. As Granter states in Calvinism, work is not the

means to an end but an end in itself. The teachings of Kalvin and Luther helped factory owners in two ways. First, the concept of profit creation could be turned from something usually looked down on, immoral into the contrary: a sign of heavenly help and a sign of God's favor. Secondly, the low working morale of workers could be tamed too by posing the possibility of an afterlife in Heaven if they work hard in most of their time spent awake (Granter, 2009; Applebaum, 1992).

In the open future regime, the perception of the future changes a lot. As previously mentioned, in this system, the openness of the future means, that it is not viewed to be impossible to change it. Our actions in the present will have serious consequences in the future. Therefore, we always have to think ahead of time and plan our decisions. The future is not part of a cyclic repetition of events; humans can actively shape it into a desirable state. Alongside this forward-looking attitude evolved the view that societies develop throughout history; therefore, what was in the past is inferior in comparison to what is in the present, and everything will be even better in the future (Granter, 2009; Ransome, 1999; Kumar, 1978).

Work's role in visions or utopias about the future gains a central role in an open future regime. By this time in history, work is considered the central element of both the lives of individuals and society. Therefore, social theorists observe different aspects and mechanisms of society in their relation to work. While in the closed future regime, work wasn't central because of the amount of time spent on working, neither the quality of work done nor the knowledge it needed defined social status or could cause mobility to higher status groups, in the open future regime paid work became the only means to survive or to rise in the ladder of hierarchy. Measurable time became the center of life since wages were based on time spent at work, not based on the piece made. With the emergence of mechanized factories, it was simply not possible to follow a natural or personally favored rhythm of work; it had to follow the pace of the machines, and it lasted until the clock said otherwise (Ransome, 1999). Even with the change in attitudes towards work as something that is a moral obligation to be done for the survival and thriving of society, the possibility of a future in which time spent at work is minimal was more than tempting.

It is interesting to see that for those picturing the idle state of humanity as one without the pressure of work, the core concept of work is that it is forced; therefore, it can't be pleasurable. For example, in More's *Utopia, citizens can engage in the same activity they otherwise do during the six hours of work that are* obligatory for each citizen and still enjoy

it. Work done because we are forced to do it is toil or drudgery, while the same activity done in our free time is a pleasure.

A life without work might seem perfect, but it is impossible. The perception of work as a means to self-improvement and satisfaction is the other side of the dichotomy of the perception of work. What makes work a drudgery is, in part, its monotony and the way it's organized, which can alienate the worker. If we can achieve a state where work is enjoyable, when it can be the activity in which we express ourselves, then we have achieved another type of utopia (Fourier, 1971; More, 2018; Bastani,2019; Gorz, 1985)

2.2.2 The quantity and quality of work

The binary hierarchy regarding the quality and quantity of work is multi-faceted. On the one hand, there are those who see the problem of work in its quantity and, therefore, see the solution in the lessening of it. If we can manage to work less, we can be happier (Granter, 2009; Ransome, 1999; More, 2018; Fourier, 1971; Keynes, 1930; Gorz, 1985). Visions and utopias of the future of work written before the proliferation of machines and factories see the solution for fewer hours spent on work in the even distribution of it among all citizens. By engaging every member of society in work, its per capita amount can be lowered to a minimum (More, 2018; Fourier, 1971). Similar reasoning can also be found in the 20th century when the substitution of human labor for machines became part of reality. Fragmentation and standardized work have subversive power on the existing setup of work organization, but it has the potential too to transform it into a new state that would allow less work for more people and, therefore, more time for leisure (Gorz, 1985). In works such as Etzler's *The Paradise,* the role of machines and technological innovations gained importance, too. Etzler obviously saw technology as a positive manner that can bring humanity to a happier, more satisfying state of existence by eliminating tedious work for them (Etzler, 1835).

On the other hand, some see work as a negative aspect of life because its quality is not high enough to bring satisfaction. Quality of work can be understood in different ways. As we saw, the very meaning of work can be understood as a forced activity for sole survival that serves the joy and satisfaction of others, not the producers. Once the forced element is removed, the same activity often loses its meaning as work and becomes a free-time activity (Granter, 2009; More, 2018; Fourier, 1971; Marx, 2013; Keynes,1930). Another aspect of the quality of work is its capability to satisfy the need for self-improvement or the sense of a higher goal.

This can be achieved in different ways. The philosophy behind the Protestant Ethic is to elevate the process of work into the highest possible realm: to give it the earthly equivalent of how God created everything. The quality of work, in this case, is not high because it makes the individual's work in a factory actually more satisfying but because the end bears such a high moral quality that the means to achieve it has to be suffered (Granter, 2009). In the 20th century, the general quality of work was thought to be improved through the process of the extension of the service sector. Daniel Bell sees white-collar jobs as more satisfying since they require a higher educational background and involve more complex tasks (Bell, 1999).

2.2.3 The Role of Technology

Technology is usually seen as an element that will play a great role in the future. From the early stages of industrialism, technological innovation made production more effective, and its potential to replace the human labor force was discovered early on. This perspective wasn't frightening at all since the value of work as a forced activity to satisfy the necessities of life was low (More, 2018; Etzler, 1835; Marx, 2013). John Etzler, an engineer, believed that technological advancement would allow the birth of a society without human labor. The work of Etzler is outstanding, given the fact that it was written in the 19th century and still envisions a future that is very similar to what we like to call self-supporting, green, or eco-friendly visions. In his ideal future, society will use renewable energy sources; people will live in prefabricated buildings made of a vitrified substance that can last for hundreds of years while machines will perform all sorts of work and will be able to build other machines or fix themselves (Etzler, 1835). The role of technology is central in Marx's theory, too, but unlike others, Marx had a contradictory opinion about it. Machines make work monotonous; they force an artificial rhythm on humans without any rest; they kill creativity and are the main cause of alienation. At the same time, Marx believed that machines only negatively impacted workers' lives in a capitalist system. The machine in itself is just a tool; it is not good or bad by nature, and it was not created to worsen the lives of many. The system assigns the role of the machines; therefore, they can be put to use in a way that helps humankind achieve a truly meaningful life by reducing the time and the amount of human labor needed for producing necessities. In capitalism, machines are applied in a way that lessens the number of the human labor force and, at the same time, makes workdays longer. The acquisition of the latest innovation is a great financial expense that must be gained back as soon as possible by having the machine in use as long as possible because higher profit can only be achieved before this new technology is spread among other producers. When this time comes, the price of the

product will fall, and profit can only be achieved from surplus labor. Since the new machine lowered the number of workers, the remaining ones have to be made to work longer hours, and since the number of unemployed had risen, they can be made to work longer hours, too (Marx, 2013)

2.2.4 Equality in Visions

When we hear the term utopia or vision, we picture a future state that is not just simply better than our present; it suggests a perfect alternative in the future. In relation to the future of work, these writings aim to propose ideas of how work should be organized in a better way. As we saw it, a binary hierarchy characterizes most aspects of these discussions except the question of equality. Most of the visions written are products of white men, writing about the present and the future of white men (Ransome, 1999). The better future they depicted is not for everyone. Slaves, women, children, or laborers from other countries are the pillars of the bright future for the selected few. In early accounts of utopias, when the solution was generally the widespread involvement of every member of society in productive work, it was presumed that the main reason for long workdays was that only a small fraction of society engaged in it, while the others were just idlers. Among these idlers are women, children, and servants whom Fourier saw as domestic parasites and who can be used in Harmony as incentives for the men engaged in less pleasurable jobs (Fourier, 1971). More's Utopia involves foreign workers from neighboring countries who can be delegated to harder work and longer workdays just like slaves, a group of citizens condemned by the law of Utopia to live at the bottom of the hierarchy (More, 2018). Marx saw the transitional period from capitalism to communism as the dictatorship of the proletariat, during which winners of one system will be suppressed by the winners of the next one (Marx, 2013).

2.3 Debates about the future of work in the world of robotics and artificial intelligence (RAI)

As I have already mentioned in the introduction, the topic of the future of work and the role technology will play in it is very popular. Not surprisingly, authors try to systematize the different possible outcomes in many ways, but in general, there is an optimist or at least a neutral string of opinions standing in front of the pessimist or alarmist group of thinkers. Just as always, the quality of the occurrence of an event as positive or negative depends on the individual's preconceptions (Ransome, 2018). In this section, I will list the most well-known

statements about the future of work and show how the different sides reflect on them.

One of the most famous publications written on this topic and representing a pessimistic point of view is the 2013 report by Frey and Osborne, stating that approximately half of all jobs in the US are under the threat of elimination by robots and AI (Frey et al., 2013). The probability of losing jobs for RAI depends on its nature, whether it is routine or not, and in which industry it is. It is almost common sense that self-driving cars will one day eliminate the need for drivers and that factories can operate with only a minimal human workforce. What is relatively new and why the prospect of rapid RAI innovation can be used as a threat against employees is its increasing capability of substitute human labor in the service sector, too. The power behind this statement lies in the numbers. It is not just about a fragment of the workforce; it is about masses of professions traditionally thought to be prestigious and RAI-safe (Susskind & Susskind, 2018; Ford, 2017; Brynjolfsson & McAfee, 2016; Schwab, 2016). Martin Ford published his *Rise of the Robots* with a similar pessimistic conclusion regarding the capability of robots to take our place in the labor market, but his book is not entirely cynical. While most of Ford's book elaborates on the details of a future in which the superiority of RAI takes over humans, income and wealth inequality is growing. The population is aging; in the last chapter, he tries to map out a possible solution to resolve the problems and express hope for a stable continuation of society (Ford, 2017).

Those on the more optimistic side of the debate like to emphasize that while RAI might take over humans in some positions, forces are working against this tendency. As Geels and Schot showed in their typology of possible pathways of innovation, the statement that innovation will deterministically take over another existing technology is instead the exception rather than the rule (Geels & Schot, 2007). Ransome states that it is possible that if technology evolves too fast without leaving time for society to adjust, a counterculture might arise (Ransome, 1999). The possibility that RAI takes all jobs from humans can be the perfect solution for the economic problem of all times, that humans must work to satisfy their needs, whether it be basic or luxury. While searching for answers to minimize time spent on work usually presumes either the stagnation of needs or the elimination of needs for luxury, a fully automated global economy can provide us with plenty of free time for leisure and to engage in caring or nurturing for each other without the need of drastically lower our expectations for quality of life (Bastani, 2019). Another string of optimists expresses their expectations that innovations in the ICT sector can solve pressing problems of the future, such as the global energy and resource crisis or environmental issues (Perez, 2015; Valenduc, 2018) or create a

geographically more evenly distributed labor market by enabling remote work (Veress, 2020; Juhász, 2022).

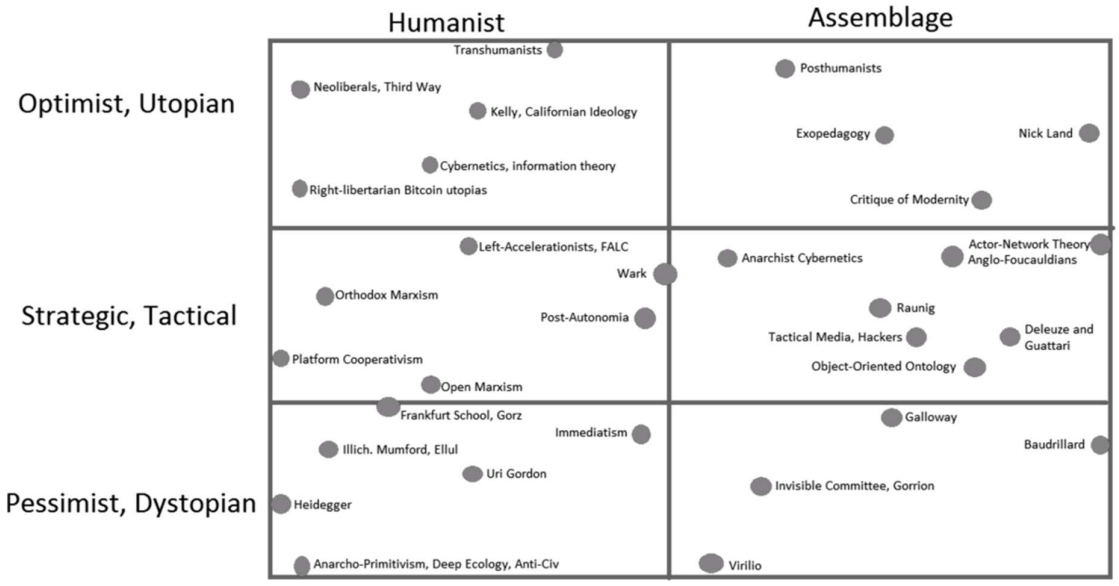
The third type of opinion is the neutral one, which states that the disruptive power of technology is exaggerated. The process of computerization and the evolution of ICT is not new; the promise of robots taking significant volumes of work is even older, yet the apocalyptic consequences are nowhere to be seen (Gordon, 2014; Taylor, 2018). Using the example of Germany, Arntz et al. found that while mature technologies have substitution effects on labor, the so-called Industry 4.0 technologies seem to create more jobs instead of destroying them. While this result may resemble a tech optimist point of view, the authors emphasize some crucial points that must be considered when discussing this topic on a general or global scale. First, legal regulations of the labor market can change the timing and extent of introducing disruptive technologies. In the case of Germany, unions and the social security system provide a safety net for workers, enabling a slower transition from human labor to machine or AI-driven industry. Even without such a legal background, the cost and availability of a trained human labor force might make the implementation of technologies that would substitute humans financially irrational. Second, any genuinely disruptive technology will need an entire infrastructure behind it that has to be available, affordable, and implementable simultaneously. Without any of these, profit-oriented firms might decide not to invest in them or implement a hybrid system that would give time for the labor market to adjust—regarding the question of whether robots will take our jobs or not, Arnzt and colleagues predicted a moderate increase in the number of jobs paired with significant structural changes in the labor market that will negatively affect blue-collar jobs and jobs that include mostly repetitive tasks while will have a positive outcome for highly educated and skilled employees whose jobs involve more creativity (Arntz et al., 2019).

As we have already seen, the quality of work is another question with a long history. In the age of RAI, the more pessimistic opinion is that before technology robs us of our jobs, the tendency of job fragmentation and the spread of the gig economy will force humans to work under insecure conditions (Ford, 2017; Huws, 2014; Schwab, 2016; Dyer-Witherford et al., 2019).

On the other side, there is the possibility that new jobs will be created and that the transition to a machine-based workforce will be slow enough for education to prepare new entries to the labor market with the new skills that will be needed or to provide training for those, who have

to change their career (Pulkka, 2017; Ford, 2017; Veress, 2020). This is not the first time in history to see significant shifts in employment from one sector to the other. RAI will probably dominate routine jobs, may they be manual or cognitive, but non-routine jobs, especially those where human interaction is highly valued, will grow. Automation makes production more efficient, which has a price-lowering effect that can lead to increased spending on discretional goods (Deloitte, 2015; Marciniak, 2018, 2020; Veress, 2020).

Typologies created by social scientists can help us to navigate the multitudes of opinions. It is commonly accepted that there is a mainly pessimistic and a mostly optimistic group of thinkers, with a moderate middle group. It is also evident that the future of work debate has so many layers and different perspectives that a simple dualistic grouping is inefficient in describing it. A typology can aim to build a system of thoughts to provide the various frameworks in which different positions are represented without criticizing them or offering new positions to take. In this section of my dissertation, I will use the framework of Firth and Robinson as a benchmark from where other, more critical typologies can be presented (Firth & Robinson, 2020). The categorization system in their article involves all the main strokes of mainstream literature's viewpoints, although their exact naming might differ.



1. Figure. Visual map of perspectives. Source: Firth & Robinson (2020)

The categories of optimists and pessimists are self-explanatory. The Strategic, Tactical group label signals thinkers putting extra relevance to the socioeconomic systems in which technologies are created and embedded. Humanists and assemblage theorists differ in their

perception of the centrality of humans or assemblages. Post-humanist or transhumanists belong to some version of the assemblage group depending on their views on the quality of systems humans are only part of but not the center of. Optimist-humanists believe that technological change drives economic growth and often position those against it as Luddites. Risks and possible adverse outcomes are perceived as irrelevant or not plausible. Technology is believed to be value-neutral and can only be spoiled by humans with harmful intentions. Assemblage optimists celebrate new technologies for their capability to disrupt the binary of humans and robots and perceive resistance toward the posthuman experience as an attachment to the old, disappearing world. For them, humans are embedded in assemblages with machines and expect the renunciation of human agency to evolve into another state of passive stance. Humanist strategists are situated in the middle since they acknowledge that technology can have a positive effect in the form of lessening drudgery and improving working conditions but also emphasize the possibility of new types of exploitation of labor. In line with their humanist disposition, they are more likely to be socioeconomic determinists concerned with the human experience within the given production system. The Assemblage-tactical cluster is the counterpart of the Humanist-Strategist in that it can be considered the middle-ground direction. What separates them from members of the Assemblage Optimist cluster is their selectiveness. Different assemblages provide different levels of utility to achieve the goal of a better state of being with higher levels of cooperation. Instead of passively accepting alternatives presented to us, humanity should actively participate in the creation process. As their naming suggests, the clusters of Humanist-Pessimists and Assemblage-Dystopian both occupy a rather critical position toward technology. Humanists and assemblage theorists are both concerned about the harmful effects of technology, but from different standpoints; one focuses on how technology deforms the human psyche by causing addiction and moving humanity further away from its natural way of being, while the other is concerned with the nature of the assemblage that would integrate humans, animals, and machines. The Topics primarily mentioned in the Assemblage Pessimists cluster are surveillance, elite control, and military issues, while human values are at the front for humanists (Firth & Robinson, 2020). Detailed as it is, there is one group not presented in most typologies and underrepresented in general, which is the voice of those who do not believe in AI's coming dominance or even its existence. Doubters refer to AI as an expert application designed to solve a specific problem with outstanding performance but has little to do with intelligence. To be truly disruptive and to fulfill expectations of reproduction or the ability to create other algorithms without an order being issued from a human, AI should break the rules

written in its code, something an algorithm will never be able to do (Makridakis, 2017).

From a sociological point of view, a classification should be created that focuses on if and how technology changes society. The starting point of this grouping is the techno-deterministic statement that smart technologies and AI shape societies, and therefore, whoever owns this technology has the power to manipulate it to create the environment most beneficial for them. From this standpoint, optimists emphasize the positive effects of technology in general and its capability to resolve issues that only exist because the technology does. It is indifferent who owns the robots or who is in the position to shape AI because it will either deliver positive outcomes from the beginning of its implementation or will be able to amend unanticipated consequences. Two main groups can be identified if we look at the extent to which technology can shape society (Boyd & Holton, 2018). The first is the "No real change" disposition occupied mostly by economists, stating that the IT revolution has been ongoing for almost fifty years without causing significant disruption in capitalism. Problems such as aging populations or rising inequality were not solved by technology either. Economists, therefore, contrast the rule of diminishing returns with the principle of continuous growth at the heart of narratives of imagined futures about technology's future. The second group is the "Very real transformation." Boyd and Holton do not center their criteria of typology on the sentiment of the opinions; therefore, this group involves both those who believe that change is happening and see it in a positive light and those who also accept it as a fact but fear the outcomes in the future. Their main critique points to the fact that optimists and pessimists tend to ignore factors such as societal acceptance or the rate of technology diffusion in industry. A crucial aspect of technology's substitution power is whether humans need or even demand humans in certain positions and deem robots or AI immoral. Firms' decision-making process, whether to implement a given technology or not, is also influenced by many aspects that can lead to the postponement of implementation to fulfill short- or medium-term profit maximization.

In the following section, I would like to present some examples of the different narratives described before in the various typologies. As already proved, the issue's complexity makes it almost impossible to find clear examples for the different ideal types. However, I will attempt to present articles with arguments closest to them.

Miller and Atkinson's reasoning closely follows the optimistic narrative about the future of work and the effects of technology on it (Miller & Atkinson, 2013). The article repeatedly

uses the term “neo-Luddite” to ridicule economists, journalists, or anyone who publicly shares their reservations regarding technology’s capability to substitute humans and cause mass unemployment. Technology is perceived as just a novel way of production that can result in higher productivity but not at the expense of humans. On the contrary, it will either create more jobs or contribute to the increase in the welfare of society through mechanisms set by capitalism. If technology improves productivity, then savings from this heightened productivity would return to the customers as lower prices, or it would be used to pay higher wages to the employees that will create demand for other products and potentially increase labor demand there, or finally, saving can be incremental profit and be paid to shareholders. The extra spending generated by this would also increase demand and contribute to job creation. The statement that technology will eliminate jobs because they are more productive than humans is rebutted using historical data and the logic of unlimited human wants. According to this, there is no upper limit to our needs, and if technology-induced productivity growth causes the price of a product to decline, humans will instead work more to consume more. This limitless desire to consume creates a labor supply for other, not automated sectors (Miller & Atkinson, 2013).

Another example is the article by Campa, in which he states that technology is not good or bad per se but has a different connotation for different social groups. In a hypothetical equal society, technology would be positive for everyone since it can potentially substitute humans in dangerous or tedious jobs; it can produce with higher precision and lower the price of goods through productivity gains. Since such a perfectly equal society is yet to come, he outlines four scenarios that might occur in the future. All scenarios consider both social and economic considerations and place technology mostly in a dependent position. In the “Unplanned end of work scenario,” states do not intervene; therefore, technology-induced mass unemployment hits people with all its strength. State response moving to the other extreme creates the “Planned end of robots” scenario, which is also a negative one. In this scenario, technological improvements, especially robots, would be banned by “degrowthers.” Without new technologies, this imagined state could only rely on outdated ways of production and lose its economic viability. The third scenario is the “Unplanned end of robots,” which resembles the idea that states should provide some alternative income for citizens if robots take their jobs. According to this case, the solution would be the taxation of robots paired with the distribution of shares of the firms using the robots to create an environment in which citizens are recipients of the profit generated by the higher productivity of robots. Since the

executive body of these provisions is the state, there is the danger of ever-increasing taxation on robots to win votes. After a point, firms would lose their competitiveness, causing a decrease in citizens' income. The best-case scenario is considered a "Planned end of work" future and very similar to the "Unplanned end of robots" scenario. Here, citizens would receive shares of the robotic industries, but it would not necessarily cover all their expenses. As this is a socialist-capitalist scenario, it requires a hyper-technological semi-autarchic state that has both a high level of technological advancement and intent to maintain this and is also able to reduce working hours to provide a sufficient number of jobs for the masses (Campa, 2014).

Technological anxiety has a long history, although the focus is not so much on being substituted as on lowering wages, perceived worsening of the quality of work, or even the fear that one has to leave one's home to find a job somewhere else. Paid work is so highly valued in society that being unemployed can feel like an outcast. (Mokyr et al., 2015; Valenduc & Vendramin, 2019). The relevance of this statement can be understood even better when we look at research focusing on scenarios in which the financial pressure to have a job is elevated and ask participants about their assumed withdrawal from the labor market. Results show that in most cases, respondents would keep on working to improve their capabilities to consume more or higher quality goods or services (Valenduc & Vendramin, 2019; Banerjee et al., 2019) or to use their extra income for investments (Paz-Banez et al., 2020). In some cases, respondents would work less to spend more time with their friends and family, return to training, or be better involved in caregiving or some kind of volunteering (Paz-Banez et al., 2020; Oláh, 2019; Mokyr et al., 2015).

Technological innovation doesn't necessarily have to be detrimental to humans or endanger their job opportunities. Following the neo-Schumpeterian tradition, Carlota Perez (2015) describes the periods of innovation as surges. The first stage, called Installation, is what Schumpeter labeled "creative destruction" and can be described as chaotic in the sense that there are no set rules and regulations, social disruption and rapid obsolescence of skills are typical, while capital and investment are pouring into disruptive technologies. A bubble and later a market crash is following this period, which leads to the second period called Deployment. This second period is when regulations are enforced, and a steady but lower level of economic growth can be achieved (Perez, 2015; Valenduc, 2018). According to Perez (2015) and Valenduc (2018), the currently ongoing ICT surge can be different in its capability to achieve goals and changes on a global scale in a relatively short amount of time. The goals

and changes have to be agreed upon on a global scale, too, but pressing issues like high energy demand paired with low raw material supply or the different environmental issues could be addressed by technology once there is a generally accepted, declared goal of what this branch of technologies should be used for. Unfortunately, the IT sector has only added to the energy and resource problem so far, but its potential to enable humans to work on the same problem independently from their location also makes it possibly part of the solution (Perez, 2015; Valenduc, 2018).

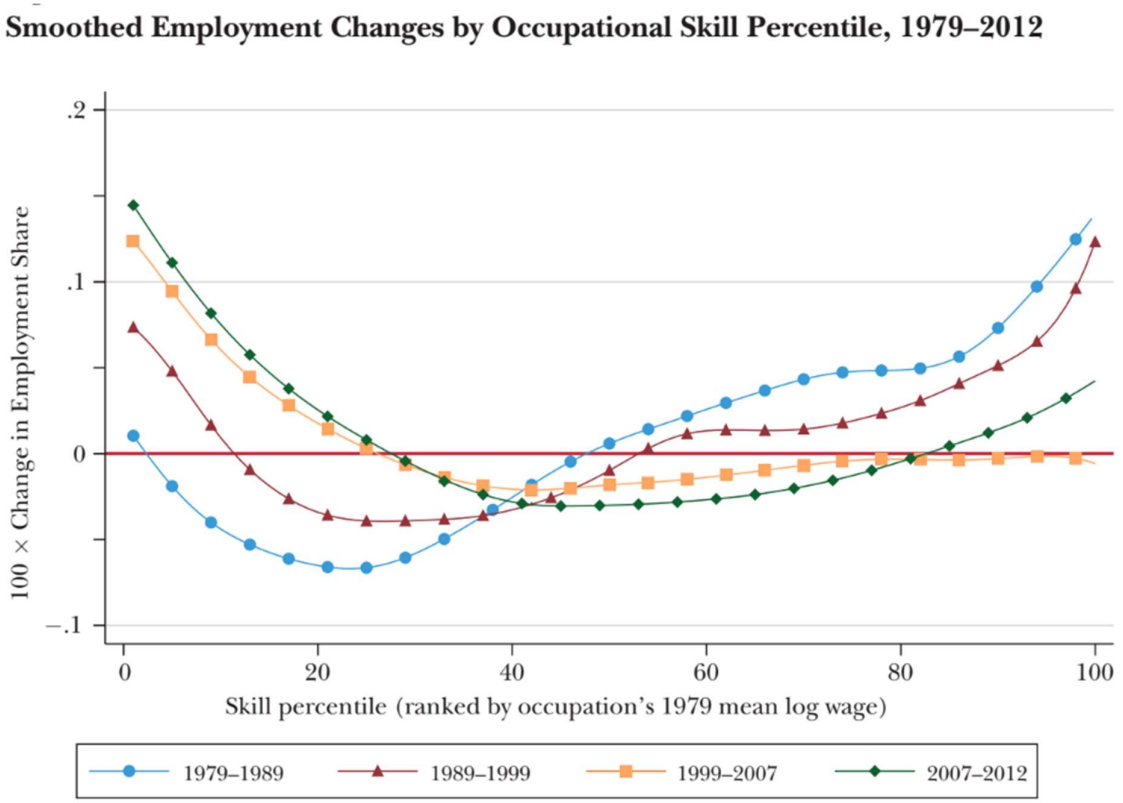
Between the "No real change" and the "Very real transformation" groups (Boyd & Holton, 2018) stands a group of economists who are acknowledging the existence of automation's effect on the labor market and voicing concerns regarding wealth redistribution in a mostly workless future without the extremities of optimists or pessimists (Autor, 2015; Ernst et al., 2019). The central dilemma here is the hollowing out of middle-skilled jobs. According to the Moravec paradox, it is relatively easy to make a computer that can perform tasks that require a high level of intelligence, like playing chess, but challenging to make them solve sensory-motor exercises that a one-year-old could easily comprehend (Moravec, 1988). Applying this observation to the labor market, two conclusions can be drawn. First, manual task-intensive jobs might be more difficult to automate than expected, mainly by low-skilled blue-collar workers. Second is the resilience of abstract task-intensive jobs since "We know more than we can tell," as Polányi phrased it (Polányi, 1966 in Autor, 2015). Computers might be able to quickly solve problems that can be well-defined by simple rules used in coding, but in the case of jobs where abstract thinking is pivotal, computerized, algorithmic solutions are not widely used yet (Autor, 2015; Bessen, 2016, 2019; Ernst et al., 2019).

There are situations in which automation can benefit workers depending on some prepositions. First, the tasks they provide are complemented by automation. Second, the labor supply is inelastic, meaning there is a higher demand for workers than supply. This labor scarcity can drive wage increases, while abundant labor supply can scatter productivity-driven wage increases. The third aspect regards the nature of the product that is produced. The correlation between growing productivity and decreasing prices is accurate in the case of agricultural products but false in the case of healthcare services, where automation resulted in higher prices (Autor, 2015; Ernst et al., 2019). Automation generally affects workers in three different ways. It has a displacement effect, although it does not necessarily mean the displacement of entire jobs, but often only parts of it. It has a skill complementarity effect, prioritizing employees with the knowledge needed to operate a given technology. Finally, it

has a productivity effect that assumes the correlation between higher productivity and lower prices that universally benefits every member of society through increased disposable incomes. The assumption that skill complementarity and productivity effects have universally beneficial consequences also assumes an inelastic labor supply and the universal distribution of increase in demand, but this is not always the case (Ernst et al., 2019).

The topic of the quality of work and what makes work high or low quality is difficult to grasp due to the complex interplay of different systems on different levels (Warhurst & Knox, 2020; Findlay et al., 2013). On the macro level, Institutional regimes, employment policies, regulations, or labor-capital ratio can be mentioned, while the ways of work arrangements represent the meso level, and psychological characteristics are at the micro level (Findlay et al., 2013). Warhurst and Knox (2020) take the position that in the future, a state-enforced minimum standard of work has to be introduced to mitigate the detrimental effects of low-quality Taylorised or non-standard, precarious jobs. Their reasoning acknowledges that, at least in the EU, permanent, standard employment status already offers minimum job quality standards. However, the remaining employees working under non-standard agreements are left to the mercy of voluntary company actions. To ensure the same minimum level of job quality globally, each government should enforce a commonly accepted concept of quality insurance (Warhurst & Knox, 2020).

While the period from World War II to the 1970s saw a shift from dangerous and monotonous work towards jobs in services and skilled blue-collar positions, the polarization of jobs can be detected after this period. High employment rates are at the top ranks of highly qualified managerial positions and the lower end of the scale, with low-paid personal services rising (Autor, 2015; Bessen, 2016, 2019; Ernst et al., 2019; Spencer, 2018). Jobs might be polarized, but this does not automatically mean wage polarization due to the abovementioned factors influencing wages. Computer use is higher in abstract task-intensive jobs, and the proportion of employees with at least a college degree is higher (Bessen, 2016). With the high demand for the outputs generated by these jobs and a labor shortage to supply growth, abstract task-intensive jobs are also more likely to be highly paid. At the same time, it is worth noting that the level of computer usage also determines wage differences within occupations. In the generalized group of managerial occupations, automation resulted in the delayering of structures and shrinkage of the number of support personnel like paralegals or secretaries (Autor, 2015; Bessen, 2016).



2. Figure. Smoothed Employment Changes by Occupational Skill Percentile 1979-2012 Source Autor (2015)

The data presented in the table provides additional details about the changes undergone through the decades. The table's left-hand side represents manual task-intensive or low-skilled jobs, and the right-hand side is the abstract task-intensive or high-skilled jobs. As can be seen, the employment share of jobs on the left-hand side has been rising at a continuous but slowing pace. What can be more surprising is the decline in employment shares of jobs from the highest skill percentiles with a moderate level of growth after 2007. This can be explained by the fact that the number of abstract task-intensive jobs grows slower than the number of highly skilled workers, hence the decline in employment shares. Also, improving technologies in these occupations slowly started to displace jobs in even the highest skill percentiles. If we look at AI solutions as expert systems that provide specialist knowledge to users without the need for any prior knowledge about AI or how it works, it can strengthen the position of low-skilled workers who could be enabled to conduct exercises otherwise done by high-skilled workers for lower salaries (Ernst et al., 2019). Economists usually dismiss this explanation and point to macroeconomic or demographic processes (Autor, 2015; Miller & Atkinson, 2013).

Pessimists are the most critical of the imagined jobless future vision. As described in a previous chapter, the notion of a workless future has been introduced. While it is often connected with the end or at least the transformation of capitalism (Marx, 2013; Campa, 2014), the goal of working less than 8 hours a day thanks to automation enhanced productivity is perceived as attainable in the current economic system (Keynes, 1930; Campa, 2014; Miller & Atkinson, 2013). In his famous essay, *Economic Possibilities for Our Grandchildren*, Keynes assumed that once it is technologically viable, humans will turn to higher values of art and other pleasures of life instead of reaching for higher financial gains and that employers would grant shorter working hours to their employees since heightened levels of productivity would ensure the profitability of firms even with less hours of human labor (Keynes, 1930).

Although there is a debate about the promised productivity boost by technology, it is a fact that working hours are not getting lower (Spencer, 2018). One explanation is that, in contrast to Keynes' assumption, human wants do not have an upper limit; therefore, we will always want to work to consume more (Miller & Atkinson, 2013; Spencer, 2018). This argument assumes that everyone who participates in the labor market will instead work longer hours to reach higher consumption levels, which gives the impression that a better quality of life can be reached simply by working more. Pessimists point to the fact that, at least in the USA, real wages have been stagnant since the 1970s, meaning that longer hours have to be worked without the potential to reach the same standard of living as previous generations. Another explanation is the lack of bargaining power of workers since the 1970s.

To turn again to Keynes' assumptions, not only did capitalist employers not allow shorter working hours, but they also used their position of power to pressure workers into longer working hours for the same or lower wages as before. Optimists like Miller and Atkinson often use unemployment rates to support their argument but neglect the rising number of those employed in precarious jobs that do not provide basic job security or benefits. Most of the pessimistic mainstream literature is occupied with growing inequality in the future due to mass unemployment. At the same time, the concentration of wealth in the hands of an affluent minority is the cause of rising inequalities that also affect society's future (Spencer, 2018).

Optimists often cite statistics that contradict the substitution power of technology to prove wrong the reasoning of their opponents' fear of "robots taking our jobs." Conversely, pessimists emphasize that the real problem lies in the nature of the new jobs created by

intelligent technologies. Since in a capitalist economy, people must work so they can consume, the pressing question is not whether and when unemployment rates will rise to an extreme level but the quality of jobs that masses of employees will have to do in the future (Huws, 2014; Spencer, 2018; Dyer-Whiteford et al., 2019).

No matter from which position we are looking at the debate on the future of work, some criticism can be made in general. At the core of the entire forecasting of percentages of jobs or skills that are in danger of automation is the methodological problem of sparse or outdated skills data. While there is a connection between skills and wages, like between skills and the probability of automation capability, other factors can override the simplistic logic that robots are better than humans so that they will take our jobs. Databases of skillsets often used for classification are only sometimes up to date; therefore, they can cause misleading labeling at the beginning of a forecast process (Frank et al., 2019).

Another recurring element is the positioning of the education system as the first step to a more equal and properly trained society (Frank et al., 2019; Spencer, 2018; Ernst et al., 2019). To change entire systems, especially such a crucial one, based on an imagined future vision created in the present would mean that we accept on the societal level one narrative about how the future may enfold and close or at least narrow the possibility of another path. On a more practical scale, re-training and life-long learning might be used to fix a more significant part of the problem. However, it poses a high opportunity cost for someone in the middle of their professional life or can be a substantial financial burden for the state (Ernst et al., 2019; Ramos, 2022).

AI poses a novel challenge from an economic point of view. When debating how productivity gains can be redistributed, economists often use terms that assume the existence of a tangible unit of product made in any given country. In the case of AI, boundaries are blurred. The so-called cyber proletariat (Huws, 2014; Dyer-Whiteford et al., 2019) working in precarious circumstances through platforms like Amazon's Mechanical Turk or TaskRabbit will hardly benefit from the financial gains of the Big Five (Alphabet, Amazon, Meta, Apple, Microsoft). The products marketed by these companies are generally believed to be free, but powerful and efficient AI is taught on big data sets gathered from the users of the applications. A solution can be the option for users to restrict the use of their data for specific purposes, for example, the development of new products, unless they are agreed upon and compensated for beforehand (Ernst et al., 2019). In IT, in general, being the first to introduce a new product or

innovation is crucial, and this is especially true for AI, given the present hype around it. Therefore, the existence of the Big Five is problematic because of their questionable methods of using precarious employment and their power to eliminate competition and narrow the pool of potential first-movers. Given their financial and technological background, paired with the armies of intellectuals employed by them, they can easily claim most of the patents in the field, making innovations even more difficult for competitors in less wealthy countries. Antitrust policies should be implemented to stop further monopolizing the market and prevent first-movers from establishing irreversible market dominance over others (Campa, 2014; Ernst et al., 2019).

It is worth taking a step back and looking at narratives about the future of work in general. Most of the debate focuses on the possibility and the range of future unemployment caused by productive, intelligent technologies that can substitute humans. This change might be considered beneficial, benign, or harmful, but a common trait in these expectations is giving agency to technology as if it would evolve or come into existence independently from society (Wyatt, 2008; Winner, 1985; Vicsek, 2020). Technological determinism can be found on every part of the spectrum. For optimists, technology is equal to social improvement; therefore, it is necessary and should be supported. In extreme cases, humanity should willingly let machines do almost anything technologically feasible, especially tasks traditionally considered to be work activities (Bastani, 2019). Even in more moderate cases, technology is seen as the power that shapes human societies, often without considering how socioeconomic structures influence the creation and application of various competing technologies (Winner, 1985; Wyatt, 2018; Vicsek, 2020; Beckert, 2016).

Accepting this deterministic occurrence of technological innovations allows it to deny responsibility for whatever will happen in the future and release or deter us from trying to change the course of happenings. Technological determinism can take different forms and meanings depending on the actor. There is the everyday form of it, what Wyatt labeled "justificatory technological determinism." As its naming assumes, this type would be used to justify layoffs after implementing new robots or applications. This type can be found in official documentation and policy papers in which technology is the cause and existing social structures are the consequence. .". Technological determinism is so deeply infused in science that we often describe entire historical periods or civilizations based on the technology they invented or used the most (Wyatt, 2018).

The debates about the future of work and technology emphasize the necessity of capitalism to achieve a stable economy regardless of the outcome of technological disruption. Keynes envisioned the 15-hour workweek due to capitalist processes; in his scenarios, Campa condemns degrowthers to failure and concludes that a viable future can only unfold in a modestly socialist version of capitalism (Keynes, 1930; Campa, 2014). Even in their criticism, most of the literature is looking for ways to amend the existing economic system to fit the shape of technology. This also means that at least some technologies are created in a way that makes them dependent to some extent on the existence of capitalism and other existing social structures. Winner uses the example of a nuclear power plant and solar energy. While a power plant must be operated based on strict hierarchies of a "techno-scientific-industrial-military elit." solar energy is only compatible with capitalism but could stay viable in other structures, too, thanks to its decentralized nature. Even if the explicit goal of innovation is not the maintenance of capitalism, there are plenty of historical examples when technologies or artifacts were implemented to threaten workers or undermine unions (Winner, 1985; Huws, 2014; Dyer-Witheford, 2019).

The debate about ongoing technological improvements brings up the topic of universal basic income. If we accept that robots will take our jobs, as a fact, introducing universal basic income might overcome social and economic upheaval (Paz-Banez et al., 2020; Bidadanure, 2019; Schmid, 2018).

Van Parijs's seminal work (2010) deconstructs this concept into its parts while also explaining why and how it can be utilized in practice. The definition of universal basic income is "An income provided to all members of a political community on an individual basis, regardless of their financial situation, and without the obligation to work." It is a frequent payment made by the government in cash, and there is no limitation regarding how it can be spent. There can be a debate regarding who can be considered to be a member of a political community, whether only citizens will be regarded, or anyone having a legal permit to stay in the given country. In the case of citizens, should minors receive their basic income from birth or get a lump sum when they reach adulthood? How should the government handle imprisoned citizens? The universality aspect is important in two ways. First, it is paid individually, not to the household, and to every political community member regardless of their economic situation. This is especially important for Van Parijs because universality supposedly negates the prejudice of accepting financial help from the government, which often stops eligible people from applying and accepting financial aid. While it is true that the rich would benefit from

basic income, ensuring the total coverage of those in need will still improve the quality of life of the masses (Van Parijs, 2010).

The idea of a universal basic income, especially in the context of potential mass unemployment due to technological advancements, goes against the value of work and its connection to self-worth and societal status acknowledgment. The scenario of millions losing their job to technology or being left with low-quality jobs could resemble so many readers exactly because of the strong connection between our jobs and our sense of self. It doesn't come as a surprise, then, that one of the major criticisms of the universal basic income is that not only will it distort the labor market, but it also will cause a moral decay in society. There are two main assumptions. First is that a universal basic income would elevate the financial pressure to work, and therefore, at least some people would stop working or give up searching for a job. The other is that the amount received would be used poorly, spent on gambling, alcohol, or other additives (Schmid, 2018; Bidadanure, 2019; Oláh, 2019, 2021; Paz-Banez et al., 2020). In a 2018 policy paper issued by the Institute of Labor Economics (IZA), Günther Schmid (2018) presents the alternative to basic income: the Right to Decent Work. At the center of this alternative stands the value of work and the importance of involving as many people as possible in the labor market by making the market fit the worker. Flexible working arrangements, dual educational systems, and unions ensure the position of those who work so they don't have to struggle with balancing private obligations and their work. An interesting part of the paper is the notion that in the case of a basic income system, a wide range of people wouldn't leave their neighborhood and wouldn't meet others from different places and backgrounds, which would narrow the perspective and our understanding of life (Schmid, 2018).

Research done to test this expectation of recipients leaving the labor market or not applying for jobs while spending tax money on cigarettes found mostly evidence to the contrary. Recipients of financial aid resembling the universal basic income in India, Namibia, and Iran consumed fewer cigarettes and alcohol and started to use health institutions (Banerjee et al., 2019). Pilots testing different financial aids that resemble a basic income typically resulted in higher job-seeking activity, investment in further training, or other additional costs related to job applications like purchasing monthly tickets or adequate clothing (Paz-Banez et al., 2020; Wilson & McDaid, 2021; Banerjee et al., 2019).

2.3.1 IT professionals in the future of work debate

As we have seen, every utopia and every vision has groups with more privilege than others. In this section, I would like to show some of the recent visions of the future of work with an emphasis on the role of IT professionals as a group with the potential to become the winners of the upcoming Robotics and AI (RAI) future.

During the emergence of computers around the 1970s, the debate about the future of work started to focus on the role of quickly developing, disruptive technologies. The following theories are not utopias or visions in the sense that they do not inform us about a possible or desirable future. Instead, they aim to give a picture of the current state and presume that the trends shown in them will remarkably affect the future. This is the era that Daniel Bell examines in his *The coming of post-industrial society*. The central idea of the book is to show the shift in the occupational system and the change in the organization of production, underlining it such as the change from goods-producing into the service economy, the importance of theoretical knowledge, and of those employees who are trained enough to use and innovate them. Bell's perception of post-industrial society is optimistic. With the rise of employees in the service sector, there is a rise in white-collar jobs that require a higher educational level and include more complex tasks, which can lead to more satisfaction in work. Bell saw the "new man" rising to be a scientist, mathematician, and engineer of the new technological era who would lead this new system based on knowledge (Bell, 1999). There is an evolutionary element in the work of Daniel Bell, and it is an excellent example of Williams's binary hierarchy (2008). The post-industrial society is one that evolved to a higher level from industrial societies, one that has the potential to provide better jobs for more educated people.

The situation of a high-skilled, technologically savvy labor force is more advantageous in the study of Atkinson and Meager, too. They found two types of employees in the new flexible or post-Fordist firms settings: the periphery and the core workers. The firm's flexibility reflects the consumers' need for more individualized products instead of the previously accessible mass-production products. To make production flexible, firms use flexible forms of employment that enable them to easily change the structure of employees in accordance with demand. In this setup, core workers are the privileged group of employees with benefits, the possibility of further training, and job security. In contrast, workers in the periphery are more prominent in number and consist of part-time workers or interns without all the benefits of

core employers (Atkinson & Meager, 1986).

Ransome created a matrix in which he examines the prospects of high, intermediate, and lower-skilled employees regarding the conceptual integrity of their work, their personal satisfaction with their work, and the level of practical skill needed. His study was made in 1999, and at that time, he found that both high and intermediate-level skilled employees can be characterized with the possibility of positive effects on all three aspects thanks to technological innovations, while employees with basic skills can only count on improving working conditions. This result again shows an optimistic view regarding the future of at least high- and medium-skilled workers but with limitations. While it can be said that high and medium levels of IT and other technical skills will be increasingly demanded, employees may need help to keep up with the ever-changing skillsets required by employers, triggered by the growing speed of innovations. Also, if the demand for high and intermediate-skilled employers is high and challenging to satisfy, then firms will have to widen their scale of benefits and incentives that can be most easily gained from the surplus profit taken from the wages of low-skilled workers from the periphery (Ransome,1999).

Suppose there is one common point in popular science books and reports by different organizations about the future of work. In that case, it is expected that income inequalities will rise in the short and long run with the possibility of extreme wealth concentration on the side of people who either accumulated a high amount of capital or high social capital. Technological knowledge has to be paired with the ability and willingness to learn new skills and to change roles between these skills if and when needed (Ford, 2017; Susskind & Susskind, 2018; Brynjolfsson & McAfee, 2016; Schwab, 2016; Dyer-Witherford et al., 2019; Ransome, 1999; Frey & Osborne, 2013). The famously pessimistic report of Frey and Osborne separates employment types into three different groups based on their probability of computerization. The reason for popularity among techno-pessimists is the conclusion that repetitive, low-skilled jobs, even in the service sector, are likely to be replaced by RAI. Regarding IT professionals, the report gives a quite optimistic view of the future. Together with educators, healthcare workers, and managers, IT professionals and engineers are listed in the low probability group (Frey & Osborne, 2013).

Not all accounts are optimistic regarding the future of work in general or appropriately skilled workers to use or improve technologies. In her book dedicated to labor in the digital economy, Ursula Huws sees the growing number of qualified workers as a modern, transformed version

of the reserve army of labor that a capitalist system can use. Capital needs the reserved army to be globally ready to work so goods can be produced to any destination that best serves the corporation's benefit. To achieve this goal, capital actively helps governments create this class. Corporations dispense their software to universities so that students will be familiar with them before they even finish their schooling. The vocational training programs, in which students can work for a company, are perfect opportunities to train the workforce specifically for the needs of a given firm. Expanding compulsory education, teaching English, and computational skills all serve the interest of capital. Huws states that the illusion of growing incomes due to higher education is just the tip of the iceberg. While highly skilled labor has a better bargaining position, the readiness of the global reserved army makes it easy to restructure positions and move them abroad, leaving everyone in an uncertain situation.

Nick Dyer-Witheford, in his Cyber-proletariat, goes even further. He draws a picture of the global reserved army or proletariat by showing how the shrinkage of human labor in agriculture, the emergence of edu-factories, new types of labor migration, and the emergence of the service sector created a global phenomenon of moving people from the danger of famine to the threat of exploitation in services or in factories (Dyer-Witheford, 2015). ICT professionals are among the few employees who survive the storm of changing times. Highly skilled, involved in research and development, and motivated by incentives and opportunities for growth, this class is more protected by automation and computerization. But eventually, this class can cause its own destruction. There is a dire need for professionals like them to use their creative knowledge for innovations and even for new inventions. Still, once the job is done, the second step is to make modules for it, codify the production rules, and make it easy for semi-skilled workers. The final stage will be the rise of artificial intelligence that can develop or even innovate other robots, making such a group's existence negligible (Huws, 2014).

2.3.2 Expert visions about the future of work

One of the starting points of the recent debate about the future of work was the publication of Frey and Osborn’s article stating that almost half of the jobs in the USA are in danger of automation (Frey & Osborn, 2013). Since then, many scholars and institutions have devised different methodologies and results looking at the same problem from various perspectives (OECD, 2016; Autor, 2014; PwC, 2019). Because AI and automation are always at the core of this debate, it is logical to investigate how AI and related technology experts view this

question.

Survey research conducted among European AI conference attendees resulted in even higher levels of mass unemployment probabilities than the Frey and Osborn report. Participants commonly believed that computing power and computational resources needed for continuous AI development would always be available and therefore predicted 90% or greater labor displacement due to AI innovations in the next 25 years. It is important to note that the survey only asked respondents to give a probability of a task or set of tasks to be automated shortly, making it a purely technical consideration. Social or economic possibilities and restraints were not involved (Gruetzemacher et al., 2020). One step of the model-building process of Frey and Osborn was the hand-labelling of 70 occupations together with a group of machine learning researchers. In his article that aimed to test the differences between expert and non-expert views on technological unemployment, Walsh used a variation of this method. Instead of machine learning experts, he invited experts in robotics and experts in AI together with a group of readers of a webpage that reports news from the science and technology field. Although readers can not be considered experts, they are involved in conversations about scientific topics and, therefore, have a higher chance of gaining broad knowledge regarding the capabilities of technology than a layperson. The participant's task was to classify the same 70 occupations if they were in danger of automation in the next two decades. The research resulted in two main findings. First, non-experts labeled more occupations as being in danger than experts.

		Predicted number of occupations likely at risk of automation (out of 70)			
Group	Sample size (n)	Mean	Median	Standard deviation	Confidence interval
Robotics Expert	101	29	29	10.1	(27.0, 31.0)
AI Experts	200	31.1	33	10.8	(29.9, 32.6)
Non-Experts	473	36.5	37	10.9	(35.6, 37.5)

1. Table. Experts and Non-Experts Prediction of Occupations being at risk by Walsh (2018)

As can be seen in the table, robotics experts were the most restrained in their predictions. This is interesting since one of the main turning points of the “robots will take our jobs” debate was the change in perception of physical jobs’ automatability. While the phantom of a totally autonomous factory and mass unemployment in transportation due to self-driving cars were at the center of the news, more recent accounts on the future of work predict the automation of

manufacturing and transportation to the latest, final stage of technological improvement (PwC, 2019; Ford, 2017). The second difference between the groups of participants was which types of occupations they considered to be in danger of automation and computerization. Non-experts labeled economists, electrical engineers, and technical writers in danger, while experts perceived these occupations as safe. The differences between the groups reflect different levels of caution regarding the future capabilities of AI and robotics. Experts involved in this research labeled fewer occupations in danger than non-experts but also less than the original Frey and Osborne study. The explanation provided by Walsh is that experts expected the coming of human-level AI (HLAI) decades later than others previously. This postponed date has made them believe that occupations previously seen as automatable would be safe for longer (Walsh, 2018).

The future of work debate almost exclusively considers paid jobs. Regardless of genre, unpaid and care work is not in the focus. Due to this reason, research conducted among AI experts to evaluate the automation potential of unpaid housework and care work is unique. Just like Walsh, Lehdonvirta and colleagues also used the methodology used by Frey and Osborne as a basis for their research. The article is an outstanding novelty in the literature for a number of reasons. First, their attempt to reach about 50% of participants as females, a standpoint usually ignored. Secondly, they asked AI experts from the UK and Japan, a similarly advanced country but not in the Western European Judeo-Christian culture. Thirdly, the researchers acknowledge the importance of who can get the chance to be involved in the labeling process of a scientific report with such importance. The sample of 70 occupations labeled by machine learning experts was an early-stage exercise in the Frey and Osborne report, meaning several following steps were built based on that data. Presumptions of the labeler will be at the core of the model but would be accepted as an objective decision because an expert made it. In order to involve a variety of experts in this research, desktop research was used together with personal network utilization and snowballing. Unfortunately, since AI is a male-dominated field, the research could not reach gender equality, but still, females make up approximately 40% of respondents. Researchers utilized the Delphi method to get 17 items labeled as automatable or not in the next ten years. According to the findings, respondents decided that 39% of the listed housework and care work items would be automatable. Reasons for a list item not to be automatable in the future usually involved not technological but social pitfalls. Participants believed that the automation of some unpaid jobs is seen by society as immoral. Not surprisingly, the defining attribute that affected

participants' perception was the place of residence. Male participants from the UK were significantly more optimistic about the potential of technology than their Japanese counterparts. Japanese males generally believed that the reason why housework items from the list will not be automated is not the lack of technological solutions but the lack of demand; therefore, these solutions would be too expensive to manufacture for a minority of consumers. Contrary to this, Japanese female experts agreed that automated help with household chores and care work would be highly appreciated and marketable even for a higher price (Lehdonvirta et al., 2023).

Inequality in the models such as the one built by Frey and Osborne will have consequences for the masses. As was shown, researchers from different fields share the common belief that asking experts to consider only the technological feasibilities of a future event would actually make the results objective. Even though the articles cited in this section aimed to test whether the same methodology used on different samples would result in novel findings, the focus was more on the deviation between expert and non-expert perceptions and judgments. Justification for using experts for such a task is well-established, but researchers rarely sacrifice any paragraphs for the social implications of the methodology.

Lehdonvirta and colleagues pointed out the importance of participating experts' place of residence and gender, which shapes their presumptions that will be reflected in the model they build (Lehdonvirta, 2023). A similar tonality was used in the UNESCO report about the impacts of AI on jobs and skills. The report emphasized the practical challenges of automation for each country. When experts predict mass unemployment rates in industries that constitute major parts of the labor market, the immediate question is not how societies will handle chaos or deny potential negative outcomes. Theoretically, re-training or up-skilling the labor force seems the best solution, but it is unclear who should bear its financial sacrifices. Training costs are recurrent for years, depending on the number of persons employed in the labor market with the lowest level of skills. The low number of women and minorities in AI development poses drawbacks before building ethical AI, which has already been proven with examples like Amazon hiring AI that discriminated against females disproportionally (Ramos, 2022; Reuters, 2018).

It can be debated that the negligence of social issues is predominantly true for experts but not for others. The investigation of Reddit, a social media platform preferred by experts and laypersons, arrived at another conclusion. The main question of the researchers was whether

opinions articulated by experts, journalists, and laypersons were aligned or not. According to the findings, three main themes often occurred: economy, economy/inequality, and inequality. Economy and inequality as themes are self-explanatory; the theme economy/inequality meant topics related to inequality derived from economic consequences. Experts mentioned economic issues and inequality with almost the same frequency, and they were the only group with significant numbers of mentions of equality issues. In discussions started by journalists, economy and economy/inequality were equally present, but surprisingly, there was no mention of purely equality topics. Even in the case of the mixed theme with the economy, they were more focused on future government actions and regulations or data privacy issues. Laypersons mostly followed journalists in their mentions and reasoning but generally in a simplified way. Economic issues dominated this group's mentions, with very limited space for any topics related to inequality. All three investigated group members were generally pessimistic about AI and its future effects (Cecchini, 2020).

The literature presented here proves that although experts often avoid embedding social implications of technology in their train of thought, in cases when there is space for them to elaborate their opinion in length or in an informal environment, they would express their reservations regarding AI. With the acceptance of the many possible aspects that can influence the views of any individual, it is not entirely in vain to search for common traits that define how an AI expert perceives their role and technology's place in society, especially when we consider their central importance in the creation of a technology that is commonly believed to define the future of not just work, our everyday life, too.

In his seminal work, Vaast (2022) explored "how AI developers consider the future consequences of their work." The research is built on the theoretical background of imagined futures and is centered around the thought that AI developers are actively shaping the future through their visions. During the building of an AI application, developers and other participants in the process have an imagined picture of a customer who will use the product in the future, and they aim to create a product that solves future problems. The shape of their visions will shape how end-users will work and what practices will be implemented, which shapes a vast number of people's everyday lives. To give a well-rounded picture of narratives in different settings, the article involves 63 interviews with AI practitioners, a set of different social media post archives, and two years of participant observation in the "Observatory on the Societal Impacts of AI and Digital Technology. After processing the data, two dominant models of expertise emerged. The type of model that most characterized an expert also

defined how they perceive the future, how they position AI in that future, and how they handled potential negative outcomes or negative feelings through their boundary work. The first model is called tangential. Experts in this group mostly distance themselves from the consequences of AI. Statements about the responsibility of society in shaping an otherwise neutral technology are recurrent. Positive outcomes are often overemphasized, together with the concern that legislation or social backlash would halt or position AI improvement as redundant. Part of the distancing process as a self-defense mechanism is the distancing of the future. Descriptions of the future are abstract; the future is always far, and experts always have a lot to do before achieving meaningful goals or breakthroughs. Experts in this model defined themselves as scientists who follow rigorous rules to test assumptions that later must be redefined and used to build AI.

This separation of the social and the scientific spheres serves two purposes. First, mentioning strict rules that must be followed gives the impression of objectivity and precision. Scientists cannot be reckless or motivated by impulses or emotions; therefore, the results and solutions they come up with must comply with rules and regulations. Second, this mentality enforces the idea of a neutral technological entity that will only cause harm in the hands of others, not the scientists who created it. This also means that the creators or builders of AI are not the ones who can be held responsible for the consequences since they were acting as rational, objective scientists. The narrative of being a scientist instead of a developer or using other, more grounded labels often originated from the nature of AI these experts had been working on. Experts in this group mostly developed fundamental AI or participated in explorative, basic research, which also enhanced the need for a “distant future” perspective. A typical boundary work was to delegate tasks outside the realms of coding and other technicalities to other groups. Data cleansing and labeling are often perceived as the epicenter of bias in AI. Delegating this part of the job to other groups of specialists is a boundary work because it serves the goal of not interacting with the wider public and avoiding having conversations with users about potential misuse or innate bias of an AI algorithm built by them.

In sharp contrast to the tangential model stands the integral. Experts in this group put responsibility in their own hands for how technology based on AI would affect society in the future. AI practitioners in this model present a more practical approach to AI in general. They see themselves as experts who must progress further existing AI solutions or mitigate existing problems and threats instead of achieving a distant, unclear goal. Typically, they are engaged in applied AI projects with results in the foreseeable future. Their focus on possibilities and

dangers in the present prompts them to take a "near future" approach when asked about their imagined futures. In their visions, experts often referred to AI as not extremely different from already existing smart technologies. AI lost its revolutionary aspect in their report and became the continuation of a long process in the history of IT developments. Experts saw themselves as scientists who are also citizens. Gender, nationality, and other social identities were important assets that helped them better understand the multi-faceted environment in which AI operates. Instead of separating themselves from society, they situate AI experts in the middle of it. Maybe because they were not distancing themselves from the others, but experts in the integral model did not display an exact boundary work.

Although it is tempting to use dualistic viewpoints, in reality, many AI experts engage in different jobs during their careers, which implies some level of blending between the two models. Indeed, integrating elements from the integral model to the tangential was observable. In some cases, experts kept their identity as scientists but voiced their concerns about the potential misuse of the AI they were working on. Other cases involved the expansion of the term expert to professionals without technological degrees who are nevertheless heavily involved in the development process. This way, experts either reduced the distance between themselves and experts in other fields or integrated diverse expertise into one unit they belonged to (Vaast, 2022).

2.4 The Hungarian Context

While I am looking at the future of work in general, my research participants are Hungarians, which undeniably brings some prepositions regarding the context in which these people work and might frame how they perceive the topics during the interviews or the scenario-building workshop. In this section, I will briefly describe the Hungarian context, including the country's situation regarding the number of jobs in danger of automation, its position in global knowledge creation, and how some stakeholders perceive the future.

Hungary is an industrial economy, meaning that a significant amount of its labor force is employed in transportation, manufacturing, or construction (PwC, 2019). Based on numbers from the Central Statistical Office, the total number of employees involved in these three sectors is approximately 1.3 million. As shown before, according to the representatives of the "robots will take our jobs" discourse, these sectors are considered particularly vulnerable to automation. Another often-mentioned sector is wholesale and retail, which employed around

half a million people in 2022. If these sectors become fully automated, Hungary will face high sectoral unemployment, starkly contrasting its current level of only 4% (KSH, 2023).

Just as it was with the debates after the publication of the now-famous 2013 report by Frey and Osborn, it is vital to consider the different methods used to make predictions regarding the future of jobs and the labor market.

The 2019 report by PwC Hungary focuses specifically on the possible effects of AI on the Hungarian labor market. PwC designed a three-wave model initially used to show global processes and applied to the Hungarian market, too. The first wave is called the Algorithm Wave. It will occur in the 2020s with the "automation of simple computational tasks and analysis of structured data" that would impact mainly data-driven sectors and jobs, including using simple software to make calculations and analyze datasets. The second is the Augmentation Wave starting from 2025 with "Dynamic interaction with technology for clerical support and decision making. Also, robotic tasks in semi-controlled environments such as moving objects in warehouses". This wave should see the emergence and widespread use of algorithms that can write repeatable programs for simple tasks, causing the disappearance of some programming languages and robots that can move objects in a well-structured environment. The third wave, called the Autonomy Wave from the 2030s, is characterized by "automation of physical labor and manual dexterity and problem-solving in real-world situations that require responsive actions such as in transport and manufacturing." While the report gives cursory examples of jobs and fields that will be affected by these waves, it is careful not to express numerically.

The PwC report concludes that since Hungary is an industrial country, its labor market will suffer the most significant blow during the third wave when industries that employ such an enormous number of employees will be transformed and automated. In the first two waves, women and white-collar employees will face task changes and potential job losses. However, age and educational background can heavily influence the impact of the changes. While younger (15-24-year-old) females are more at risk of losing their jobs during the first wave, the report acknowledges that it is easier for this group to obtain new skills and, therefore, to find new jobs or adjust to new challenges. The report's concluding remarks emphasize the importance of education at every level, especially training aimed at groups at high risk of job losses to mitigate the impact of automation and AI.

The PwC report combines the methodology used by Frey and Osborne and the following OECD report to get a fuller picture of the Hungarian situation. Since Hungary was not involved in previous studies, the team behind the PwC report had to use data from other databases and benchmarking with similar countries. Although these difficulties might distort the result, the most problematic part is the description of the three waves and their timing. The description of the first wave is so generative that it ruins its usability. The exact text could have been used to warn about the consequences of Excel or any other existing software. We can assume that the first wave will mainly consist of task changes and not job losses, but the report does not declare this. Research done on trends and the level of automation in Hungarian business service centers shows that automation did not result in mass layoffs for companies working in this sector. On the contrary, automation happens simultaneously with continuous growth of employment (Marciniak et al., 2018, 2020; HIPA, 2023). Although automation was an already ongoing trend, the COVID-19 pandemic sped it up (Juhász, 2022). The result seems to be more positive in contrast to the expectations of the PwC report. Jobs in this sector keep moving towards higher added value, more complex tasks that can be done remotely, which helps elevate the pressure of workforce demand (Juhász, 2022; Veress, 2020).

The second wave supposedly starts in 2025 and includes robots that can move objects in a semi-controlled environment. Just like previously, this wording can describe warehouse robots from the 2000s or even earlier versions. On the other hand, the third wave is pictured as the turning point, when industrial robotics and autonomous cars will become so advanced that physical labor can be replaced entirely in the 2030s.

Apart from the plausibility of the technological advancement listed in the three waves, another weak point of the report is the discussion of different employee groups. Gender, educational background, and work experience are defining categories that shape to what extent an employee is at risk of job loss due to automation and AI. Still, the report only describes the situation of workers in manufacturing, construction, and transportation in detail while handling almost every other category in general terms.

While the PwC report focused on technological advancement and its saturation into the workplace, Makó and Illéssy used a different approach and another mixed method involving the aspect of creativity. Their starting point was the tacit element of jobs from the Frey and Osborne report, further elaborated by applying the analytical framework of Autor's 2014

article and used on the European Working Conditions Survey's data from 2010 and 2015. They distinguished three types of jobs: the Creative Workers, Constrained Problem Solvers, and Taylorized Workers. Jobs in the Creative Workers category involve high cognitive tasks and give broad autonomy. Constrained Problem Solvers are jobs where cognitive capabilities are highly needed but paired with low autonomy. Taylorized Workers are jobs most resembling the typical routine jobs with low levels of expected cognitive capacities and low levels of autonomy.

Central Eastern Europe						
	2005			2015		
	CW	CPS	TW	CW	CPS	TW
Poland	46	32	22	41	30	29
Hungary	44	29	24	37	30	33
Slovakia	37	32	31	35	35	31
Slovenia	52	24	24	55	26	19
Czech Republic	43	30	27	38	32	30
EU-27	50	24	26	52	24	24
Calculations based on the 4th and the 6th waves of the European Working Conditions Survey. Legend: CW: Creative Workers; CPS: Constrained Problem Solvers; TW: Taylorized Workers						

2. Table. Changes in the Proportion of Occupations by Makó & Illéssy (2020)

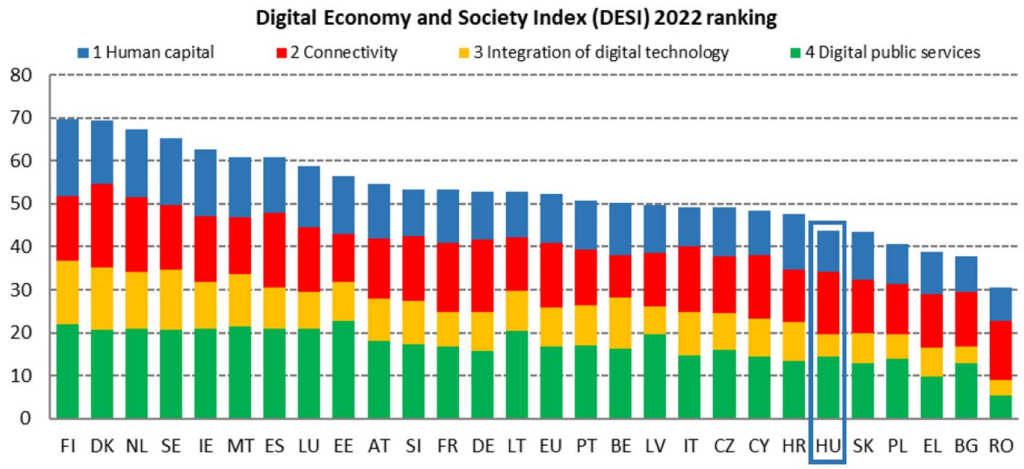
The results showed that almost every country in the region went through the same process except Slovenia. The proportion of Taylorized Workers' jobs increased in every Central Eastern European country during the examined period. Simultaneously, there was a general decrease in the proportion of Creative Workers, but the highest decrease happened in Hungary. In 2015, the proportion of jobs in the category of Taylorized Workers was the highest in Hungary among countries in the region. This result strengthens the opinion that a significant part of the Hungarian labor market is exposed to automation and technological unemployment. As the authors point out, Hungary's competitiveness is focused on the economic benefits of a cheap and skilled labor force, which can explain the shift between Creative and Taylorized Workers' jobs. The fact that the Constrained Problem Solvers category showed only minor changes and even grew during the examined period can be interpreted in different ways. First, according to Autor, this category of jobs will be, and in the USA, already in the process of "hollowing out" due to new technologies in other industries too, that cause employees in this category to either gain new skills and move to the category that Makó and Illéssy call Creative Workers, or technology means de-skilling for

them, and they move down to the equivalent of the Taylorized Worker category (Autor, 2014). The findings of Makó and Illéssy prove the existence of a process in the opposite direction, even though it cannot be clearly stated that the decrease in the proportion of jobs in the Creative Worker category is due to the de-skilling and moving to the Constrained Problem Solvers category or the up-skilling of jobs in the Taylorized Workers category. As Makó and Illéssy point out, further renewal of their research is needed to point out trends not just because it is shortness in time but also because the examined period contained years of crisis management of governments that possibly deteriorated countries from their desired economic paths (Makó & Illéssy, 2020). The relative importance of the category of Constrained Problem Solvers may pose a problem in the future if we apply the logic of the PwC Hungary report, which states that jobs with the same characteristics as the Constrained Problem Solvers are in danger of automation in the short term since the reason why this category is called constrained is the lack of autonomy due to given processes which is a signifier of being easily translated into algorithms.

The problem with defining the volume and influence of the ICT sector is problematic, too. Due to its overarching nature, jobs, tasks, and services connected to ICT can be found in almost every sector with varying levels of importance. While there is a classification system (TEÁOR) that groups firms into sectors, it is based on the main activity of a given firm, which can overlook the growing importance of digital services or the number of jobs closely related to digitalization. Based on whether we look at the narrowest classification or use an extended one, the ICT sector gives approximately 7-13.4% of Hungary's GVA (Gross Value Added), and it is expected to constitute the GDP's 25% in the near future (IVSZ, 2019). Estimations regarding the number of people employed in the sector vary from 17% in 2018 (IVSZ, 2019; Tardos & Ságvári, 2021) to 3,5% in 2022 (KSH, 2023). The problem is again the question of how we should define an employee working in the ICT sector when, in most cases, it is a complex problem.

Regarding Hungary's situation in the international context, the DESI (Digital Economy and Society Index) report issued by the European Commission can give a broad overview. It includes four chapters: Human capital, Connectivity, Integration of digital technology, and Digital public services. Due to the very technical nature of the Connectivity chapter, it will not be presented in detail.

	Hungary		EU
	rank	score	score
DESI 2022	22	43.8	52.3



3. Figure. DESI 2022 Ranking

The human capital indicator:

	Hungary		EU
Human capital	rank	score	score
DESI 2022	23	38.4	45.7

	Hungary			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
At least basic digital skills	NA	NA	49%	54%
Above basic digital skills	NA	NA	22%	26%
At least basic digital content creation skills	NA	NA	59%	66%
ICT Specialists	3.40%	3.80%	3.90%	4.50%
Female ICT Specialists	11%	12%	14%	19%
Enterprises providing ICT training	16%	16%	16%	20%
ICT Graduates	4.60%	4.90%	3.10%	3.90%

3. Table. DESI 2022 Ranking-Human Capital

Unsurprisingly, the percentages for basic digital skills are much higher than those above basic or specialist-level knowledge in Hungary and the EU. Less than a quarter of Hungarians have above-basic digital skills, and although the proportion of ICT specialists is rising, it was only 3.9% in 2022. The situation of female ICT specialists mirrors the same mixed picture. The growing proportion of females within specialists can be considered progressive; however, numbers are still well below 50%, meaning that the ICT sector on a specialist level is firmly male-dominated. The fact that the proportion of enterprises providing ICT training remains at

the same low level can indicate the lack of training possibilities outside of the educational system or the lack of demand for it. Either case is troublesome, especially considering how much ICT skills are perceived to be essential in the future, together with the need to equip employees whose jobs are in danger of automation with the necessary skills to adjust to the future's challenges. Finally, the proportion of ICT graduates shows an alarming trend, sharply declining from 4.9% to 3.1%. Given that Hungary is already facing a significant labor shortage in the ICT sector, the shrinking pool of ICT graduates can cause setbacks for the country's economic development. Although ICT graduates rarely leave their profession, according to a study by Századvég, 20% believe that starting their career abroad is the best strategy. Almost half of them considered staying in Hungary but working abroad as a freelancer or self-employed, which makes it even more difficult for any Hungarian firms to achieve their hiring goals, especially small and medium ones since they cannot compete with the salaries provided by multinationals (Századvég, 2022).

Integration of digital technology:

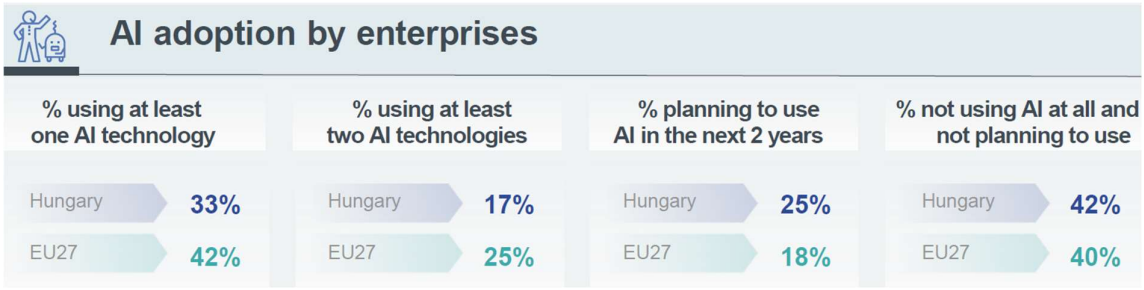
	Hungary		EU
3 Integration of digital technology	rank	score	score
DESI 2022	25	21.6	36.1

	Hungary			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
SMEs with at least a basic level of digital intensity	NA	NA	34%	55%
Electronic information sharing	14%	14%	21%	38%
Social media	12%	12%	13%	29%
Big data	6%	7%	7%	14%
Cloud	NA	NA	21%	34%
AI	NA	NA	3%	8%
ICT for environmental sustainability	NA	65%	65%	66%
e-Invoices	10%	13%	13%	32%
SMEs selling online	12%	13%18%	18%	18%
e-Commerce turnover	11%	9%	11%	12%
Selling online across border	9%	5%	7%	9%

4. *Table. DESI 2022 Ranking- Integration of Digital Technology*

The integration of digital technology is an essential indicator of the extent to which different-sized firms are using technology and for what. The table shows the proportion of usage in most of the listed fields to be stable with only minor incremental changes. Hungarian SMEs have mostly the same proportions as their other EU counterparts except for their basic level of

digital intensity, measured by a list of 12 elements where an SME should use a minimum of 4 items to be counted in this group. This means that, unfortunately, most SMEs have not even reached this level. Big data and AI usage are well below the EU average, too, which indicates that Hungarian enterprises are lagging behind in deploying the most advanced technologies that require specialist knowledge to be maintained and improved. Results of measuring AI usage in the EU reported by the European Commission's European Enterprise Survey on the use of technologies based on artificial intelligence show a different picture based on a different methodological approach. This report used self-evaluations of different-sized enterprises in the EU and acknowledges that results can differ from the DESI report. As can be seen, although Hungary does not reach the EU average in many aspects, 25% of enterprises are planning to use AI shortly. Another interesting point is the high proportion of firms in both categories that are not using any AI technology presently and do not plan to do so in the future.



4. Figure. AI Adoption by Enterprises by European Commission (2020)

One explanation for lower levels of AI usage in Hungarian enterprises can be the labor shortage within the ICT sector or the perceived effectiveness of these technologies, considering the cost of implementation and the personnel needed to work with it too low. The report's respondents listed the difficulty of hiring new staff and the cost of adapting operational processes as the two main internal barriers to not using more AI technologies in their firms (EU Commission, 2020). While the scope of this paper is insufficient to uncover the reasons behind the low level of AI and big data usage, the relevance of these technologies within technological futures implies that reaching higher proportions should be a top priority for the country.

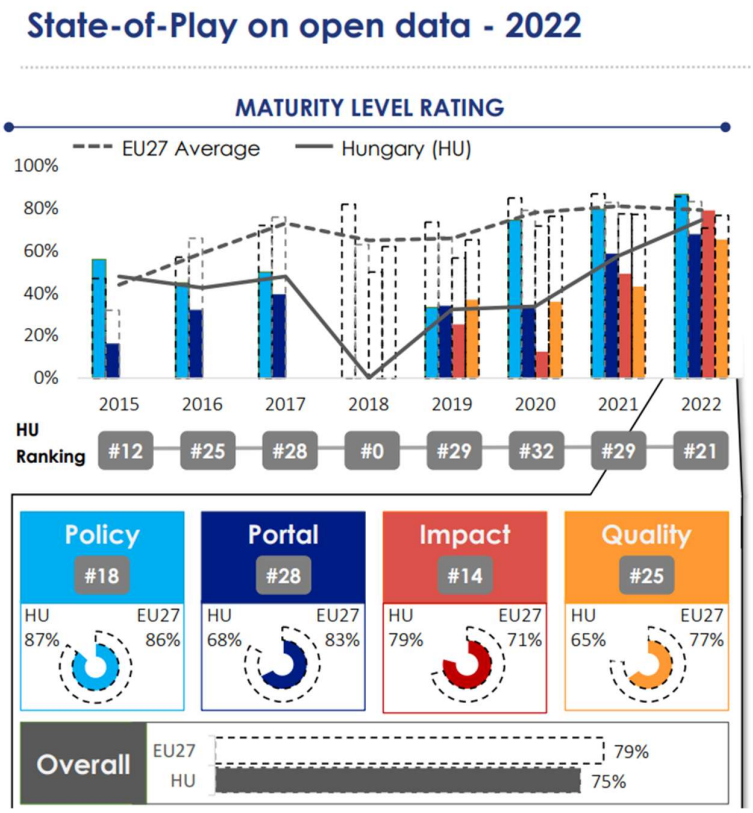
Digital public services:

	Hungary		EU
4 Digital public services	rank	score	score
DESI 2022	21	57.4	67.3

	Hungary			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
Government users	64%	70%	81%	65%
Pre-filled forms	NA	NA	60%	64%
Digital public services for citizens	NA	NA	64%	75%
Digital public services for businesses	NA	NA	74%	82%
Open data	NA	NA	58%	81%

5. Table. DESI 2022 Digital Public Services

The Digital public services table shows that despite the success regarding the proportion of e-government users, which indicates a clear preference for online administration, there is space to improve the scope of types of administration that can be done online. The most striking difference between the scores of Hungary and the EU average is regarding Open Data. Unfortunately, there is no data available from previous years. However, according to information from the European Data Portal, the source of this table, Hungary made a significant improvement in 2022.



5. Figure. European Data Portal 2022

Based on data from the Eurobarometer report conducted in 2021, the overwhelming majority of Hungarians believe that ICT development, in general, will be beneficial for society. Young people's involvement and interest in science seem especially important regarding the future of society, with an 83% agreement rate. AI technologies face moderate resistance, with one-third of respondents saying they will not be beneficial but still favored by 59% of Hungarians. Healthcare and energy supplies are the most expected to be affected by new developments, while job creation is relatively irrelevant. Ethical and regulatory questions seem to polarize the public. Half the country believes the government should tightly regulate science and technology developments. In contrast, the other half stated that the scientists and places producing technological and scientific knowledge should operate on a market basis. Similarly, half of the respondents replied that decisions should be based on moral and ethical questions that they raise or can solve, while just slightly fewer respondents had the opinion that only the potential of discoveries and developments should count.

Regarding the perception of scientists in general and their performance, Hungarians have a more positive attitude towards them than the average EU citizen. Positive statements like

intelligent, reliable, or honest scored higher, while negative statements like arrogant, narrow-minded, or immoral scored lower. Almost half of the respondents believe that Hungarian scientists are as good as others in the EU, and 14% believe that they are even better. About half of Hungarians gather information from documentaries, journals, or online sources and talk about science with their family and friends. However, the other half rarely or never engage in it (European Commission, 2021).

As discussed before, the importance of manufacturing and the automotive industry in Hungary is undeniable. Based on the literature, a string of thoughts implies that jobs in these sectors are in danger of automation, at least in the long run. Of course, the situation is complex, and expectations about the future of work and how different labor market scenarios might take place differ depending on the lens we use to evaluate it. In the last section, I will present three studies conducted in Hungary that shed light on the most critical aspects of the future of work debate. The first two articles focus on firms, while the last one takes account of the perceptions of students in higher education.

In their seminal work, Tardos and Ságvári conducted a company case study in the manufacturing sector, in which they mapped out the perceptions of three stakeholder groups regarding automation: the management, employees, and trade union representatives (Tardos & Ságvári, 2021) while Keszey and Tóth investigated attitudes toward industry 4.0 the automobile industry (Keszey & Tóth, 2020). When asked about factors that slow down the expansion of automation of processes in the firm, managers listed aspects that resemble the findings of the European Enterprise Survey in both case studies (European Commission, 2020; Tardos & Ságávri, 2021; Keszey & Tóth, 2020).

The cost of the investment was significantly more important in the case of the manufacturing firm since it was a subsidiary, which meant that any significant investment would not simply be weighed against the cost of labor, but it must be negotiated with the central office, too (Tardos & Ságvári, 2021). Hiring sufficiently trained employees and offering a compensation package to keep them with the company was also seen as a challenge in both firms. One of the most exciting findings of the study is the managers' opinion regarding the substitution power of technology. Even though all of them had the conviction that digitalization is not a threat to jobs in their firm, they had different reasons for it. In the automobile sector, engineers had a positive attitude towards automation and robots but also saw the lack of capability of robots to replace thinking human beings (Keszey & Tóth, 2020). The case of managers working in the

manufacturing sector is more layered. Some said that the change is so slow that it is barely noticeable, while others mentioned the rising numbers of vacancies in positions that are disappearing otherwise. One manager experienced the layoff of almost one-third of employees in his department while implementing a computerized company management system that increased the department's efficiency so much that they managed to set a record even with fewer employees. Although no one was made redundant explicitly due to automation, the tone of the manager talking about this process is raising questions:

"I can quietly say, so the microphone doesn't pick it up, that we were able to take close to one hundred people out of 350, actually, and after that, we broke a record with 250 people. So order management was only a beginning; then came the planning system, which was able to systematize the orders that have been rapidly processed and worked out the optimal work plan to ensure the best efficiency in the factory." (Elektronika GR, Site Manager) Source: Tardos & Ságvári, 2021

It seems that behind the definite no to the question of automation is a threat to jobs in their manufacturing firm, managers instead think "yes, but not now" or covertly tell stories from the past when employees were let go due to the existence of a technology that can increase efficiency without acknowledging the connection between the two (Tardos & Ságvári, 2021). Employees in non-managerial positions in both sectors were similar in that they shared the same opinion, just a more negative one. Blue-collar employees not only feared that they would lose their jobs to robots and automation but also feared that their salaries would decrease and believed these technologies to be modes of surveillance (Tardos & Ságvári, 2021; Keszey & Tóth, 2020).

As discussed previously, in the future of work debate, digital skills and willingness to improve those skills is a recurring theme. Like previously, managers and non-managerial employees had different attitudes towards this topic. Managers, especially engineers, were open to and enthusiastic about training and learning about technology. In the manufacturing sector, most of them felt already knowledgeable enough for their position but were aware of the importance of up-to-date ICT knowledge; therefore, they were also concerned that if they do not keep up with the latest technologies, they might lose their jobs (Tardos & Ságvári, 2021). In the automobile sector, white-collar employees are often self-taught and excited to be experts in various fields because it makes them feel irreplaceable for the firm, and therefore, they are not concerned about losing their jobs in the future (Keszey-Tóth, 2020). In opposition

to managers, blue-collar employees either had mixed feelings of excitement and fear, especially towards robots, or felt that they already had enough knowledge to work in their position and felt any further training was bothersome. The difference between the two sectors is the perception of the employer's willingness to provide necessary training. In the manufacturing industry, recurring training was not scheduled, and non-managerial employees had expressed doubt and either did not answer this statement or replied "no." In the other case, employees of all levels were involved in the training and implementing of robots in the workplace. They were allowed to express their reservations or suggestions during workshops with the engineers. This attitude of involvement resulted in a divide between blue-collared employees based on age. Younger employees were more enthusiastic about both the training and the technologies they got to use. In comparison, older employees often felt nervous because they felt incapable of learning how to handle the robots and worried about losing the respect of others (Keszey-Tóth, 2020).

Vicsek and colleagues investigated how Hungarian young adults perceive the role of automation in the future labor market (Vicsek et al., 2022). The results show the respondents' general optimism towards their professional future. While they were aware of the existence of technologies that have the potential to change or eliminate jobs, they also believed that the change would be slow and gradual and thought their profession to be safe. No matter which profession they were aiming for, job safety was mostly grounded on the belief that machines or AI could not do an essential part of it because it is too complex or the given profession needs the human interaction element. It became obvious that interviewees had only superficial knowledge, which resulted in changing opinions by the end of the interviews partly because they were asked to think about the topic from different viewpoints and were shown different videos about existing robotic and AI technologies. Young adults did not show solidarity when asked about the situation of those who will potentially lose their job in the future. In line with the techno-optimistic line of the literature, they believed there is time for the legal system to find a solution to stop or alleviate technological unemployment on a large scale. Also, they shared the opinion that these technologies could do more tedious or dangerous jobs, which was seen as an overall improvement in job quality.

In conclusion, it can be said that highly educated, white-collar employees and young adults do not see RAI as a threat to their future work in general or their professional future. Slow, gradual change is expected, and technology, in general, is perceived as a way to improve the quality of work. At the same time, it is important to point out that beliefs and perceptions

often change depending on the contextual situation. While these groups' perception of job security is positive, they admit the possibility of job losses for blue-collar workers. The reason that change would be slow is the masking of the lack of solidarity towards these employees. Managers admitted that for firms, the return on investment into technologies that substitute human labor depends on the cost of labor. This also means that change and slow downsizing of jobs are not to be expected due to technological insufficiency but because it is cheaper to employ a human for now. Blue-collar employees, in general, are sceptical about modes of automation. Their logic mirrors the techno-pessimist, “robots will take our jobs” sentiment of the literature on the future of work. These employees might not perceive robots and automation as an immediate threat. However, they are concerned about salary loss, downsizing, and the limits of their capabilities to keep up with the latest technologies. The topic of surveillance was only mentioned in blue-collar employee interviews. This is not surprising, firstly, since they are well aware of the many cameras and sensors built into these machines, and secondly, because they are exposed to surveillance during their workday, unlike most white-collar employees.

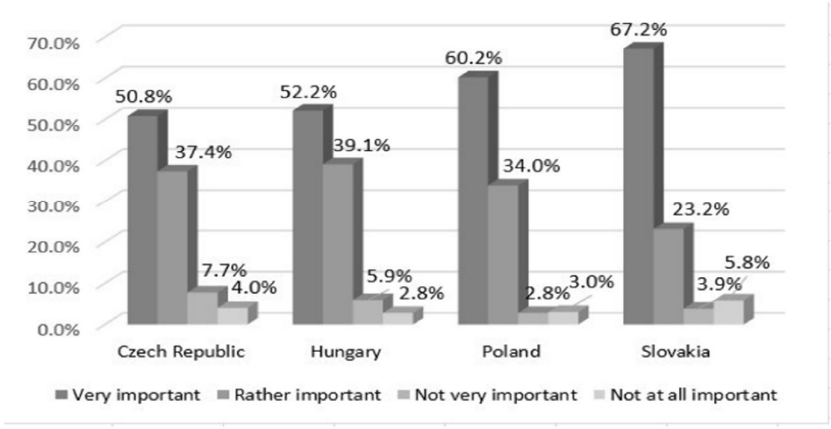
Research using data from the European Values Survey focusing on Central and Eastern Europe demonstrates the importance of values connected to paid work. Tables from the survey use comparisons with our neighboring countries that can be useful for different reasons. Given our shared histories, it can shed light on the possible similarities within the region and place the Hungarian results in a more international context. In case of significantly different results, new directions of research can be defined to address the nature and reason for the differences.

The tables below show the proportions of respondents who believed that work in life is very important. There has been an interesting change in trends among Visegrad countries. While Poland had the highest proportion in the 1999/2000 dataset of 78% by 2021, Slovakia became the leader in this respect, with only 67,2% of people in the very important category. This means that within about two decades, the overall enthusiasm towards work decreased so much that the now highest level of support towards the importance of work in life is lower than the highest proportion at the beginning of the 2000s. Hungary has relatively stable proportions. Approximately 57% in 1999/2000, while in the 2021 dataset, 52,2% of Hungarians fell into the highest, very important category. Although there has been some decline in the group of people in the highest importance group, combining those in the very important and quite/rather important categories, numbers become higher in 2021 than before (Halman, 2001;

Basa and Basa, 2022).

	Very	Quite	Not	Not at all	N
Poland	78	18.1	2	1.8	1087
Czech Republic	53	40.6	5.3	1.1	1899
Slovakia	61.4	31.7	4.8	2	1320
Hungary	56.8	31.9	7.8	3.5	998

6. Table. EVS Source Book 1999/2000 How important it is in your life: Work (in %)



6. Figure. Basa and Basa 2022 Importance of work in respondent's life

The importance of work in one's life might differ based on their socio-economic status, or someone might believe work to be important for themselves without the assumption that the same is true for everyone else. The importance of work on the level of the individual might not translate into the importance of work on a national scale. As can be seen below, both datasets of EVS show the leading position of Hungarians regarding the statement that work is a duty towards society. Combining the groups of those who strongly agree and agree, we can state that steadily, about 70% of Hungarians agree with this statement.

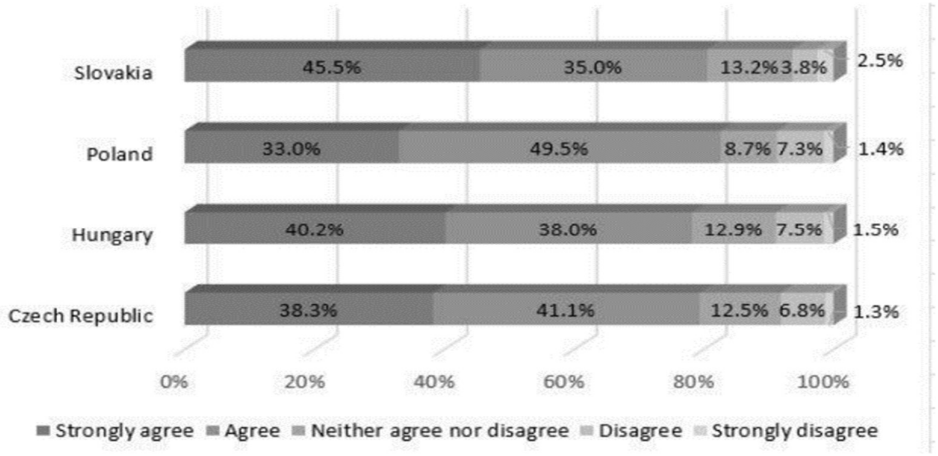
	Strongly Agree	Agree	Nor agree nor disagree	Disagree	Strongly disagree	N
Poland	29.8	43.3	13.8	11.3	1.8	1069
Check Republic	18.9	44.0	19.5	14.7	2.9	1889
Slovakia	28.5	34.6	18.9	12.1	5.9	1297
Hungary	30.1	39.5	16.5	10.1	3.7	980

7. Table. EVS 1999/2000 SourceBook: Work is a duty towards society (in %)

	Strongly Agree	Agree	Nor agree nor disagree	Disagree	Strongly disagree
Poland	24.2	51.2	12.4	10.5	1.7
Check Republic	20.9	36.3	23.9	14.9	3.9
Slovakia	27.1	37.3	22.8	8.5	4.3
Hungary	31.5	37.6	19.6	9.0	2.3

8. Table. EVS 2017-2021 SourceBook: Work is a duty towards society (in %)

Given these results, looking at value judgments about the unemployed is interesting. Looking at the relevant sections of the two EVS data, we can conclude that among the Visegrad countries, Hungary kept second place in the proportion of people who strongly agree with the statement, "People who don't work turn lazy." Given the nature of the EVS research, this means that the proportion of Hungarians (around 40%) agreeing with this statement hasn't changed in twenty years.



7. Figure. Basa and Basa 2022 People who don't work turn lazy

	Strongly Agree	Agree	Nor agree nor disagree	Disagree	Strongly disagree	N
Poland	34.8	43.2	10.7	9.1	2.2	1070
Check Republic	29.5	49.5	9.8	9.2	1.9	1895
Slovakia	47.4	31.5	10.7	7.7	2.8	1300
Hungary	40.5	33.2	12.6	9.1	4.5	976

9. Table. EVS Source Book 1999/2000 People who don't work turn lazy (in %)

It is not surprising that while on a national level, Hungarians support the idea of UBI (Roosma & van Oorschot,2019; Végvári et al., 2022), they have contradictory opinions when asked about its potential positive or negative effects on the labor market. Although, unfortunately,

the research conducted by Végvári et al. isn't representative, it has especially interesting results regarding this research and the topics discussed in it. Hungarians listed the two major positive effects of a basic income as the reduction of anxiety about financing basic needs and helping people return to education. Not surprisingly, women were the most supportive of financial independence, given that a significant proportion of them face difficulties in gaining or maintaining financial independence after marriage and motherhood (EIGE, 2023). Regarding education, respondents raised the issue of the difficulties of gaining different or higher education once they entered the workforce.

In the context of technological unemployment and the often-repeated threat of being substituted by robots, it would be crucial to enable vulnerable groups to attain skills that would help them reposition themselves in the case of a job loss. As for the potential negative effects, other than the fear of high inflation, respondents agreed that a basic income would discourage people from working. What is contradictory about the results is the perceived opposition of people wanting to go back to education and deepen their expertise or gain new skills to ensure their position as being employed but, at the same time, willing to leave the workforce as soon as it is financially possible (Végvári et al., 2022).

To further demonstrate how controversial Hungarians' opinion about basic income is, I will present three different studies published close to each other in time but with different outcomes. First is the 2019 article by Oláh Eszter examining media coverage of the universal basic income and an online survey done with students of the University of Debrecen. According to this research, the media generally pictured basic income in a positive light, although financial feasibility was always an issue. Students expressed a positive opinion, too, and empathized that with such financial help, they could aim to get more fulfilling, complex jobs or take time to find a better-suiting job. Not entering the labor market wasn't mentioned because they all perceived this benefit as a supplement to their potential income, enabling them to spend more on high-quality or luxury products. Working fewer hours was considered if their cumulative income would stay at the same level so they could spend more time with their friends and family (Oláh, 2019). In comparison to this research, Oláh's findings in 2021 about YouTube comments under videos about universal basic income show a more dismissive attitude. Most of the comments were negative, bringing up the connection between having a paid job and the deservedness of help from the state (Oláh, 2021).

Research conducted by Herke and Vicsek with university students who weren't studying in

STEM fields showed a sharp rejection of UBI. According to their findings, young citizens in higher education were skeptical about UBI and showed support for only modified, not universal, versions of it. Similarities are the strong belief in work as a means of self-respect and the measurement of a useful member of society. As the researchers point out, the reason behind this sentiment can be the communication of the current government about the merits of a work-based society that depicts UBI as turning back to socialism (Herke & Vicsek, 2022). The assumption that unpaid work is worthless and unemployed persons lack respect and eventually will lose their connection to society is very unsettling, given the fact that typically, women are in this position (EIGE, 2023); therefore, such statements put these groups automatically into the problematic box. As can be seen from the data below, Hungarian women spent significantly more time with unpaid work in the household.

Activities	Male 1986/1987	Male 1999/2000	Male 2009/2010	Female 1986/1987	Female 1999/2000	Female 2009/2010
Household chores	62	65	78	208	186	183
Shopping, accessing services, administrative tasks	14	17	17	24	26	24
Minding children (own)	10	12	18	28	28	41

10. Table. Source: KSH Időmérleg 2009/2010- Average daily time spent by the population aged 15-74 by gender (minutes/person)

2.5 Lay Perceptions of RAI

The future of work debate has many layers and can be approached from many aspects. One divisive part is the question of technology's substitution power and how societies will handle the different scenarios created by experts with different convictions. While the term "robot" is often interchangeable with many other technologies like AI or algorithms in general, the notion that physical robots will take over jobs in manufacturing, especially in the automobile or transportation sector, is widespread among techno-pessimists (Ford, 2017). Conversely, techno-optimists emphasize the possibilities of technology to enhance human labor and its promise to improve the quality of work by eliminating tedious or dangerous aspects of it (Bastani, 2019; Miller & Atkinson, 2013; Ransome, 1999; Geels & Schot, 2007). As discussed previously, according to the sociology of expectations, experts' projections are not just simple visions but also have performative power that transforms their imagined future into promises (Beckert, 2016). If we accept the truth of this statement, then we should find evidence of it. Performativity can manifest in heightened interest in research of a given field,

in the numbers of media coverage of financial investments to support research and development, and in adjusted expectations of laypersons. The same technology and vision about the future might evoke different expectations in laypersons based on their perceived situation in society and the labor market; therefore, looking at examples from different geographies and jobs is beneficial.

Chigbu and Nekhweva investigated the preparedness of thirty employees in the automobile industry in South Africa for the possible automation of their workplaces. They conducted semi-structured interviews that brought to light several common strategies of the participants based on their existing level of skills and current positions. Employees with low-level technical skills were not motivated to attend training or any education. They commonly believed that they lacked the power to fight for their jobs against robots and, therefore, deemed attempts to gather more knowledge about technology useless. Their expectation about the future of their work was to stay employed unless robots would take their job, a scenario they saw as unavoidable. Low-skilled workers commonly perceived self-employment as farmers as a viable option for the future, even when they lacked the financial resources when the interviews were conducted. Workers with existing medium or high technological skills had the same expectations but planned a different solution for their future. Although they neither questioned nor denied that robots would take their jobs, they were open and keen to improve themselves because they believed in being able to find comparable positions at other firms. Self-employment was mentioned among them, too, but as technicians or engineers (Chigbu & Nekhwevha, 2021). Lovett and colleagues' research focused on two factories owned by the same parent company situated in the same region of Mexico but equipped with different quality technologies. One was referred to as a low-tech factory, meaning that the technology used there was outdated and high-tech, with cutting-edge technology. In this case, the research focused on comparing employees' job satisfaction levels since high-tech factories, according to the authors, are seen as the future of Mexican industry. Surprisingly, the results showed that employees in the low-tech factory gained higher levels of job satisfaction in almost every examined aspect. Low salaries were an issue, but financial compensation for the job was not perceived as the most important aspect of work. Instead, opportunities to advance in their profession and voice at the workplace were ranked high. High-tech factory workers were unsatisfied with almost every aspect of their work that the researchers listed. They were more prone to consider turnover, felt more voiceless, and saw less intention from management to listen to and follow up on their questions and suggestions.

The explanation given by the researchers is the difference between the average age and level of education of the employees in the two factories. The high-tech factory employed younger and better-trained workers, which should not necessarily lead to this result. As was demonstrated in the Hungarian context, younger and better-trained workers can have a more open and enthusiastic attitude toward work in a high-tech environment (Keszey & Tóth, 2021), not to mention claims of the techno-optimist literature that robots and automation can improve working conditions and make work less of a drudgery. Lovett and colleagues argue that workers in the high-tech factory might have had higher expectations before they got employed regarding the nature of the job and the environment in which it is done, and this disillusionment is what the research grasped (Lovett et al., 2004). If we accept this reasoning, it still can be pointed out that heightened positive expectations or "hype" about technology can indicate the alignment of laypersons' expectations to experts' visions shown in mainstream media. Following a similar logic to their research, Winkelhaus and colleagues investigated the lived experiences of sixteen employees of seven German firms in logistics. In order to get a fuller picture, not only did they investigate the effects of automation but also the interplay between algorithms and automation. According to their rationale, software, and different algorithmic solutions can make work more effective and often require hiring highly skilled employees. On the contrary, automation simplifies processes and makes rigidity crucial because most automation techniques need well-defined parameters to work in order. Automation is connected to this process through the many cameras and sensors built into the robots used in logistics centers that feed information back to algorithms that can use this to fine-tune work processes in the warehouse or the shopfloor. Participating firms have been classified into three groups based on the level of both automation and what the researchers labeled "Industry 4.0 maturity", which meant using algorithmic solutions. According to their findings, none of the participants thought that technology would endanger their jobs in the future. The results were independent of the level and sort of technology used at the firm. Respondents unanimously believed in their expertise and did not believe that future technologies could replace them. However, they were not so optimistic about the future of other jobs in the same firm. Although participants perceived their jobs to be safe in the future, their attitudes towards technology differed based on the level of automation. The more mature a firm was technologically, the higher the level of both automation and Industry 4.0 implementation it achieved, the less satisfied its employees were with their jobs. As the researchers hypothesized, a high level of automation resulted in monotonous, simple tasks and a lack of perceived autonomy over the process. Employees often felt "part of the machine,"

described their jobs as unimportant, and themselves as insignificant. Such signs of alienation were missing from the accounts of employees working in less automated environments where they felt that technology enhanced their work and felt that their work was complex but let them have space of autonomy (Winkelhaus et al., 2022).

The studies mentioned above investigated the perceptions and expectations of blue-collar workers and are examples of the importance of technology's social and economic embeddedness. South African workers might consider farming an alternative because it was a viable strategy in the past, and therefore, they expect it to work in the future, too. This can also mean that this group perceives the future as the continuation of the past and does not expect significant disruption that would make past strategies for survival insufficient. Workers with better training or higher education only framed the same strategy differently. Being self-employed and setting up a small repair shop is the mechanical equivalent of farming. Of course, the higher and the more relevant their skillset is, the more positive they can be about their future in the same industry and profession. What is interesting is the general acceptance of a future scenario in which robots will replace these workers and the widely shared opinion that a return to small-scale farming or entrepreneurship will solve this. Although other researchers found that blue-collar employees do not fear that robots will take their jobs, they believed that others, even in the same factory, could be in trouble. Furthermore, while the "robots will take our jobs" narrative might not receive full acceptance, the statement that higher automation makes more pleasurable workplaces seems to be refuted, at least in these examples. Based on research done by Winkelhaus and colleagues, the level of automation was the factor that affected the participants' job satisfaction negatively (Winkelhaus et al., 2022). It might be that computerization enhances human labor productivity, and due to the nature of most blue-collar occupations, its effects can be better captured when looking at jobs done by white-collar and highly skilled blue-collar workers.

Research done on employee awareness of smart technology, AI, robotics, and algorithms (STARA) proves that place of residence and pre-existing knowledge are important factors in the perception of how the labor market will look in the future. Lingmont and Alexiou involved both blue- and white-collar employees living in India and the USA in their research. Participants viewed smart technologies as a possible threat to different degrees. According to their study, the less an employee knows about STARA, the more optimistic they will be in the belief that training help them keep their job in the future (Lingmont & Alexiou, 2020). Place of residence has many implications. As shown previously, blue-collar workers' expectations

and strategies will differ based on their personal, subjective opinions and what they believe their country's economic future might hold. In South Africa, labor market instability might drive blue-collar workers back to more traditional ways of working, while in Mexico and Germany, workers denied the possibility of losing their jobs to robots and, therefore, did not have plans for alternatives even when they had experienced the negative effects of automation personally. In their research based on data from the USA, New Zealand, and Australia, Brougham and Haar found that while there are general trends in the survey, replies from the USA were dominantly different in most of the cases. The main research question was to define if the perceived technological threat affects job satisfaction and turnover intentions. According to their findings, respondents from New Zealand scored the lowest for fear of losing a job in general and due to disruptive technology, while respondents from the USA scored the highest in both categories. The article hypothesizes that due to the central role of the USA in technological improvements, participants might be more exposed to media coverage of potentially disruptive technologies and their potentially devastating consequences on the labor market; therefore, they articulate a more pessimistic opinion. The study also points to the effect of perceived job mobility. The result shows that even if an employee has high job satisfaction, if the perceived technological threat is high, they will consider finding another job, especially with perceived high job mobility chances (Brougham & Haar, 2020).

Research done on the perceptions of smart technologies shed light on the phenomenon called "job satisfaction dilemma," which refers to mixed emotions toward technology as being useful and perceived to be enhancing, the same time as being invasive and perceived as a threat of surveillance (Bhargava et al., 2021). An example is the study by Bisht and colleagues, who concluded multiple case studies of Indian microfinance institutions where field officers and branch managers' work went through digitalization to make their processes and employees more efficient. Participants of the studies had positive attitudes toward this change for different reasons. As it was found elsewhere, employees often feel valued by the company in such cases because they feel part of a long-term investment that enhances their feeling of job security (Keszey-Tóth, 2020; Bisht et al., 2023; Siemon & Kedziora, 2023). Also, using technology gave them the confidence to become more employable in the future if they need to find employment elsewhere. Applied technology made quantifiable parts of the job more efficient and also increased employees' discomfort due to its pervasiveness in their private lives. While they enjoyed the benefits of technology during their work hours, the management also used it as a tool to invade off-work hours (Bisht et al., 2023).

So far, it has been shown how certain blue- and white-collar workers perceive smart technologies and automation. The next examples will shed light on how different perceptions become when the subjects of the inquiry are from upper management or highly skilled white-collar employees. In the case of such participants, smart technologies and AI are not perceived as a threat at all. Instead, the narrative that technology will only enhance human labor in the future is commonly shared, even in the case when employees initially had reservations regarding the potential dangers of smart solutions (Siemon & Kedziora, 2023; Sowa et al., 2021; Milosavljevic & Vobic, 2021).

The role of media outlets in shaping laypersons' expectations is a recurring theme because most people get their knowledge from these outlets (Special Eurobarometer 516, 2021). Given that newsroom managers should be well informed on a topic so frequently covered, they are expected to have an opinion on the possible takeover of AI in journalism and its forecasted disruptive power on the labor market. Not surprisingly, newsroom managers of prominent media outlets did not see AI as a threat to their profession or jobs in general, only as a technology that will enhance human labor to be more productive. As in many cases, the importance of human interaction and intuition was emphasized. According to their accounts, AI might be useful in detecting events that make breaking news, but the profession's core is interacting with people in person and telling their stories by someone with whom the readers can connect. AI might be able to write an article but never find informants or become a celebrity journalist whose opinion is a trendsetter (Milosavljevic & Vobic, 2021).

In a study that aimed to observe the introduction of a robotic process automation (RPA) technology that involved the training of several employees in Finland, researchers found proof of the shift in views toward smart technologies as the knowledge base changed. Before the training, managers were skeptical about whether someone without technological expertise could be trained to be able to use and program such a technology. They were also afraid that the reason for this investment was to substitute humans with algorithms to the extent that, after sufficient time, it would enable the firm to lay off everyone in the department. Not only did their reservations disappear after the training, but they voiced an optimistic view about the technological enhancement of human labor that makes each employee more productive by freeing up time by completing time-consuming and monotonous tasks (Siemon & Kedziora, 2023).

Sowa and colleagues conducted multi-layered research to explore perceptions regarding

human-AI interactions through a survey, interviews, and an experimental exercise. Regardless of the methodology or the level of measurement, participants did not perceive AI as a threat to the future of jobs. In contrast, the prospect of having AI as an assistant or co-worker was widely accepted. The only difference between the survey participants was how they would prefer AI to look. Younger participants prefer a visually and verbal human-like experience, while older respondents would prefer a smart but only verbally controlled, faceless solution. Unfortunately, the low number of interviews (only 6) did not allow the authors to draw general conclusions. Interviewees were managers from different fields, and only one of them had IT expertise. Nevertheless, it became clear that the less a manager has to use AI in their job, the more negatively they will perceive it. When asked about the task they would delegate to an AI assistant, they mainly listed items they previously listed as mundane or monotonous. Although managers did accept the idea of an AI assistant, they emphasized its limitations in becoming a real co-worker. In contrast to human coworkers, AI was described as reactive instead of proactive and submissive instead of challenging, therefore lacking qualities they were looking for in someone they would work together with. The final phase of the research was designing an AI assistant based on previously gathered information. This experiment might be considered unsuccessful since the attempt to draw the general outlines of an AI assistant that could serve various purposes had failed due to varying demands for capabilities and functionalities (Sowa et al., 2021).

This section tried to shed light on the presence of expert visions about the future of work. Narratives like “robots will take our job” or “technology only enhances human labor.” are often cited; therefore, they should also be found in laypersons' accounts. Many factors influence laypersons’ perceptions based on their location, position, and perceived possibilities to change their situation. The “robots will take our jobs” narrative was rejected in most cases except in the study made in South Africa. In that case, the researchers hypothesized that blue-collar workers perceive the automobile industry as unstable; therefore, they are prepared to return to other traditional forms of livelihood (Chigbu & Nekhwevha, 2021). Unfortunately, the research did not investigate the connection between perceived job insecurity and the acceptance of negative future visions. Blue-collar workers might not believe that robots will take their jobs, but they do not make them feel good in the workplace either. Whether the factories are situated in Mexico, Germany, or Hungary, blue-collar employees share the common fear of hidden surveillance and feel alienated and dissatisfied with their jobs in general (Lovett et al., 2004; Keszey & Tóth, 2021 Winkelhaus et al., 2022). Perceptions vary

within white-collar workers since a wide range of professions and positions are considered here. In lower-skilled, non-managerial positions, employees often face the job satisfaction dilemma when they are initially optimistic about the possibilities given by smart technologies and might feel more respected by their employer, but in the same time, are being exploited in their free time by the management (Bhargava et al., 2021; Bisht et al., 2023). As we move higher in the workplace hierarchy, the idea of a human-enhancing technology is becoming more abstract, and fears regarding the misconduct of technology by the employer are disappearing. As it was not the focus of the cited literature, it can only be hypothesized that on a medium or high managerial level, employees, in general, do not experience workplace surveillance, but probably they are the surveillants. Not only do they not perceive smart technologies and automation as a threat, but even the human-enhancement aspect is degraded to a digital solution to eliminate unpleasurable tasks.

3 Preliminary Expectations and Assumptions

Knowing what the future will bring is impossible, yet most of us are willing to believe what a specific group of people state about it with high confidence (Beckert, 2016). But all this knowledge is only worth the effort if the future matters. There was a time when knowing what the future have for us wasn't the key to power. It was either useless or it could even be seen as a curse. What makes the difference? How we perceive time and think about it if we can even imagine it. If there is no difference between past, present, and future, if we see life as continuous or as recurring in a circle, then the concept of the future is meaningless; the answer to what the future has for us is easy: the same as yesterday. It might feel monotonous, empty, or even frightening for the mind of the 21st century, but it carries a sense of stability and safety in itself, too. There's no need to worry about something that we can hardly imagine; there is no need to make hard decisions about something that most probably never will happen. However, a privileged few had the chance to think about the future as a thought experiment. The question was not What will be? but How should it be now? How should it be when we reach the golden age (again) before fate strikes us down so that we can start everything from the beginning? (Adam, 2008, 2010; Ransome, 1999).

The question of "How it should be" is a critical one. The hidden assumption is that something is wrong with the present that has to be fixed in the future. However, it is inevitable that we will see both the problems and the solution through the lens of our perceived reality. Thinkers of all historical ages seem to find common ground in defining the problems but propose different solutions based on their own values. Most visions include technology, needs, means of production, work, and ways in which these can be altered and combined to achieve a more fulfilling, happier life. Technology is commonly believed to bear the potential of eliminating the need for human labor in producing material or even intellectual goods; may this be a utopian or dystopian outlook (Frey et al., 2013; Ford, 2017; Brynjolfsson & McAfee, 2016; Schwab, 2016; Miller & Atkinson, 2013; Bastani, 2019). In each case, technical innovation will have a central role in the life of future societies, almost as if a new version of Fate, almost as if the future of work is about to close. Technology in previously created visions is a tool without its own will of playing the role of destroyer of humanity and society, yet the closer we are to the present, the darker the picture gets. Technology is still a tool, but whoever owns it, master's it, and directs it will have great influence and, therefore, power over others (Huws, 2014; Dyer-Witheford et al., 2019). Experts of the future and experts of technology are the

ones who will show the way, and the performative power of expectations and imagined futures is the force that will make us followers (Beckert, 2016).

3.1 Preliminary Assumption no 1. The presence of mainstream discourses in the account of Hungarian AI developers and IT professionals

According to the sociology of expectations theory, visions of an imagined future created by experts influence different actors' actions in the present. Therefore, these expectations of future outcomes have a performative role. Imagined futures of experts become a shared vision that aligns different discourses and storylines into one direction (Beckert, 2016; Birch, 2017; Borup et al., 2006). If this is true, then we should find elements of the mainstream, overwhelmingly Western discourses about the future of work in the accounts of Hungarian AI developers and IT professionals, too.

3.1.1 Preliminary Assumption 1/a: The fundamentality of work as a value

Independent of the historical era in which it was written, whether it is a utopia or a warning, the centrality of work as a fundamental value is unquestionable. Utopias imagine a future with as small a quantity of time spent on work as possible (Fourier, 1971; More, 2018; Etzler, 1836), but the vision of a totally workless future is rare (Bastani, 2019). In the accounts of pessimists, the possibility of robots taking our jobs is terrible precisely because it is almost impossible to imagine a future in which humans can survive without the interplay of paid work and consumerism (Frey et al., 2013; Ford, 2017; Brynjolfsson & McAfee, 2016; Schwab, 2016). The perceived importance of work and its strong signaling effect on status and self-worth is the main reason why thinkers on the "no real change" (Boyd & Holton, 2018) side argue that the current socioeconomic system will maintain and organize itself around new technologies to keep its basic structure intact (Campa, 2014; Autor, 2015; Bessen, 2016, 2019; Miller et al.,2013; Ernst et al., 2019).

Preliminary Expectation 1/a

Based on the literature and statistical data presented in the Hungarian context part of the research paper, it can be said that work has a central role in one's life and is also perceived as a duty towards society (Halman, 2001; EVS 2017-21). This fact predisposes participants of this research to share the importance of work as a value in life.

3.1.2 Preliminary Assumption 1/b: Quantity of work in the future

The starting point of the current debate about the future of work was the now infamous report of Frey and Osborne (2013) that predicted half of jobs in the US to be vulnerable to automation. Since then, one focal point of argument is the question of future work quantity. Pessimists forecast an overall decrease in the high unemployment rate of low-skilled workers and in jobs that consist of mostly repetitive actions that are easy to automate (Frey et al., 2013; Ford, 2017; Brynjolfsson & McAfee, 2016; Schwab, 2016) while others argue the hollowing out of middle-skilled jobs (Autor, 2015; Bessen, 2016, 2019; Ernst et al., 2019). In contrast, those argue that in history, new technologies didn't bring less but more work for a growing global population by creating new types of jobs (Campa, 2014; Miller, et al., 2013). Based on this literature, this research question concerns which argument Hungarian AI developers and IT professionals agree with.

Preliminary Expectation 1/b

My preliminary expectation is that participants in the research will take the position of those predicting the emergence of new kinds of jobs created by AI and related technologies or made for their maintenance. As developers and experts of the technology in question, they probably have a positive attitude towards it and wouldn't argue otherwise.

3.1.3 Preliminary Assumption 1/c: Quality of work in the future

The other side of the debate is the quality of jobs in the future. The assumption that technology will primarily take jobs that are monotonous or easily can be broken down into programmable parts of tasks suggests that remaining jobs will be more complex and require higher professional skills, which translates into the improvement of the quality of work (Winkelhaus et al., 2022; Lingmont & Alexious, 2020). In contrast to this statement are those who expect the hollowing out of jobs that require middle-skilled labor power because low-skilled, blue-collar workforce can be cheaper and readily accessible for firms while jobs done by high-skilled, tech-savvy labor is not automatable (Campa, 2014; Autor, 2015; Bessen, 2016, 2019; Miller et al.,2013; Ernst et al., 2019). Finally, there is literature stating that technology will eventually de-skill jobs in general because what first might require high expertise will be simplified and made more user-friendly to make it more accessible for employees. At the end of the process, AI might reach the level of autonomously creating codes, which means the de-skilling of IT professionals, too (Huws, 2014; Dyer-Whiteford et

al., 2019). My research question regarding this topic is which opinion will Hungarian AI developers and IT professionals mirror in their discourses?

3.2 Preliminary Assumption no 2. Ethical considerations in the discourses about the future of work

The theory of the sociology of expectations suggests that expectations have a performative power, which implies that if AI developers voice their reservations and negative expectations against certain application methods of AI and related technologies, it can influence the direction of development (Beckert, 2016; Geels & Schot, 2007). There are examples from the media for cases of IT professionals of the Big Five openly standing up against the company's intentions of development (Tung, 2019), but ethical issues usually don't have great importance in the studies conducted among IT professionals and AI specialists when they consider future outcomes of the technology (Vaast, 2022). Not every research question below has a hypothesis since, in some cases, either the goal is to ask an open question and give space for the respondents to decide what to mention, or there is not enough preliminary data to draw definite explanations.

3.2.1 Preliminary Assumption 2/a: Top-of-mind awareness of ethical issues

Will AI developers and IT professionals mention ethical considerations during the research without being directly asked about them?

Preliminary Assumption 2/a

Due to their educational background and since English is the most commonly used language in IT, participants probably have heard about the most frequently mentioned scandals surrounding AI recently. For this reason, I expect them to at least mention this news.

3.2.2 Preliminary Assumption 2/b: Ethical issues after directed question

When asked about the topic, which ethical issues will participants mention in relation to AI and other technologies?

3.2.3 Preliminary Assumption 2/c: Perceived responsibility

How do participants view their role as developers and experts in shaping the future of work? Do they realize their potential to influence the direction of development or put the

responsibility elsewhere?

4 Methodology

4.1 Methods of research on the future

While engaging in the theory of expectations is intriguing, empirical research poses complex problems for psychologists and sociologists. Expectations and aspirations tend to fail, and outcomes tend to deviate from what was initially planned. Nevertheless, there are aspects of the imaginative process of future creation that the toolkit of sociology can investigate. Mische propounds several cognitive dimensions of projections about the future that can guide us in understanding this phenomenon better. She propounds using the rope metaphor to enable the researcher to list different attributes that can be otherwise easily measured. Such attributes as contingency, expandability, connectivity, or contingency can be observed and described through the actor's stories of the imagined future and, therefore, can add essential knowledge about how these futures are built, their structure, and genre (Mische, 2014).

Multiple research methodologies aim to guide interested actors in mapping out different future outcomes. Depending on the arena of usage, these methods can either focus on helping decision-makers of economic entities or institutions handle uncertainty or on mapping out the mechanisms working in the background during creating and articulating expectations and plans regarding the future.

We have to differentiate methodologies for academic, business, and governmental use. Academic studies focus more on the underlying mechanisms of scenarios and the process of creating them. Criticism about the potential biases, the oversimplified structures, and the lack of voice from various members of society is central.

For the business sector, future-oriented thinking and planning are tools that empower companies and other economic actors with the knowledge of many plausible or possible alternative options for the future. Such knowledge can be essential for first preparing for different threats and second enabling them to act as fast as possible.

In her seminal work about the visions of the future articulated at the Rio +20 conference, Mische presents a classification of methodologies. Survey approaches have a long-standing history in social sciences and have many benefits in researching future aspirations and expectations. A definite advantage is the well-rounded methodological background of

conducting surveys, but in the case of expectations and any future-oriented research question, it is questionable if surveys reflect respondents' true intentions or only provide answers that comfort socially accepted opinions. A solution can be to ask closed questions in a fast response format that forces respondents to use deep-rooted norms that are mainly unconscious. Narrative approaches are beneficial since they work with texts, allowing the researcher to better understand well-articulated future visions. This is the kind of approach in which the rope metaphor can best be used. The nine dimensions of the rope metaphor can be grouped into three main aspects of narrative research: cognitive contours, such as the extension of a vision; action orientation, like relations and interactions of actors in the visions; and finally, mode of projectivity, which refers to the genre of the vision. While a survey may show deeply rooted thoughts, norms, and values, the narrative approach can give a broader view of how different actors picture the future. Functional as it can be, we must not forget that this approach has weaknesses, too. Written texts, policies, and speeches may be easier to reach, and the researcher may have more time to look for the hidden, unintended messages of the text, but at the same time, this format can enable the creator of the text to communicate an opinion that is accepted or expected from them. Many reviewers can modify white papers and conference reports to take the most widely accepted shape instead of what one may honestly think.

Performative approaches claim to overcome the problems of both survey and narrative approaches by focusing on the performativity of expectations in different settings. The rationale behind this approach is that actors may answer surveys with a socially more acceptable bias in their answers, and they may alter their speeches in formal gatherings or their written statements, but if researchers can investigate both what they express and what their actual actions are, they can grasp the picture closest to the truth. Just as in all the other cases, this approach also has limitations. People may act and talk differently in different settings of life. The very same topic can possibly be communicated differently depending on who the audience consists of. To gain the extra knowledge this approach claims to give, researchers should capture an actor's behavior in many different settings, which is challenging to implement in real life. A solution can be using experiments during which a set of actors with various backgrounds would discuss a topic in groups. By mixing up these groups occasionally, researchers could investigate how both communication styles and content change (Mische, 2014).

Gruetzemacher also lists survey methods as the most widely used tools but finds the Delphi

technique more adequate for future research, especially on technological futures. The Delphi technique consists of multiple rounds of questionnaires conducted among experts, including aggregating and distributing answers to gain a summarized version of expert opinions. A Delphi questionnaire typically works with open questions and, therefore, allows experts to freely articulate their views regarding the given topic, which can help researchers identify a broad set of aspects that respondents find necessary. This openness can be essential in the early phases of research. It can highlight otherwise neglected dimensions of phenomena and help researchers map out the logic of a selected group of society. The downside of this method is its core attribution, namely that it only shows expert opinions. Findings can be biased because of the selection criteria. Who will be decided to be entitled an expert? There is a possibility that only some respondents will fill out the second questionnaire, and finally, it is a question of whether generalized statements regarding future states of anything can be legitimate based on the opinion of a group with specific but narrow knowledge.

Regarding technological futures, Gruetzemacher considers judgmental techniques the most useful since these can handle high levels of uncertainty the best. Roadmapping usually consists of three steps involving workshops and with an emphasis on the graphical outcome that can be distributed within organizations for the management as an easy-to-read material for future strategy plans of R&D. Innovation forecasting uses bibliometric data to gain information about the evolution of technology and the fields interested in either its development and its utilization. Tech mining aims to combine multiple ways of forecasting to find indicators of emerging technologies that can disrupt current setups (Gruetzemacher, 2019).

Porter and his colleagues in the Technology Futures Analysis Methods Working Group built an umbrella concept to create a system of methodologies that can guide research on technological futures. Their thorough list of existing methods lists 51 items grouped in 9 families based on the main characteristics of the methodologies. They argue that technological futures or any phenomena related to technological development have to be investigated with multiple ways of inquiry. Researchers or managers can’t use only statistical data or only surveys and interviews; they need a toolkit that can give them a “big picture” view of the problem they are searching for answers to. For this reason, they created the TFA (Technology Forecast Analysis) concept, which is a systematic process that can produce judgments about the different aspects of technological change. They distinguish three perspectives from which researchers usually choose: technical perspective focuses on analytical modeling and uses

methodologies that involve experts and data analysis. Organizational perspective is taken when the goal of the research is to aid economic or social institutions to measure their role in modifying the acceptance or denial of technology, and finally, personal perspective focuses on the role of personal attributes such as leadership and other individual considerations when facing a new technology. The greatest challenge of the TFA method is its complexity. It has to involve mixed methodologies and involve all perspectives. Experts should be asked about the technological parts, organizational and institutional stakeholders should evaluate the scope and the limits of their role, and finally, users should be asked about their experiences, fears, and hopes about the given topic. This makes TFA expensive and time-consuming.

Researchers have to face the problem of expert bias, which potentially creates conflicts between different actors' goals. The time horizon set for the research defines which method can be used and, therefore, can make it impossible to use mixed methods. Reproducible findings are another critical point of TFA due to its complexity. As was already mentioned previously, each method used for research on any aspect of the future has its limitations, which can add up when research is conducted with multiple methods over a long period of time. The process of how a finding was accomplished must be well documented, but the question remains if following the same process but in a different environment can lead to the same outcome (Porter, 2004). The Porter article's aim is only to introduce a possible frame that can be used for forecasting goals that can escape being single-dimensioned and working linearity in trends, but it doesn't provide a detailed description of how TFA research should be built up. While it can be important to involve a diverse set of participants, it can also limit the scope of utilization of this method to those who can afford such a complex and long-lasting investigation.

As we can see, there is a huge variety of methodologies that can be used to help actors handle a high level of uncertainty regarding possible future outcomes. Statistical methods are better suited for short-term forecasting, with the presumption that the near future can be believed to be very similar to what we have already experienced. For longer time periods, these methods aren't reliable.

In the literature regarding practical methods for long-term forecasting, qualitative methodologies are commonly believed to be more suitable for either academic or commercial use. The rationale behind this is the high level of uncertainty and the fact that while there can be many different ways to investigate different outcomes of actions, the future can never be

fully known.

Scenario building is a commonly used method in companies for the assessment of different future states of the market, while in academia, it is a useful tool to analyze how different actors picture the future and to debate about the outcomes and the dynamics behind it. The origins can be traced back to futurism and strategic management. After WW II, scenario building started to develop in both the USA and Europe, although with different emphasis on the goal of the method. In Europe, leading institutions were mainly in the Nordic part of the continent, like the Copenhagen Institute for Future Studies, and futurists like Jouvenel and Jungk. The focus was more on desired and possible futures and not on preparedness for plausible alternatives. Gaston Berger, a French philosopher as the founder of Centre d'Etudes Prospectives, established a scenario approach that he called Le prospective or prospective thinking in the 1950s. As a philosopher, Berger's main concern was his country's long-term social and political future. The goal of the center and the approach was to find a proper methodology with which socially positive scenarios can be created and used by actors of the polity as guidelines for future actions. Berger didn't see the future as predetermined. In his view, the future can be shaped, created, and modeled to be beneficial for society. Another prominent representative of the Le Prospective school was de Jouvenel, who was concerned with the potential power of small but dominant political groups that could impact the broader society. De Jouvenel saw the solution in the creation of visions of ideal futures by scientists that would spread in society and be blueprints for the future. The final touch of this school was added by Godet by integrating a more mathematical approach to it with an emphasis on probabilistic modeling and algorithm-based computer analysis (Bradfield et al., 2005).

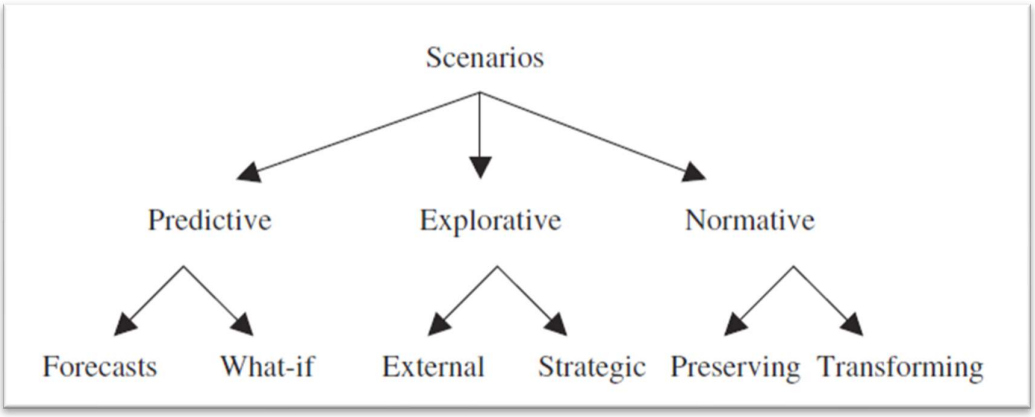
In the USA, scenario building was utilized by the Air Force through Rand Corporation with a focus on developing global scenarios. Herman Khan later left the corporation and founded the Hudson Institute where, with his colleagues, he wrote *The Year 2000: A Framework for Speculation on the Next thirty-three Years* in 1967. This report included 100 projections about how technology will improve, of which only about a dozen become reality in one way or another. The importance of the report is not in its (dis)ability to predict what will happen in the long run but in the introduction and popularization of the concept of thinking about the future in a nonconventional way (Martelli, 2014).

The 1970s brought big issues like global natural resources, demographic trends, and their effect on societies of the future foreground. One of the most well-known documents of this

time is the Club of Rome's Limits to Growth in 1972 or Daniel Bell's *The Post-Industrial Society* in 1973. Scenario building lost its popularity in the 1980s and later moved to the field of economic strategy planning. One reason is the complexity of this method. While it is not as complex as TFA, it still can be considered to be expensive and time-consuming, which limits the possibilities of use in the academic or political field where financial restrictions can most often start with the cut of research cuts. Another reason was the decrease in military-founded research and the demand for global scenarios due to their failure to meet expectations regarding their employability. On the other side, corporations saw the possibilities in scenario building as a tool that could prepare them for possible or plausible future economic turmoil. From the 1980s, industry-related projects and a shift from quantitative to qualitative methods have characterized scenario building (Martelli, 2014; Brandfield et al., 2005; MacKay & Tambeau, 2013).

Despite its 50-year history, scenario building still doesn't have well-established roles and practices. The main reason behind this is the popularity of this methodology in the economic sector, where practitioners have to design each scenario-building exercise to fit the budget of the customer. However, this state can be both an advantage and a fault. The flexibility of this method makes it possible to be part of a wider research process; small-scale scenario-building exercises can be utilized for smaller communities or for academic purposes when the goal is not to create viable strategies but to create a common vision of the future or to investigate the mechanisms behind the cognitive process of scenario creation. Nevertheless, several typologies exist, each of which aims to clear the precarious situation of scenario building.

Börjeson et al. created a typology centered around the exploration of probable, possible, and preferable scenarios. As the table below shows, they created three categories of scenarios that can be further divided into six sub-groups.



8. Figure. Börjeson L. et al, 2006: Scenario types

The predictive type answers the question of what will happen in order to find the most probable future. Its sub-categories are forecasts and the What if? types. Forecasts can be useful for strategic planning, but, of course, with the limitation of the presumption that basic elements of the system in which the scenario is built will not change in the foreseeable future. Forecasts are typically not tools for extreme futures mapping; therefore, they don't count with the abolition of laws or the disappearance of the free markets. What if? Predictive scenarios are better suited for such an exercise since they are designed to picture situations in which a specified event has occurred. Unlike forecasts, this type of scenario can be used for long-term planning and incorporate not just external factors but internal decisions of the organization; therefore, bifurcation points can be identified and considered. Forecasts also have the limitation of becoming self-fulfilling prophecies that can falsely show the ineffectiveness of scenario building.

Explorative scenarios answer the question of What can happen. and can be used for possible future outcomes in case of changes in both external factors and internal decisions. As the naming suggests, this type of scenario is for the exploration of possibilities; therefore, the goal is not prediction. Börjeson et all admit the resemblance between explorative scenario types and the What if? subtype but solve this problem with the differences in time-horizons for which they are good. Explorative scenarios can be helpful for long-term planning if the user has the assumption that the current system can be perfectly known and is interested in possible alternative systems or alternatives of aspects that constitute this system. In accordance with this, explorative scenarios often have their starting points in the future instead of extrapolating trends from the present. In times of rapid change or a transition, during times when threats of the future are not clearly seen, organizations often decide to use

this kind of scenario. Within an explorative scenario, the external sub-type is centered solely on aspects that are out of the active agents' reach to manipulate. Typical examples are global climate change or energy scenarios, which can be distributed to a wide audience since they tend to be rather general, but organizations often use this sub-type as part of their strategic planning process because external scenarios can help them recognize weak signals of future threats. Strategic scenarios are quite the opposite of external scenarios, focusing on policies and aspects of the future that the actors can shape. A typical usage of such a scenario is the testing of a policy and its possible effects on the targets. The last type of scenario answers the question of how a specific target can be reached. Normative scenarios explore preferable future states and can be divided into two sub-types. Preserving scenarios look at options when the user is only willing to make smaller alterations to the current state of affairs that is believed to be otherwise stable and/or preferable. The typical question that such a scenario can answer is how we should adjust the current system in order to reach our goal. In this case, the starting point of the scenario-building exercise is a desired future state that the actors want to reach within the prevailing system. A reason for choosing this sort of scenario can be cost efficiency when a desired goal has to be achieved with limited financial resources. Börjeson et al. l mention the example of regional planning when the result might not be optimal, just satisfying. A transforming scenario is used when this desired future state can only be achieved through the transformation of the current system. This sub-type of scenario presumes that trends are going the wrong way. Therefore, they can't be trusted or used. A typical transforming scenario is backcasting, where the starting point is the favorable future that has to be reached through the transformation of the current system. While backcasting can shed light on the level of change needed if a certain goal is to be achieved and therefore shake things up, it has the disadvantage of engaging users with inexpensive measurements in the short-run that might become necessary in the long run only if the goals remain the same for 25-30 years. In a similar vein, preserving scenarios may neglect investments in the present because of their immediate effect on the budget and, therefore, missing opportunities in the future.

Van Notten et al (2003) used a broader, more general typology for scenario building. After an extensive literature review, they came to the realization that scenario building in practice is so variable because every researcher has to answer three questions that will influence each other. The first question is, Why? This will give the project goal. Why are we doing this exercise? The answer to this question will influence the second question, How? This is the process

design that will lead to the last question: What? that is the scenario content.

Overarching themes		*Scenario*	*characteristics*
A	Project goal: exploration vs decision support	I.	Inclusion of norms? : descriptive vs normative
		II.	Vantage point: forecasting vs backcasting
		III.	Subject: issue-based, area-based, institution-based
		IV.	Time scale: long term vs short term
		V.	Spatial scale: global/supranational vs national/local
B	Process design: intuitive vs formal	VI.	Data: qualitative vs quantitative
		VII.	Method of data collection: participatory vs desk research
		VIII.	Resources: extensive vs limited
		IX.	Institutional conditions: open vs constrained
C	Scenario content: complex vs simple	X.	Temporal nature: claim vs snapshot
		XI.	Variables: heterogeneous vs homogenous
		XII.	Dynamics: peripheral vs trend
		XIII.	Level of deviation: alternative vs conventional
		XIV.	Level of integration: high vs low

9. Figure. Scenario Characteristics by Van Notten et al (2003)

As the table above shows, Van Notten et al differentiated 14 scenario characteristics grouped by what they call the three overarching themes. It is obvious that they wanted to show all the details, all the steps a scenario building exercise goes through and they achieved this goal, but the result is more of a handbook for scenarios than a typology. The article goes into detail about all the possible aspects of each characteristics of scenarios, which provides essential knowledge for prospective researchers or practitioners during the negotiation with a customer or in the design of a research. Van Notten et al sees the real advantage of their research in providing a checklist when analyzing scenarios.

Bishop et all. collected the most broadly used scenario building techniques in order to aid practitioners in designing and implementing scenario building. They start with judgmental techniques that include the original idea of Herman Kahn to “think the unthinkable”, meaning not to limit ourselves to scenarios that we think to be possible but to move forward to the more extreme futures. Another example of judgmental techniques is role playing as a group judgment. During this technique participants are randomly given a role in each scenario that they created. Being able to put themselves into the shoes of a citizen who lives in one of the worlds they have previously agree to create the way it is, enables them to distance from their actual position in society and to see weaknesses of a scenario that they otherwise wouldn’t recognize.

The second type of techniques is baseline or expected future. This technique aims to provide only one scenario; the best or most possible one mostly by using trend extrapolation. Wendy Schultz elaborated this technique into what is known as the Manoa technique during which participants have to work with three closely related trends in order to investigate the effects of interconnectedness of them and the separate effect they can have on the future. The technique involves mathematical models such as cross-impact matrix. By the end of this exercise, participants receive a set of questions regarding their findings in order to create different scenarios.

The third technique is the elaboration of fixed scenarios. As is it obvious from its naming, this technique involves previously prepared scenarios that participants have to read and answer to a set of questions regarding the different implications such a future would have on society or the organization. Typically, the fixed scenario exercise works with extreme visions of the future to trigger lively conversation among the participants and to make their mindset change. The Stanford Research Institute (SRI) matrix is another type of fixed scenarios where the titles of fixed scenarios are placed as columns of a matrix and different dimensions of a society, such as demography, technology or economy as rows. Participants have to fill the boxes within the matrix and by doing so they create their own scenarios that can be later compared with either other groups of participants or with the previously fixed scenarios of the team organizing the event.

Event sequences is the fourth technique that involves a more quantitative approach to scenarios with probability trees or divergence mapping. The aim of using such a technique is to add probabilities to each future state or to the events that can led there. This way participants can create a possible, plausible or extreme scenario.

Backcasting is the fifth technique. Most scenario building techniques and approaches to any activity that want to create future states of the organization, society, a community or the planet starts from the present and looks at either future outcomes of currently existing trends or try to anticipate events or technologies that will cause certain future outcomes. Backcasting on the other side starts from a desired future state or from a future state that we want to avoid and moves backwards in time to map out the steps we have to take in the present. John Anderson used backcasting at NASA to help engineers figuring out which direction they should make in innovation that will have the biggest positive impact in the future. Anderson challenged them with the hypothetical mission to make the travel to Jupiter only one day.

Since a one-day travel to Jupiter is science fiction, engineers could easily play with the possibilities instead of thinking about available budgets and the technological boundaries. By the end of the exercise, NASA engineers were able to find possible ways of innovation and R&D that had the potential of influencing long range technological advancements.

The last three group of techniques are heavily dependent on computer modelling and mathematical calculation of probabilities and the level of uncertainty. Techniques vary in the sense that they are either looking at modes of organizing scenarios into the order of how possible they are or they help to check if the scenarios are consistent, if the results aren't contradictory. Since scenario building is considered to be mainly a qualitative method, the usage of mathematical models and matrix calculations can add extra strength to the finding especially if the scenario project aims to forecast possible futures of an organization or aims to supplement policy decisions (Bishop et al, 2007).

As it was previously discussed, the goal of scenario building is not forecast, it doesn't aim to tell what the future will bring. Scenario building is used to create visions of plausible and possible futures. It is true indeed, that some of its applications use statistical and computational methodologies, but the original goal was to help think the unthinkable. One of the main problems of scenario building is its lack of theoretical embeddedness in social sciences. Its focus on handling uncertainty made it successful in the economic sphere, where theoretical background wasn't a problem (Börjeson, 2006; Wright and Cairns, 2011; Lindgren and Bandhold, 2003). Regarding the question of the future of work, scenario building is a sufficient tool to empirically test how an (otherwise supposedly privileged) group sees the future. Since the future is the realm of the "not yet" and only the present and the past have tactile proof of existence, it is of great difficulty to scientifically study it (Adam, 2008, 2010; Mische, 2014). By examining written or told stories or visions of the imagined futures that we create, we can grasp at least parts of what might shape the actual future to come (Adam, 2010; Beckert, 2016; Mische, 2014). Expectations, visions, and promises have performative roles, this is why so many of us accept the opinions of experts. The assumption, that there is a set of people who are sufficiently knowledgeable to predict the future can make masses move into the same direction (Beckert, 2016). By using scenario building I intend to create a piece of tactile proof of plausible or possible futures of IT professionals to investigate in which direction they imagine society might move.

During my research, I will conduct interviews with the participants and predictive scenario

building with the What if? sub-type. Interviews before the scenario-building exercise can inform us about the general opinion of each participant, which aspects and factors they consider to be important, and how they see the future without any help or influence from others. This can show to the researchers how much the final scenarios differ from the individual perceptions and makes it possible to draw conclusions about group dynamics. While predictive scenarios are most often used to aid strategic decision-making, they are fit for broader usage too since they can involve extreme futures, unlike the other types (Börjeson 2006). While there are multiple ways to conduct scenario building, I decided to use "intuitive logic" or the Royal Dutch Shell approach and the description of its steps based on the literature by Wright et al (Wright et al, 2013). This is one of the most widely used, basic logic of scenario building to analyze the relationship between the critical uncertainties, important predetermined trends, and the behavior of actors who will want to enhance and preserve their current position. During scenario building a wide range of considerations have to be investigated may it be from the political, economic, technological, or social sphere of life. There are three main stages of a scenario-building exercise. Participants have to:

1, Identify key driving forces that are present in the future, and they believe will have a huge impact in the future.

2, Consider the range of possible and plausible outcomes of these factors

3, Understanding of how these forces interact with each other.

One question regarding the scenarios that are created by a group that contains individuals with similar attributes is whether there's the possibility of them using the same logic and the same filters on each scenario, therefore strengthening their beliefs instead of "thinking the unthinkable" (O'Brien, 2004). Wright et al suggest using additional techniques to enhance the original intuitive logic approach. One of their proposals is role-playing or role-thinking. During this exercise, participants are given a role within one of the scenarios they have created so as to make them leave the comfort zone of their thoughts and to actively guide them to consider the roles and possibilities of actors they otherwise wouldn't think of (Wright et al, 2013; Bishop, 2007; Green and Armstrong, 2011). The critical scenario method applies the intuitive logic approach but, in order to shed light on possible inequalities, the situation of less powerful stakeholders, the person who leads the scenario building can either interrupt the process itself or wait until the end and raise value-rational questions regarding the created

worlds. Questions can cover whether the scenarios are desirable for certain groups or who gains and who loses in them (Wright et al, 2013).

Using scenario-building combined with the interviews enables the research to harness the positive aspects of both methodology to get a better rounded view of the topic of the research. Interviews will be essential in many ways. First, in contrast to the DELPHI method, one interview can cover all the different topics and the researcher has the opportunity to ask for further details in case an unexpected topic arises or the participant would overlook issues that are otherwise important for the research. The anonymity is still ensured, therefore we don't have to worry about peer pressure. Also, the semi-open interview structure gives space for the participants to include topics and perspectives that they find important and might missing from the list of questions.

As was shown in this chapter, scenario-building has many versions used by different schools, which makes it a flexible tool to use when a researcher is working with groups of participants. The reason this research utilizes the Shell method is its rootedness in corporate usage, which makes it simple, compact, and time-efficient even in small groups. To avoid the tendency to use mental filters and values that participants are comfortable with, role play and other games will be used to facilitate open-mindedness and out-of-the-box thinking.

4.2 Methodology of the Interviews

From the perspective of AI, Hungary is interesting for several reasons. Being situated at the heart of Europe, Hungary benefits from proximity to Western European HQs and a relatively cheap and well-trained labour force. Hungary can be considered to be located on the semi-periphery regarding knowledge creation and the development of AI technologies (Vértesy, 2020). According to a survey by the European Commission in 2020, Hungary is lagging behind the European average in almost every aspect in terms of the use of artificial intelligence. While 42% of companies within the sample in the EU used some kind of AI technology, in Hungary, the proportion was 33%. The biggest lag was identified in the field of machine vision and process optimization. The situation is not primarily because of legal obstacles, data inaccessibility, or reputational fears (unlike in several larger EU Member States), but the lack of competent human resources (European Commission, 2020).

Interviewees' characteristics define them as elite members of the workforce: on average, their average annual gross income is more than double the national average, not including other

benefits. In senior positions, it can exceed three times the national average, thus ranking in the top decile for the Hungarian labour force (KSH, 2022; Hays, 2022). Typically, having completed higher education, and due to the shortage of IT workforce, the respondents' positions are better than those of their fellow Hungarians. On the other hand, they face limitations created by the position and role of Hungary within the global economy, especially in relation to global AI development. Furthermore, the semi-peripheral situation of the country restricts the range and number of jobs that are available to Hungarian professionals (Makó & Illésy, 2020). These tendencies make the field of AI development very competitive and privilege those individuals who obtain employment in this area.

While it was clear during the planning period of the research, that it will focus on the views of IT professionals, later a narrower description was needed to determine who will be considered AI specialists and therefore be invited to participate. This task proved to be difficult due to several circumstances. An AI specialist can be someone who is working with AI but since this term is used so broadly nowadays, it is almost impossible to distinguish anyone whose job isn't related to it in some way, therefore this definition would include numerous professionals who have the same level of understanding of AI as any layperson. Also, the name of the position one holds can be deceiving since some AI-related jobs aren't state explicitly the term "AI" nevertheless can be closely related to it. Educational background in itself is not sufficient in the case of IT and especially AI because of the unique nature of knowledge creation in this field. Unlike most professions, it is acceptable in IT not to have an official certificate or degree if someone can demonstrate their knowledge through practical examples and exercises. The age of the participant could affect how they were involved in AI development. Some of the experts might have a degree in a field that is loosely connected to AI but finished their studies at a time when either the term "AI" wasn't used so broadly or got involved in the development of it at a later stage of their career. Recent graduates or professionals in the early career stage might have a degree that indicates a strong connection to AI development but weren't able to find a job as AI developers or were involved in research activities but decided to leave due to financial reasons.

After considering these aspects three groups of experts had been created. Since participants were asked to decide which group they think they belong to there was the possibility to change or delete this grouping, but in the end, it wasn't necessary. The first group consists of people who are working as AI developers, even if the naming of their position doesn't state it explicitly. The second group was for participants whose educational background was AI-related but who currently hold other jobs and the third group involved people who gathered

significant knowledge of AI and are recognized as experts in the field but neither have AI-related education nor work as AI developers.

Three strategies had been used to reach potential participants. First, the snowball method was used within my personal network to reach developers and ask them to participate or refer someone whom they consider to be eligible. Secondly, I contacted the John von Neumann Computer Society and asked for their permission to post about my research in their newsletter, and finally, I reached out to AI developers on different social media outlets. Self-identification and referral of others who are considered to be specialists within a given community is a useful way to identify potential participants in case the researcher is not familiar with the field or when a very specific group of people are intended to be reached (Mauksch et al., 2020). The snowball method was the most successful even in the case of the newsletter posted by the John Neumann Computer Society. Even though no one responded to that post, AI developers who were involved through networking did write in private to members of the Society which initiated a chain of positive responses. The general response rate for the social network messages was low too, but those who decided to participate agreed to forward the description of the research within their network which resulted in additional developers willing to participate.

An unpredicted limitation of the fieldwork and data collection period was the announcement of lockdown due to the COVID-19 pandemic. While the original plan involved only in-person interviews, unfortunately, the opposite, only via internet interviews was soluble. The in-person interviews would have given an opportunity to draw a picture of the work environment and the broad milieu that surrounds participants, not to mention non-verbal communication. Although these nuances were lost, it is possible, that IT professionals would prefer online meetings anyways.

The role of the interviews was to give a general picture of how IT professionals specialized in AI imagine different scenarios of the future of work, their line of thought regarding the role of technology, and their own place and power to shape future societies. In order to achieve this goal, semi-structured interviews were conducted that give opportunity for the participants to move the conversation into directions that weren't originally recognized. The timeframe of both the interviews and the scenario-building workshop was the year 2050. This date is far enough to give room to scenarios or possible future outcomes of existing technology that wouldn't be seen as possible in the next ten years, but close enough to prevent far-fetched

science fiction scenarios or over-generic answers. Each interview consisted of four main modules. The first part consisted of questions about the future of work in general, without mentioning AI or robotics. The second part brought in the topic of AI, and its capability to change what will be called work in the future. The third part was dedicated to ethical issues regarding AI and its role in shaping the future of work. Participants were asked to talk about their visions of a best-case scenario and after they finished their description, the topic of equality and the situation of vulnerable groups was mentioned by the interviewer. The last and final part of the interview asked participants about their current role, how prestigious they think it is, what motivated them to choose this career path, and how they imagine the future of it.

4.3 Methodology of the scenario-building workshop

The lack of a well-established theoretical background in scenario building is its biggest weakness and strength at the same time. In the world of academia, a methodology that is used in research must have a well-established theoretical background in order to be taken seriously. Scenario building can be viewed as a strange choice from this point of view. As it was described in the methodological background of this research, scenario building was originally created to fulfill a special need to forecast the future during a period, when uncertainty was perceived as especially fearful, and preparedness was paramount. Early scenarios had been created in state-funded institutions but later the method found its way to the private sector, where uncertainty and preparedness were framed similarly and where the success of a given corporation was perceived just as important as the state's security and capability to defend itself from outer threats. Being used outside academia or other institutions run by people involved in academia, scenario-building became solely a method to achieve goals while theories that would embed it into a broader social context became irrelevant. Managers, stakeholders, and corporate decision-makers needed brief, easy-to-read reports without any additional information that wouldn't contribute to the creation of a successful business plan. Due to this looseness of theoretical connection, scenario-building can be creatively used in many research situations.

In the case of this research, life itself produced an example of how important it is to "think the unthinkable". Since the initial research plan was made before COVID-19, and originally it was designed to leave an excessive amount of time to conduct both the interviews and the scenario-building workshop, the new reality of lockdown made it necessary to change when

and how data collection will be done. Doing interviews online was easily implemented especially because the target group of IT professionals was not just familiar with this type of communication, but often preferred it to personal meetings. Another unforeseen advantage of online interviews was that it made it possible to conduct more interviews in a shorter period because participants working remotely found time for the interview easier since they didn't have to commute. Scenario-building on the contrary, is a methodology that is designed to be done in person, but at least its implementation online is not encouraged. The pandemic during which this scenario-building workshop took place posed another difficulty. Participants of the interviews had been asked to attend the workshop, but even though their workplaces were mainly situated in Budapest, and they were officially living there, the vast majority decided to leave the capital until the end of the lockdown or until their workplace demanded their personal presence at the office. Many of them expressed their concerns regarding any in-door event and even the risks of traveling via public transport back to Budapest.

The workshop took place on 10th August 2021 at the premises of one participant's workplace as part of the firm's end-of-Summer events. Participants had been recruited from this firm with the help of the HR department. Both the company and their employees attending the workshop decided to remain anonym, even though the executive summary about how employees see the role of the company in the future was used for interior communication about the event. Voice or video recording of the event wasn't permitted by the participants. Conducting the workshop under such conditions made it possible to finish the data collection period of the research before Autumn; an aspect that had high priority during a time of uncertainty regarding lockdowns. Also, it posed certain restrictions that limited what could have been achieved during the workshop. First, it had to fit one workday, with fixed breaks according to the department's daily routine. This meant, that the workshop had to be done in six hours, which limited the scope of the scenarios. Second, the format of the workshop had to be adjusted to the limitations of the environment in which it took place. While the company let us use one of their main meeting rooms, the arrangement of the desks and fixed-at-place technology elements didn't allow for a more cooperative, informal atmosphere to be formed. The group consisted of three male and one female member. All of the participants were engaged in teams developing AI for transportation, two of them worked in the same team and none of them were in entry-level positions.

The findings of the interviews were used to outline the basic structure of the scenario-building workshop. Although only the preliminary results were available, it was already possible to

make some assumptions. One result of the interviews was the lack of ethical considerations regarding the possible harmful consequences of several AI developments. The second aspect was the situation of the "losers" of the change, who will probably not be able to adjust to the new challenges. While interviewees acknowledged the existence of this group in the future, they mostly distanced themselves from this part of their visions. During the scenario-building workshop, I wanted to test the hypothesis, that in a group situation, participants mitigate their opinions that might not be accepted in the broader group or society, or they will express the same or similar opinions because the group consists of members from the same professional environment. Will the outcome be similar to what IT professionals said during the interviews or a group will create a more value-neutral scenario even for extremes as are the best- and worst cases?

While this methodology has a basic structure, that can be found in the limited literature about the actual steps of the workshop, it's flexible enough to allow the researcher to insert parts that are focal for them. After all the adjustments, the final structure of the workshop was as follows:

1, "The Thing from the Future" game

2, Discussion of dimensions/factors that participants consider most important

3, Creation of a general best-case scenario of the future of work by 2050.

4, Discussion of the role of RAI in the best-case scenario

Lunch break

5, Creation of a general worst-case scenario of the future of work by 2050

6, Discussion of the role of RAI in the worst-case scenario

The workshop started with a mini-game called "The Thing from the Future", created by Situation Lab. The goal of the game is to make team members create or invent an imaginary object from varied alternative futures that will be sent back to the present. The object must reflect this imagined future world's values or involve a message that can give a clue to people of the present time about how the future will look like. I decided to use this particular game for two reasons. Most importantly this game is only over if the group members reached a

consensus regarding their imagined subject that established the basic premise of the workshop, namely that each stage will be closed once they have a consensus. Also, the game was intended to show them, that what seems impossible to imagine or absurd at first, can be described in detail after a short brainstorm with the other team member. Participants showed honest confusion regarding the aim of this game. They shared the idea, that talking about and planning the future is important, but they couldn't see the relevance of imaginary objects and alternative futures that they didn't see as plausible. Talking and planning meant mainly numbers, statistics, and strategies without involving societal or interpersonal aspects of the future. It appeared, that while the version of the future in general that they saw as plausible was considered a reality that is merely not here yet, and therefore they perceived the labeling "imaginary" or "vision" as belittling, and derogative. They found the game difficult because due to its playful nature, they had to invent a candy that is banned by the authorities and therefore produced in secret and distributed through the black market. After the first wave of resistance, a pleasant conversation took place, during which the group discussed a wide variety of topics that otherwise wouldn't be involved in their mental map.

5 Results

5.1 Interview results

A total of 27 interviews had been conducted between March and July 2021. The average age of the respondents is 39 years, with a modus of 29 years. The youngest participant was 26 years old, and the oldest was 72. The overwhelming majority of the respondents were employed in the private sector (18 respondents), a quarter of them were working in the public sector, and only one of them was a freelance developer. Given the fact that most of the participants were recruited through the snowball method, the sample hasn't become representative in any way. This fact is clearly shown in the gender distribution of the participants, who were only three women in the sample.

No.	Gender	Age	Criterion
1	Female	29	Occupation
2	Male	31	Hobby
3	Male	26	Education
4	Male	35	Occupation
5	Male	44	Hobby
6	Male	28	Hobby
7	Male	60	Occupation
8	Male	72	Occupation
9	Male	34	Occupation
10	Male	49	Hobby
11	Male	32	Occupation
12	Male	38	Occupation
13	Male	27	Occupation
14	Male	36	Hobby
15	Male	29	Occupation
16	Male	61	Hobby
17	Male	35	Occupation
18	Male	29	Occupation
19	Male	44	Occupation
20	Female	30	Occupation
21	Male	63	Occupation
22	Male	35	Occupation
23	Male	36	Occupation
24	Male	42	Occupation
25	Male	42	Occupation
26	Male	45	Hobby
27	Female	50	Occupation

11. Table. Demographic data of the interview participants

In the next section, I will show the results of the interviews, grouped by the most prominent common themes that emerged during them. The listing of the themes follows the structure of the interview draft's structure.

5.1.1 The future of work in general by the year 2050

In the first part of the interviews, the focus was on the future of work in general by the year 2050. The initial question asked was very simple: How do you imagine the future of work by 2050? Most of the participants echoed the same responses that we can find in popular science books and on social media; they listed jobs related to transportation such as taxi and truck drivers, manual jobs in factories, and repetitive jobs in general, as targets of automation. Surprisingly, job losses in the future caused by technological advancement were strongly connected to automation through robotics and not AI. In the case of transportation, the rationale was that not only drivers are in danger, but anyone currently working in a warehouse because robots will be able to substitute humans on every step on the road of a product from the factory to the shelves of a consumer. Regarding AI, responses formulated by the participants were not just different from what can be found in the literature but even went against them. According to their opinion, automation and the implementation of AI will occur slowly and gradually, without any dramatic changes. The following three excerpts highlight typical answers to this question.

> In 2050…30 years from now, there is still a long way to go, but I don't expect revolutionary change. (Thomas)

> In 2050, artificial intelligence will only play an ancillary role and not be a protagonist. (Andrew)

> The machine depends on the person, and then the person depends on the machine, so there will be an endless circle. (Emett)

Even though participants generally acknowledged the coercive force of the market regarding the implementation of cost-saving technologies, they also mentioned the limited capability of currently available AI technologies to substitute the human labour force. They believed that AI and robotics have a long way to go before such technologies seriously threaten humans. They feel that there is currently hype about AI, whereby technological possibilities are overvalued, unreal, and exaggerated. They reasoned that the fact is not mentioned enough that while it is not that difficult to teach AI how to complete repetitive tasks with clear and well-defined rules

and parameters, there are significant limitations on AI with respect to situations in which one must improvise, adapt to new circumstances, or when tasks change rapidly.

> They are very enthusiastic about AI. Consulting firms, companies, and start-ups are really riding this wave, but there will be a setback at the end of the day, and it's a good question when this valley of disappointment will arrive. (Ethan)

Interviewees mentioned that AI is currently a buzzword, with companies claiming to 'do' AI even if what they are doing cannot be considered AI, and that the label is a popular means of raising financial support:

> They see an opportunity to make money by putting AI on everything, putting that label on their own business, and so applying for money. Well, 30 years have passed, and the world has not changed. (Calum)

AI specialists repeatedly blamed the current hype associated with AI for creating unreal expectations and fear about what AI will be able to do in the future.

> A lot of people don't know what they're talking about, and what's worse is that decision-makers think a lot can be managed by just snapping some artificial intelligence algorithm on it, and then that will solve the problem. (Peter)

According to the developers' accounts, the overuse of the term 'artificial intelligence' is also why change generated by AI and robotics will not be revolutionary. Lay people hear the term 'smart' and 'AI-driven' so often that, by now, the word AI is applied to all kinds of algorithms. One of the participants referred to AI as an example of pervasive computing, which is the process of embedding IT into everyday objects like the onboard computers in cars. After a time, the embeddedness of such technologies becomes so natural that users do not consider them separate technologies; for example, they consider a computer a natural, organic part of a car. The hype associated with AI and the commercial use of the term for a wide variety of products makes it invisible or normalizes its presence in our everyday lives, and once this happens, people do not consider artificial intelligence to be a cause of change.

The concept of AI as pervasive computing was also present in participants' visions when they talked about the future of work. What most interviewees mentioned is a future in which AI technology will assist a human labour force in decision-making and save time and effort, but humans will have the final word. AI, and robotics are pictured as integrated into the tools

we will use for work, not as a separate entity that will work 'against' us. Thus, the future is not expected from this perspective to be radically different from the present: humans remain in control of technology; technology assists humans.

The slower nature of technological development is thus seen to have less dramatic effects on society, as changes in jobs are also envisioned to occur slowly. They felt that the slow and gradual introduction of these technologies would allow enough time for workers to either avoid these positions or search for alternatives; thus, the number of people who lose their jobs to technology would be so small that it would not cause serious social upheaval.

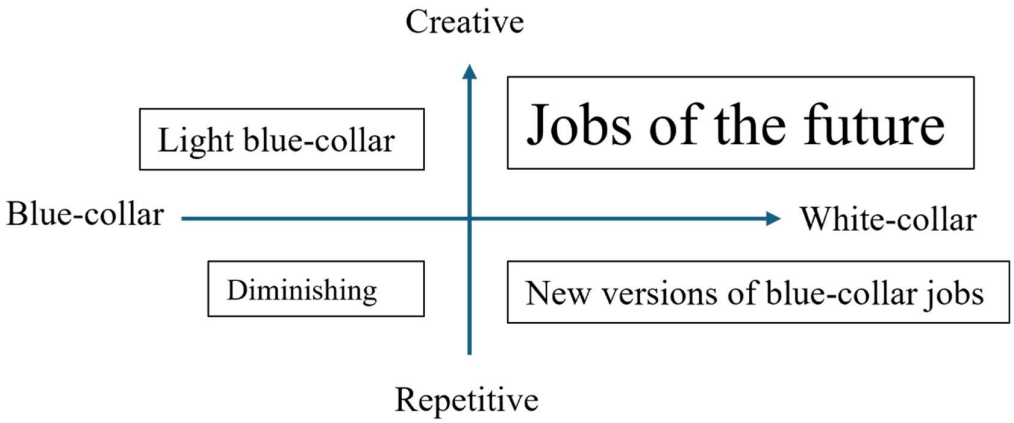
5.1.2 Techno-optimism

Most interviewees can be regarded as technophiles and shared mainly optimistic expectations about the effects of AI on the future of work and the situations societies will face due to technological development. This optimism was, on the one hand, supported by the previously mentioned idea that change will be slow and there will be enough time to adapt. On the other hand, there is the argument that change will not be as radical as eliminating the need for human control. The general idea was that AI would slowly become part of some professions, leading to improvements in the quality of work: humans will thus be enabled to work faster, more safely, and more accurately together with AI.

Participants' assessments of the impact on the quality of jobs are illustrated in Figure 1.

Respondents believed that the number of blue-collar, repetitive jobs would decline. In most of the accounts, these jobs were described as generally expendable because they do not nurture workers' creativity and are tedious and boring.

> Let's also not forget that, for example, when they use codes to complete jobs on the assembly line, in many cases, it is work that no one is happy to do. (Lawrence)



10. Figure. Job types associated with the year 2050 as identified by interviewees. 'Jobs of the future' were seen as the largest segment, as depicted by the larger box in the figure

Interestingly, blue-collar jobs that have the potential to be transformed into maintenance support for new, AI-driven robotics-based production activities were seen as more creative, challenging, and thus as the final sanctuary for those who will still be employed in a factory – in respect of the latter, it was mentioned that such jobs might not really be called blue-collar, but rather 'light blue,' or a mixture of white and blue.

The quadrant named 'New versions of blue-collar jobs' represents the other side of the coin. While light blue-collar jobs were perceived as better positions and represented a positive transition, the appraisal of new blue-collar jobs was not that clearly optimistic. Most participants expected to see more employees engaged in white-collar jobs, especially those that feed different learning algorithms with high-quality data that has to be cleaned and labeled by humans. Since such jobs can only be done by employees with at least basic computer knowledge, participants saw this potential transition as beneficial in general because they perceive that working conditions in offices are better than other options. However, they shared the opinion that such tasks are tedious and do not utilize human creativity. Therefore, these jobs were considered a better, new version of blue-collar jobs.

> … where you will have to type data, enter, select, approve data, contribute to something or order, manage, organize something (….) you still don't need a university degree to operate these electronics, but the plain Hungarian instructions are enough, everyone will have the instructions in their own language, practically any trained worker will be able to implement them. (John)

The vast majority of respondents shared the vision that most jobs will be what can be called ‘Jobs of the future’ – this refers to jobs done in an office environment by creative, technologically savvy employees who will be able to express themselves through their work. These jobs of the future will not only involve employees working in IT. Teachers, writers, and other creatives were mentioned too. The focal point of this quadrant is the employee’s relationship with technology, especially AI. The expectation of immersion in AI in everyday life was brought up here, too. Interviewees emphasized that AI could not substitute teachers at every level of education, but AI could and should help teachers by correcting tests and creating interactive study materials, for example.

A clear distinction was made between the present as a time when people have to do tedious and /or dangerous jobs, and the future, when AI and automation will have substituted humans with AI-driven robots. In this future, not only will creative and safe jobs dominate, but technology will liberate workers from unwanted, unpleasant jobs so they will finally have time for what they would like to do most.

> We will be able to do a lot more work that really interests us, that we can accomplish ourselves, that inspires us, with which we can do something good for the world that matters. We’re going to do less administrative work, that’s repetitive, that doesn’t require a lot of empathy, that’s not inspiring, and I think we’re going to get tremendous help from technology to do that work. (Ester)

The future depicted in this system is not optimistic in all regards, but in general, the expectations were that technology would improve the quality of work for the overwhelming majority of people. This optimistic take is also reflected in how the new good jobs of the future are seen as the most widespread type.

> I believe that with the development of artificial intelligence, the world will be infinitely better, so that's a very good direction, and that if it leads to discord, then it may be the job of super AI to sort out these relationships [issues]. (Kevin)

As mentioned before, one perspective on the future of work in the literature argues for the rise of unemployment within a short period of time (Boyd–Holton 2018). The reason is mainly argued to be the economic rationale: in the current economic system, the deployment of AI-driven smart robots is the rational choice. Algorithms and robots do not get sick, do not need

holidays, and owners can save on the cost of employing a human labour force. Interviewees expressed their agreement with this logic, but unlike the authors of the literature, they saw this process as engendering a positive change in the quality of the jobs that remain, thus perceiving the existence of a psychologically healthier labour force. Furthermore, respondents' replies indicate that AI will help humans eliminate jobs that the latter believe to be typically disliked or repetitive and uncreative. Here, participants usually had a positive image of jobs that help one achieve self-fulfilment, and they almost automatically classified jobs and professions that AI can easily handle as unwanted and devastating to the human psyche.

> Technology will not eliminate the jobs that people like, but those that can be solved with basically relatively little brain capacity. (Robert)

5.1.3 Best-case scenarios

As it was mentioned before, most of the contemporary literature, may be published in a peer-reviewed journal or popular science, mostly explores negative future outcomes of RAI, creating a demand for positive "utopias". I used the interviews to create the backbone of the scenario-building workshop. Therefore, a section was dedicated to positive future scenarios, where participants were asked to describe how they envision the best-case scenario of the future of work by the year 2050. Almost one-third of the participants admitted that they had never thought about this aspect of technological advancement before. Best-case scenarios did reflect partially what we can find in most of the utopias, with some extreme exceptions and with the common belief that creating positive futures is useless in the sense, that they are unlikely to become true. Participants shared elements of their best-case scenarios that we might call a general wish for common well-being. They all expressed their hope, that technology will help humanity to reach higher standards of life, longer life expectancy, higher educational levels, and more relaxed life in general. A common element of the best-case scenarios was the expectation of people gathering high levels of technological and especially IT skills, the ability to adapt to potential career changes, and an open mindset towards life-long learning. In accordance with their views, educational systems played a central role in their visions with highly skilled and equipped teaching professionals and eager-to-learn students. Participants were asked whose responsibility would be to help society to reach such a positive future. Most of the replies named teachers and the education system but not politicians or high-level decision-makers. Participants viewed the well-known scenario of robots taking our jobs as a positive outcome. The fewer humans have to work, and the more jobs involve creative, diverse

tasks, the better.

"In the best-case scenario, it should be that everyone develops in some way, someone may have better communication, someone may be more skilful at laying the table, but there must be some kind of development, otherwise we will just stand still." (Leo)

Members of society who will not have to work or whose job will be taken by robots or AI was mentioned in almost every vision but in mixed content. The fact that a majority of people will be without jobs and that this is a positive outcome that we should aspire for wasn't challenged by the participants, but the situation of the unemployed or workless population in this future society was controversial. Some of the participants mentioned universal basic income as a solution, although it was never viewed as the obvious solution. Participants who mentioned it often articulated the opinion that while some kind of basic income can solve the problem of poverty caused by unemployment, it raises the problem of inequalities derived from the fact that those who will keep on working or at least have the opportunity to work due to their special skills and knowledge will have the opportunity to accumulate wealth at the expense of others. In general, basic income wasn't mentioned widely in the best-case scenarios. Participants made notes on potential losers of their visions and almost always had the opinion that they didn't know what the solution should be, but a society living in their imagined scenario would at least actively look for it. This was interesting because, until this point in the interviews, they mostly argued that nothing would really change and showed only little interest in the future of members of our society who will potentially lose their jobs.

Participants were asked about their views on jobs that humans should delegate to AI and robots, as part of their best-case scenario. A typical reaction was to jokingly say "Every job should be done by AI". While participants intended this answer not to be considered seriously, they used the same reasoning in the subsequent reasoning. The definite statement that AI should do every job was ridiculed, but later on, they acknowledged their difficulty in thinking about jobs that humanity shouldn't pass on to AI in an optimal future. Other than the usual list of dangerous or health-damaging jobs or jobs in transportation were typical white-collar office jobs like administration, customer service, or accountant. Two professions were mentioned repeatedly by the majority of respondents that were missing from their discussions until this point: judges and surgeons. The rationale behind the entire court system debate was that since AI is value-free and since it works with statistics, that was also seen value-free, deploying AI as at least the first station of jurisdiction would eliminate bias made by humans and, therefore, significantly

lower injustice. Interviewees emphasized that the final decision should remain in the hands of a human, but AI should handle every other aspect of the job in the name of impartiality. The usage of AI in healthcare was mentioned as an easy solution for the shortage of medical professionals. In line with their previously stated vision that technology will help or enhance the human labor force, they perceived image recognition AI applications as a perfect example of a future scenario in which technology will substitute the missing labor force while helping doctors reach their prognosis faster. Again, participants agreed that humans would have the final word, but a minority of them would rather have their surgery done by a robot than by a human.

While most of the scenarios were built up in a similar style, the youngest and the oldest participants created two very different extreme best-case scenarios. The youngest participant described extensively a future without any human control, governed by a super AI that has the authority to control markets, armed forces, the law, and every aspect of human life. Its sole purpose would be to maximize efficiency and order.

(…) because it is much smarter than us and much better than us, that is why it never occurs to anyone that this is such an oppressive force, but it manages things in such a way that everyone gets the best possible and that is why everyone has the image that it's good that this super AI came along, because otherwise we would continue to pollute this Earth here, we would send all kinds of pollution into space, the ice caps would melt, and there would be all kinds of wars and how bad that would be. In return, there are one or two rules that are very easy to follow, and then it's really good for everyone, something like that. (Harvey)

The other extreme scenario was created by the oldest participant, whose imagined future was one in which technology lost its appeal and importance. Coming from someone who had spent all his professional life developing AI and expert systems, this scenario could be considered extreme. This case is outstanding not just because of the lack of the importance of technological advancement but because the participant who created it was the only person actively questioning the validity of a best-case scenario for any aspect of the future. While many participants expressed their surprise and acknowledged that positive future scenarios are not a topic they usually think about when discussing potential future outcomes of AI, such strong emotional resistance didn’t characterize any other participant.

5.1.4 A Dearth of Ethical Issues and Social Problems in Visions: The Winner Takes All

References to ethical considerations such as justice, fairness, and responsibility, which are popular principles in AI ethics guidelines globally, were basically lacking in the responses of the interviewees, as well as any solidarity with and sensitivity to vulnerable groups, unlike in some of the academic literature which considers these factors critical ethical issues (Jobin et al., 2019).

Even for the losers of the changes – which group was held to be small – solidarity was not expressed. On the contrary, if unemployment was mentioned, it was seen mainly as a necessary inconvenience on the road to a better future for most members of society. Only in one interview was it stated that it would be the responsibility of the wealthy and better educated to help those who are losers of the changes.

In the second part of the interview, questions were directly asked about potential social tensions or resistance to AI development without giving any direct examples. Respondents were typically technophiles in accordance with their generally optimistic opinions about technology and AI. The majority of respondents saw social resistance as the consequence of insufficient knowledge about technology and a lack of trust in it. AI development was often compared to the early years of electricity – a time when what is presently considered a fundamentally important technology often used to be unreliable and even dangerous, or to the development of elevators, which first needed employees to operate them – even though the technology was still considered very valuable.

> It is enough to think back to the beginning of the last century when electricity came in – people dreaded it and deliberately smashed electricity poles and light bulbs because they did not know enough about the technology and were afraid of it, and it was not so sophisticated – there might have been a lot of electric shocks at the time. (Michael)

Another obstacle the specialist thought could seriously restrain AI innovation was legal regulation, which was another sign of society's low level of trust. These restrictions were viewed negatively.

Technology was pictured as a promising but passive entity with the potential to make our world better, but which, in some cases, could be misused by greedy politicians and economic leaders. However, its positive future uses were far more strongly emphasized. Technology in itself was regarded as value-free, as a mere instrument. If moral issues arose, these were connected to how people use it, not to the idea that technology can reflect specific

values.

It was evident during the interviews that questions about the social effects of their work or the social impact of technological development were not at the forefront of the interviewees' minds. Surprisingly, it seemed that these topics were something that most of them thought of only rarely, and they were surprised about the topic of the interviews and why sociologists would want to do research related to AI. Furthermore, participants often mentioned that they had not really thought before about the effect of AI on society, and because of this, they felt the need to prepare for the interviews.

Respondents had similar opinions about their roles as they had about AI and technology. There was almost unanimous agreement about the idea of the developer as a tool without any real capacity to shape the direction of innovation or to influence the misuse of technology. As the following quotation shows, some respondents reacted defensively to the questioning and tried to deny any responsibility:

> Now I'm sorry, the Swiss knife maker doesn't care what his knife is used for, even whether it's used for killing, to some degree. Engineers who develop such facial recognition algorithms are not responsible for where they will be used and if they will discriminate. I think a lot of engineers see this [type of work] as a challenge – to see if they can build it, and if they can, [the job is] done. (Jack)

Instead of focusing on the social effects of their action, the respondents focused on how their work can advance their careers and technology and whether they are doing something 'new.' Inventing something or creating something new was seen as valuable in itself. However, many participants looked at themselves as explorers and looked at AI as an artefact only, ignoring its potentially negative effects, as if the technology existed in a closed system created for the pure purpose of scientific advancement, not as something that has the potential to both create and destroy. Others were less enthusiastic about inventing new things in the field, but their high salary was a big incentive for their work.

Interviewees often regarded themselves as belonging to a deserving elite group: working on AI was regarded as a challenge that only a few could manage. Moreover, they felt that AI was a difficult subject to study and research – one must be employed by one of the few corporations at which AI is developed in Hungary, and then they have the chance to build something new that no one else has built before.

One ethical concern that did come up involved how data gathered by AI is handled and what

negative consequences can arise from this, but even in this case, participants never questioned the raison d'étre of such technologies. They did not trust corporations or politicians to use AI for good purposes but did not express much concern about this.

> The state simply takes data away with a word and there is no consideration of how [data should be] private and how it is going to affect people. Since there is a demand from industry, the state serves it in one way or another, so of course, there are interesting entanglements and corruption and the state passes laws that allow various companies to access it [data]. Money talks, money is the master. (Frank)

An interesting finding was their attitude towards more recognized social issues that have been discussed in the media. Examples of the misuse of face recognition software by the police or of the use of databases for HR purposes were mentioned, but not due to ethical concerns. Instead, these were seen as good examples of how human-generated but low-quality big data can attract negative press related to otherwise promising technology.

Questions and topics connected to ethical considerations were intentionally left to the end of the interview to see if the participants would mention them in earlier parts of the conversation. Even though it became obvious that this was not the case, a change in respondents' attitudes could be observed by the end of the interviews. Participants started to talk about the need to bring a more philosophical way of thinking to their workplaces and expressed a longing for their university years when they had the opportunity to talk about such issues. This implies that although the ethical or social outcomes of the products they are working on are not on the agenda at most companies, respondents would be open to having these discussions.

Six interviewees mentioned the idea of universal basic income (UBI) as a preferable solution to mitigate the destructive effects of technological unemployment. Only one of them read about it in more detail, while the others knew the term, but their knowledge about the variations and the probable ways of implementation was fragmented.

	Gender	Age	Criterium	Workplace
1	Male	35	Work	Private sector
2	Male	72	Work	Private sector
3	Male	32	Work	Private sector
4	Male	29	Work	Private sector
5	Male	35	Work	Private sector
6	Male	35	Work	Private sector

12. Table. Data of participants mentioning UBI

As can be seen in the table, all six participants were male, working in the private sector. Apart from one participant in his seventies, they are in their late twenties or mid-thirties. The column titled Criterium refers to the attribute on which they were selected. Work means that they've worked in AI-related positions at the time the interview was conducted. It is important to note, that there wasn't any direct question or mentioning any version of basic income during the interview. These six participants themselves brought this topic up at different parts of the interview. The first person on the list was the most knowledgeable on the topic, bringing it up at the very beginning of the interview when he was asked to talk about his general expectations about the future of work by 2050. He connected the idea of moving from a system based on consumption generated by salaries of people engaged in formal work to a system in which technology provides services like the utilities that we use for free. The wider the application of technology that creates wealth, the more invisible it gets because of its familiarity, the further humanity can move from our current perception of the value of paid work. To create a future with more leisure time, we have to build these advanced technologies. Universal basic income would cover the basic needs of humans and help those who would have narrower possibilities in the future's labor market by redistributing the wealth created by machines and technology.

Two of the participants shared the sentiment that although the introduction of basic income will be inevitable in the future to avoid social upheaval caused by the growing number of impoverished unemployed, examples from history show that whenever there was a leap in technology used in production, only a very limited group of people were able to benefit from it while exploiting others who would either live on the same standard that they used to before or become even poorer. Overpopulation of certain parts of the Earth was mentioned as part of

the basic income debate. Since technology will substitute humans because of its superior capability of efficiency if the population of those who will not be able to get sufficient education and gain expertise keeps growing, the amount of money given as basic income will cover less and less of our needs. In this case basic income doesn't solve the problem only prolongs its culmination.

In two cases, basic incomes were mentioned as a means to avoid the accumulation of social unrest to violence. Interviewees articulating this opinion differed from the rest of the interviewees only in the sense that they put a label to the expectation that the state should do something to keep everyone content, at least so order and peace would remain stable. As we can see from the following extract, basic income was described as a tool that would eliminate social tensions by tending to basic human needs.

(Someone) who is not motivated to want to study further and do something else on top of this basic income, but their livelihood is guaranteed, then perhaps it will not create social opposition that someone else has studied and thus earns more money. (Participant)

The last participant mentioning basic income also had a unique take on the role of that differed from the rest. As was mentioned before, the most frequently repeated statement was that people have to work. The reasons might differ, but research participants universally hold the belief that without paid work societies can't stay stable. Nevertheless, when the discussion is broadened and work is embedded into the context of technological advancement, participants accept and anticipate the rising numbers of unemployment as a natural consequence of improvement. At this point work is no longer the essential need of humankind but merely an activity that some of us would leave behind without hesitation if society finds a way of wealth redistribution that covers the basic needs. Five out of the six interviewees who mentioned basic income suggested that there will be some for whom working will not be an available option at all, while those who can stay in the labor market must have high education, high level of expertise, and the willingness to earn more than the amount of basic income. The last participant in this group was the only one who imagined another path that would still involve basic income but for other reasons. According to his account, technology will enable us to work only 3-4 workdays a week and repetitive, monotonous "distraction" jobs will be eliminated. Basic income then would be used literally as a basic, on which people can build other ways of money-making. Part-time jobs, seasonal work can be better integrated into our working schedules that would help us to adjust work to our lives and not the other way

around.

5.2 Results of the scenario-building workshop

After a short icebreaker, participants started to build up the pillars of the scenarios by deciding which aspects of the future will be considered in their debate and why. After that, the first and most important task was to define what will be considered work in their imagined future by 2050. All of the participants had a strong conviction, that having a job is the most important part of a healthy individual. Whether it is compensated somehow or done out of charity or compassion was a question but work in itself was considered to be the core of one's personality. Interestingly, there was a heated debate regarding the question of compensation. Half of the group had the opinion, that the concept of work should involve every activity that is done out of duty or that is not connected or limited to personal interest or pleasure. The yoga instructor who must give lessons in order to make a living is working even if otherwise it is a pleasurable job to do. Once this person doesn't depend on financial compensation but is still obliged to show up because others want to learn from them, it is still a job if one can't say no without risking negative consequences. Another half of the group perceived activities done for financial compensation only as work. If there will be a future in which humans don't have to work for money, because robots will work in almost every position, then entire societies can be called unemployed or idler. This led them to the question of universal basic income, which was seen as a parallel with communism and unanimously rejected as a possibility in the best-case scenario. After their debate, the group decided to only consider paid jobs as working in both of their scenarios.

5.2.1 The best-case scenario: Slow world

Starting with the best-case scenario was intentional. Since negative futures are easier to find among popular science products and therefore it is safe to say that most people will be more familiar with this side of the future, this research wanted to focus on the positive aspect of this debate. Due to this lack of widely published positive futures, it was assumed that creating the best-case scenario will take more time than depicting a negative one.

The first part of the best-case scenario was the vision of the future of work by 2050 in general, without focusing on specific technologies. Participants found this part easy to create, there weren't any conflicts regarding the contexts of this scenario, and the consensual result was reached swiftly. The title of this scenario was Slow Life. The group shared the opinion, that

2050 is not far enough in the future for them to expect any radical change in how humans work. They continuously confirmed each other in their reasoning by listing existing research or innovations that have the potential to fulfill what they imagined in the future to come. When this train of thought was questioned, they explained, that from their professional point of view, they wouldn't imagine it possible that technology can appear and take momentum at such a rapid pace that even experts in the field haven't heard of it yet. According to them, only existing technologies can be expected to evolve or become widely used and therefore causing a change in how society organizes work.

The creation of the scenario was heavily influenced by their lived experiences of how the world of work changed due to COVID. Some elements of it were mentioned as beneficial and even eye-opening. They agreed that the lockdown proved, how even existing technologies can transform our everyday life and help us to keep safe in such a situation as a pandemic. Remote work and online video calls were mentioned as positive outcomes for everyone in those turbulent times, and that should continue even after the troubles are over. In line with this opinion, the group decided, that in the future remote work will remain an option in many jobs. This brought in two other topics, that weren't discussed this broadly in the interviews: environmental issues and the situation of disabled people in the labor market. According to the group, remote working can enable firms to recruit from anywhere in the world, but it is especially easy within the country's borders since the size of the country doesn't pose technical considerations like working in another time zone. Having employees scattered around the country means, that Budapest will lose its leading position regarding the number of people employed there and the quality of jobs these employees have, which was seen as a more egalitarian form of wealth distribution. The group argued that having well-paid, potentially highly-educated employees living in other cities than the capital will bring higher levels of disposable income to these places. More importantly, they emphasized the positive environmental consequences of less commuting by cars, and less traveling for business reasons in general. The issue of disabled persons was brought up by one of the group members and was welcomed as an important aspect of a positive future. The group had the assumption, that in a best-case scenario majority of the jobs will be white-collar, office jobs, therefore it can be done either in an office or remotely. They also had the expectation, that in the future created by them, AI and robotics will take over most of the traditional blue-collar jobs, and even some white-collar ones but this transition won't cause social tensions, because the same technology will create new job positions that will mitigate the consequences. In

respect with disabilities, the group saw the expansion of remote working as the core of the solutions to most of the problems. Partly, because they assumed, that people with disabilities are living in an environment that is suitable to their needs, therefore by enabling them not to leave their residence we can ensure comfortable working conditions for them. Also, the imagined innovation of existing technologies such as tools for online meetings and remote control over objects were expected to augment these persons in order to be able to work as if they were able-bodied.

Education was a focal point of the best-case scenario. There was again, unanimous agreement in the statement, that schools would play a central role in the best-case scenario with multiple roles for all citizens of the future. In this vision, schools would teach only a fragment of what is currently expected of them, while taking up new subjects, most of which will facilitate students' success in the labor market as employees who can change their careers easily in accordance with economic demands. Not surprisingly, the group found it important to include IT skills and knowledge into the curriculum, as the minimum requirement of anyone who wants to excel in the future. Schools of the future also should focus on emotional needs and skills related to emotional maturity, not just practical skills and academic knowledge. The group also found it important, that a shorter workweek will mean less time spent in school and more time with the family. Group members perceived the expansion of education into adult life as a natural outcome of a shorter workweek. From their point of view, the majority of the adult population will choose to spend the extra free time by engaging in short educational programs. The group saw this behavior partially as an enjoyable way of passing time but also as the responsible action of a citizen who wants to comply with the demands of the economy.

The political sphere was the last on their list of aspects that will have a significant influence on the future. Participants expressed their discomfort towards discussing this part of the scenario because they had controversial feelings regarding what can be done, what should be done, and what actually will happen. Participants agreed on the opinion, that in the best-case scenario, politicians will realize early on the importance of creating the necessary legal background that helps the reform of education and adjusts labor laws to simplify the deployment of RAI. Without this, real change can't happen, therefore the political aspect of their vision had the utmost importance. On the other hand, they saw this aspect as irrelevant, since once the legal boundaries are removed, this aspect has no role in the shaping of the future at all. Education and economic practices were identified as the two tiers of progress, while politics were seen as a territory that can cause delays and therefore be part of the

problem or can play a supporting role and step back once completed its law-creating duties.

After the group considered the best-case scenario to be finished, they were asked to discuss how they imagine life, in general, would be in this world. This was the part of the workshop when they gave a title of the scenario just as if it would be a story that they have to tell. The group decided to call it “Slow World”, which meant to symbolize calmness. Participants viewed the present as stressful, with strong pressure to overachieve in both our professional and personal lives, therefore in a positive future humans will use technology to help them reach a more balanced and relaxed state of being. Prioritizing the personal sphere of life was considered important and beneficial on a societal level. Spending less time at the workplace and in institutionalized education was perceived as pivotal from this point of view as family was seen as the primary source and place of a supportive environment in which people can thrive. When asked about the situation of the less fortunate, they repeated their opinion, that since change won’t be rapid and dramatic, the structure of society won’t change dramatically either. Better education and shorter workweeks will provide a higher quality of life for everyone, which coupled with an unchanged level of unemployment means, that there aren’t real losers in this scenario.

The discussion of the general outlines of the best-case scenario was followed by how RAI technology will help the creation of this imagined future and what role will it play in it. Just as in the previous case, participants had to talk about this part in the way one would talk about a story. The group described a society in which everyone has a clear understanding of AI and its capabilities, therefore there are no unrealistic expectations and fear of it. In the story they created, AI is an already well-established and reliable technology, where incidents due to malfunction or low-quality data are just stories of the past. It was challenging for the group not to see RAI as a tool that will be used everywhere for everything. The baseline of their logic was, that AI is such a versatile technology that humanity can shape it into any form. Participants emphasized the potential behind calculating capacity and were convinced that the modelling of neuron systems will create a new kind of intelligence that can be better used for planning and problem-solving. There were two outstanding statements regarding the future role of AI and robotics, both of which are rather the lack of these technologies in certain fields of our lives. First was the role of RAI in The Nature of Jobs aspect. Originally this aspect was meant to describe the importance of the openness and fluidity of a future labor market since people will be equipped with general knowledge regarding IT skills, and the willingness of employees to change their jobs according to economic demand. One would make the

assumption, that this can only be if the majority of the jobs need the same set of skills, which should be the result of the generalizing effect of a given technology that will be widely used in the future. Surprisingly, the group didn't see this correlation, nor did they see AI as the starting point. According to their reasoning, robotics will step into the place of humans in industries that involve dangerous or health-damaging jobs, and thus nudge people toward white-collar, office jobs; a transition supported and fuelled by education too. The second outstanding statement was, that AI will help decision-makers and especially politicians to make better, "professionally based" decisions. As it was mentioned before, participants saw the role of politics, as a system influential, but politicians as humans insignificant. This opinion was strengthened here by stating, that only in the best-case scenario, only in the future, and only with the help of AI will politicians make professional decisions.

Best-case scenario summary

1	Working hours	3-4 days a week
2	Labor force/ Demographics	Local experts; demand is met with supply; disabled people can utilize technology to have decent-paying jobs
3	Nature of jobs	Different jobs are easily passable
4	Jobs	It's easy to find pleasurable jobs that fulfill us and provides sufficient income.
5	Place of work	Work can be done closer to place of residence due to remote working.
6	Occupational Health	There are only a few jobs involving health-damaging consequences
7	Education / Training	There are no language barriers, practical skills are developed, and financial and IT knowledge and emotional intelligence are important. Less time is spent in educational institutions, conflict management is in the curriculum.
8	Politics	Politicians agree on the paramount nature of the above-mentioned and support it by legal means

13. Table. Summary of the Best-Case Scenario

Best-case scenario-AI specific

1	Working Hours	Automation, deployment of robots
2	Labor force/Demographics	Translation apps, remote control jobs, better planning capacities due to forecasts, partial substitution of missing skills of the labor force
3	Nature of jobs	None
4	Jobs	AI will do health-damaging jobs, making recommendations for job searching
5	Place of work	AI-related "labeling" jobs can be done remotely
6	Occupational Health	RAI development will decrease the number of working hours
7	Education/Training	Software and apps helping educators
8	Politics	AI helps to create a professionally based regulation

14. Table. Summary of the Best-Case Scenario-AI specific

5.2.2 The worst-case scenario: War

The creation of the worst-case scenario took place in the afternoon. On the contrary to the best-case scenario, the group found it difficult to think about the worst scenario that they can imagine. One participant made the recommendation, to build this scenario around a "no-innovation" logic, where the negative aspect of the future is, that nothing happens in innovation for a prolonged time, but the other group members decided against it although the theme of "no-innovation" remained central in their way of thinking. Group members reason of declining this idea was, that they couldn't imagine any reasons behind a "no innovation" scenario. The difficulty of the first steps aroused from the fact, that none of the group members wanted to speak up. Whilst during the best-case scenario, ideas were openly discussed, and debates formulated around them, speaking about the worst outcome of a future that involves the technology that they committed themselves to innovate, and research proved to be challenging for them. After several minutes of silence, one of the group members came up with the idea of the scheme of war, as something that is generally believed to be terrifying and therefore must be avoided, and also can explain a future where technological innovation is hold back or concentrated to a narrow field. Once this general environment was accepted, group members started to outline a vision that was centered around politics and the armed forces. According to their vision, the ruling political power will be able to force people to

move around the country and change their occupation if needed. In the worst-case scenario not only free will and human rights will be violated by the state, but even creativity and the arts will be taken away from humans and AI-generated avatars will be used to present propaganda messages. In general, they perceived politicians as the protagonists of the worst-case future. They were to be blamed for the outbreak of the war and for the use of technology to manipulate the public. It was also a given for them, that politicians will keep information regarding the actual situation to their civilians a secret and that they will use AI to control them. They kept several elements of the best-case scenario and put them in a different perspective. Things like remote working or teaching remained an important aspect of how we will work in the future but in this case, its purpose is to keep citizens scattered around the country to minimalize the number of potential civilian casualties. Education lost its importance in this scenario and got reduced to training soldiers with a minimum of academic knowledge that will be taught remotely. The calculating and planning capability of AI was the cornerstone of better, more just political decision making in the best-case scenario with a clear positive effect on society, while in this case the same technology was described with mixed connotation. AI will help the country to defend itself and the government to plan economic outputs to ensure stability but it also will help the surveillance and control of citizens. When they had to create a short storyline about life in general under such circumstances, they hesitated again to articulate their thoughts. They started to talk about typical war-movie cliches with cutting-edge weapons but soon doubted whether the Hungarian army would have such equipment. Interestingly, they didn't focus on science fiction movies but mentioned ones about actual wars alongside stories about how their relatives survived World War II. The only element that referred to the future was the novelty of the weapons to be used but their projection about how a society will behave and what decisions will have to be made were solely based on projections of past events taught or told to them. In general, life will be monotonous and full of fear in this version of the future, with little hope for personal growth, fulfillment, or happiness. After creating the general outlines of the worst-case scenario, they were asked to talk about the role of AI in this version of the future. Group members seemed visibly relieved that they can move on to the next topic therefore the final part of the workshop was filled with conversations again, even though the emotional tension was palpable. According to their opinion, at the core of this negative future there are two parallel phenomena regarding AI: the first one is how humanity will use it and the second is the inevitable lack of innovation due to the nature of economics in a war-ridden country. In their vision, group members assumed, that humanity will use AI as it is by the time war breaks out,

because innovation for civilian use will be halted and because they believe that existing AI technology is already effective enough to be deployed in combat. It was interesting to see, that while thinking about the big picture was difficult and uncomfortable for them, picturing how AI will be utilized against other humans and even civilians of the heartland didn't cause such a problem. As it can be seen in the table below about their AI specific worst-case scenario, group members shared the opinion, that AI in itself will not be the cause of the situation but rather some kind of a victim of the circumstances. During their depiction of how "those in power" will order AI developers and other IT professionals to work for the state, they constantly referred to this group as people who are being forced to obey, and to act against their conscience. To knowingly and willfully participate in developing AI to kill or to alter existing technology to be used as a harmful device was something that they could only imagine being done under threat. AI was mentioned not as a simple tool that can be used for both good or evil purposes, but as an entity with some level of consciousness and agency. They pictured AI as something that will be told to do something that otherwise it wouldn't intend to do as if it would be acting like some kind of a soldier who has to follow orders. While they acknowledged the capability of AI driven autonomous weapons to destroy combat targets and to kill other humans, they also emphasized the positive side of this technology since it keeps humans from the battlefield and therefore was seen again, as a soldier that fights for us, instead of us.

Worst-case scenario summary

1	Working Hour	People must work extra hours
2	Labor Force/Demographics	High unemployment rate
3	Nature of Jobs	AI developers are forced to work for the army, others are enlisted as soldiers
4	Jobs	Less creative, arts are relegated, citizens often don't have a choice of work but told what to do.
5	Place of work	Remote working is pivotal, the forced movement of labor is allowed
6	Occupational Health	Health condition of workers isn't a priority, jobs can involve more danger
7	Education/Training	The primary goal of education is to train soldiers, general education is not important
8	Politics	Winning the war makes every other social issue unimportant, everything is subordinated to war efforts.

15. Table. Summary of the Worst-Case Scenario

Worst-case scenario: AI specific

1	Working Hour	None
2	Labor Force / Demographics	None
3	Nature of Jobs	None
4	Jobs	AI related jobs are dominant
5	Place of Work	Remote when possible
6	Occupational Health	AI controlled autonomous weapons are keeping humans away from the battlefield
7	Education/Training	AI technologies are used to improve homeschooling and training of jobs that will be done remotely
8	Politics	Making predictions and building models for planning

16. Table. Summary of the Worst-Case Scenario-AI Specific

5.3 Comparison of the results

5.3.1 The perception of work: drudgery or self-expression?

Participants of both the interviews and the scenario-building workshop shared the idea that, at present, working is mostly drudgery for most of humanity. In each case, participants took this opinion as a baseline and transformed it into self-expression in the best-case scenario or imagined it even more repetitive or forced in the worst-case scenario. Work was seen as essential to maintaining a healthy society, but its unpleasant or dangerous nature made it drudgery. AI specialists of both the interviews and the workshop mirrored in their thinking the logic of utopias created before the industrial revolution, namely, that an activity that is done out of necessity is drudgery, while the same activity done in one's free time is pleasure, therefore the goal in an ideal future is to create an environment in which people will still work, but it will feel as if it was their hobby (Fourier, 1971; More,2018; Etzler, 1836; Keynes, 1930). Research findings represent similar evolutionary logic used by Bell (Bell, 1999) with the assumption that non-white-collar jobs are generally not pleasant or are dangerous; therefore, the elimination of these jobs by technology will improve the overall well-being of society. Participants also shared the opinion that professionals who are presently working towards the creation of these technologies are helping this society to step up to the next level.

AI specialists in both interviews and the workshop team shared the opinion that having a job is essential for everyone. Therefore, the idea of an entirely workless future wasn't considered in either of the scenarios. In contrast to past visions of the future, where the goal was to work individually as little as possible by involving everyone in every kind of work, interviewees most commonly imagined a future where technology would eliminate certain kinds of jobs that they perceived as tedious or dangerous, and that will create a class of citizens who won't be able to work and therefore will be in need of some financial help from society. In their accounts, this procedure will be slow and gradual, leaving time for those affected to adjust. The possibility of involving those who will lose their jobs due to technological innovation in other types of occupations didn't occur precisely because interviewees saw the obstructive power of insufficient technological knowledge on the labor market. Interestingly, those six interviewees advocating some basic income imagined a best-case scenario in which humans are freed from the pressure of paid work, and basic income is used to narrow the wealth differences in society. The perception of work was different in these cases, too. Work was seen as an activity that was done for society, not for the self. In the future, where technology makes it possible for the economy not to depend on human labor power in most industries, humans will still have the choice to get educated and be involved in jobs that will still need human expertise, but they will make this decision based on their needs and aspirations. Those experts who mentioned that the transformation to a more automated economy could cause social tension often believed that due to the slow nature of this change, the number of this group would be so small that it wouldn't cause serious problems. Another point of view was acknowledging the possible problems without thinking about how they should be solved. Most participants hold politicians and governments responsible for thinking ahead about labor market dynamics and ensuring a sufficiently long transition period for society to adjust and find solutions for those who will lose their jobs. In this context, the word "basic income" didn't appear, but they expected the government to implement some long-term financial help.

As described before, during the scenario-building workshop, team members decided only to include work done for compensation in their imagined futures. While interview participants didn't articulate a sharp negative opinion about those who will not work in the future, workshop attendees clearly viewed unpaid work as unimportant and wouldn't imagine a future in which it has a place. Their point of view is interesting because it evidently goes against the idea of a future where no one has to work out of economic pressure, and it takes the ideology of work as self-worth to the extreme. Universal basic income or some variant of

basic income was often mentioned but rarely supported as a solution for those who won't be able to adjust to the new reality of a future labor market. This shows that the idea is not unknown to the participants, but they have controversial ideas about it. At the beginning of their debate about the definition of work, half of the group supported a workless future vision since they perceived paid work as forced by economic necessities that, therefore, couldn't be enjoyed. In their proposed vision, those very limited numbers of humans who must continue to work were seen as servants of society. At the same time, the vast majority of the population could lead a happy, work-free lifestyle. This reasoning was rejected by the end of their conversations based on ethical grounds. The group concluded that while work can feel like drudgery, it is mainly because of its low quality and high quantity. The group decided that work, as an organized activity that engages most of the adult population, was essential to maintaining a society since it provides a framework for daily life. As can be seen, their logic and the opposing reasons used in the debate of how to define work, what place it has in society, and the individual's life contains pieces of ideas from a broad spectrum of thinkers throughout history. However, at the end of their debate, the idea of work done out of necessity as drudgery and the vision of a workless ideal future was rejected.

One of the focal points of consideration, whether work is drudgery or not for both the interview and workshop participants, was the role of work in different levels of our lives. Financial aspects were also commonly mentioned, but the narrative of the central role of work in identity shaping was also recurring. Participants took the classical statement of the role of work as a signifier for the individual's place and status in society (Marx, 2013; Ransome, 1999; Gini, 1998) for granted. Because of this belief in work and occupation as the primary indicators of status and social embeddedness, participants often mentioned a workless future as a threat to a peaceful society. Their images of people not being involved in paid work were equated with idle and, therefore, morally deprived masses. The goal of a basic income or any financial support for these people was to keep them content to avoid social upheavals.

Research participants didn't directly connect the value of work to the value of the goods and services they can consume from their salaries. Yet, the potential of losing one's job and, because of this, losing the opportunity to gain higher income than others in a workless future was dismissed. While they generally accepted the possibility of a shorter work week, they couldn't imagine a positive future in which humans would rather expand their options for recreation than use the extra time to gain additional income. As one interview participant reasoned against a workless future:

"There will always be people who, given a choice to make more money or, say, have a day off, would probably choose the money." Participant X

"I think that it is the essence of a human being to work, she will not want to put it down, we will work differently, we will have different things, but in the same way, it will be an integral part of our lives." Participant Y

As it was shown before, research participants generally shared the idea that a workless future would be detrimental to society. Most of the narratives focused on the positive effects of working or how technology can make it more pleasurable. There was a sharp contrast between the interview participants and the scenario-building workshop group's perceptions of those who will be replaced by technology. Interviewees emphasized the slow nature of technological change and were optimistic about their expectations that society would have time to transition from the current state to a more advanced and, therefore, different labor market in the future. In sharp contrast to this, the scenario-building workshop team attributed such high values to paid work that when they mentioned the idle, they were also assuming that not being involved in work on a daily basis would make these people lazy and dull. As was described before, there was an initial disagreement among the workshop members; therefore, it cannot be stated that they unanimously supported this attitude. It is tempting to state that the lack of narratives reflecting this opinion during the interviews means that research participants generally shared a more inclusive attitude. Alternatively, it is possible that their overly optimistic view of technology as a factor that will more likely than not positively influence our lives in the future hasn't left space for notions of truly negative outcomes; therefore, they didn't seriously consider the flaws of the unemployed.

5.3.2 The quality and quantity of work

The topic of the quality of different types of jobs was central during both the interviews and the scenario-building workshop. The classification of a job determines if it's worth saving for future generations, if it's worth preserving or elevating in its prestige, and if humanity should work toward expanding it. Participants of the interviews clearly distinguished between jobs that they perceived as high quality versus jobs that they considered low-end and, therefore, expendable. High-quality jobs were described as complex, challenging, and creative. Jobs requiring a high educational background were commonly accepted as automatically high-quality. Part of this reasoning was that most of these jobs can be and usually are done in an office environment. Therefore, it must be better than something done on a factory floor or

outdoors. The aspect of prestige often caused problems during the interviews because some of the professions that respondents considered high-quality were, at the same time, seen as not appreciated enough by society. Primarily, traditionally respected professions were mentioned here, like medical professionals and educators or lawyers and judges. Regarding their jobs, participants viewed them as high-quality because they all considered IT jobs to be creative, but they weren't so confident about their prestige. Interestingly, participants widely shared the opinion that the broad society has little knowledge of what an IT professional does. This lack of information is the cause of many misunderstandings and made them believe that laypersons mostly perceive them as antisocial geeks who will keep on living in their parents' basement regardless of the high income they receive. Another aspect of high-quality jobs was its complexity regarding automation. Repetitive jobs or jobs that can easily be broken down into well-defined steps were expected to become automated in the near future and, therefore, be the first examples of workplaces without human employees. Interviewees also expected automation to take place in dangerous environments, where humans are working under physically damaging circumstances, or there's a high chance of occupational accidents, not just because they believed these jobs to be easily automated but because they shared the idea that industry leaders should substitute humans with robots to protect them. An exciting category of low-quality jobs was labeled as "mentally not challenging." This category represents the contradiction in the logic applied by the interview participants when they faced the complexity of jobs that are done in an office or can be done from home, require higher education, and don't pose a danger to the employees but are not creative enough. These jobs might be too complex at the moment to be automated and, therefore, perceived as safe from a technological unemployment point of view. Still, they have low prestige in the eyes of the participants as they fail to serve the need for professional growth. and, therefore, deemed to be expendable in the future.

Experts in the scenario-building workshop used logic similar to the interview participants when they classified jobs and professions. In contrast to the interviewees, their main goal was to keep humans employed and extend the possibilities to be involved in the world of work. Although they also mentioned the need to eliminate human presence from potentially harmful working environments and thought complexity and creativity to be important, the most crucial aspect was saving the current system of large quantities of humans gaining income from salary. For them, the quality of work wasn't connected only to complexity or creativity per se, but rather to social utility and personal, subjective. satisfaction of the individual with the job

they do. Interestingly, they assumed that the more technology, especially AI, is involved in a job, the more people will enjoy it, therefore integrating the presence of technology into the definition of quality. High-quality jobs might not be perceived as complex or creative; employees might not have to encounter situations where they have to develop novel ideas. High quality is meant for this group of experts. higher impregnation of technology paired with social utility.

Although research participants broadly shared the same ideas about the question of how to define high-quality jobs, it is worth discussing both the similarities and the differences in their accounts. The statement that work that can be done in an office environment is of higher quality than one done in a factory has been at the center of interest for decades. Bell, in his accounts of a post-industrial society, depicts an evolutionary advancement of ways of production in which he, too, attributes higher quality to more complex jobs since they require higher skills (Bell, 1999). During the research, participants mostly used vague, indefinite statements about high-quality jobs but openly and directly referred to blue-collar jobs as low-quality. From this, it can be suggested that high-quality jobs are supposed to be white-collar jobs in the service sector or IT. Bell, too, describes the transition from an era of artifact production focused, industrial, to a service and knowledge-based, post-industrial, as qualitatively better or more advanced since it requires a highly skilled labor force (Bell, 1999). In his critique of Bell, Kumar points to the fact that we should be cautious with general statements like this. Being employed in the service sector consists of a wide spectrum of occupations involving plenty of manual labor, which, by definition, shouldn't be considered highly skilled or of higher quality than manual labor in an industrial unit. He also points to the fact that parts of or entire work activities of white-collar jobs can be mundane and repetitive, therefore not accomplishing the criteria of complexity and the need for higher-level education (Kumar, 1978). Interview participants unintentionally reflected this criticism in their opinions about diminishing jobs in the service sector exactly because of the monotonous, repetitive nature of some jobs, regardless of them being white-collar. Both interview and scenario-building participants believed that first, manual labor would shrink in proportion to the labor market and, secondly, that the new equilibrium state would consist of more creative, self-fulfilling, or meaningful jobs. Interviewees often emphasized the importance of interpersonal skills and the possibly growing appreciation of jobs where humans communicate with other humans. By thinking so, most of them are mirroring opinions of what typology created by Firth and Robinson (2020) calls the optimist-humanist. The slow nature of change and the

predominantly positive or neutral expectations about a future that wouldn't be so different from our current way of living and working have been represented in the literature, too. Proponents of the "No real change" narrative (Boyd and Holton, 2018) acknowledge the possibility of a significant structural change that will overwhelmingly affect blue-collar workers but see this change taking place through a sufficiently long period and have positive expectations for the growing number of positions aiming highly educated, white-collar workers. (Pulkka, 2017; Ford, 2017; Deloitte, 2015; Arntz et al., 2019).

Most interviewees described work at the present as drudgery for many of us while depicting an optimal future vision in which work wouldn't feel like work anymore but rather a hobby. As was stated before, they overwhelmingly supported the idea of a slow transition to a future state in which mostly creative, self-fulfilling, and meaningful jobs will be. This statement might feel controversial due to their conviction that humanity must work in the future no matter the level of technological advancement. A possible explanation can be our incapability to imagine truly different futures from what we have experienced since the perceived stability of the current socio-economic system can be easily explained by its effectiveness (Ransome, 1999). Research participants might connect the central role of paid work in our everyday lives with its assumed efficiency as a system stabilizer and, therefore, wish only to change its nature without questioning its raison d'etre. One of the main differences between the interview participants and the scenario-building group was their reasoning behind why work is essential for society. Interviewees focused on the positive future effects of technology that would transform work from drudgery to self-expression and meaningful activities. The narratives were structured around groups of people who will have paid work, and the benefits of their technological visions expanded to a generative "everyone." Members of the scenario-building workshop formulated a sharp, utility-based approach to their visions. They clearly stated that the function of work is to keep social order by avoiding idleness, which they thought to be the starting point of moral degradation and deviant behavior.

Regarding the quantity of work, both interview and scenario-building participants agreed that we work too much and thought a working week of approximately three to four days would be desirable in the near future. The research focused on participants' visions until the year 2050, a timeframe they considered too short to achieve a workless society regardless of whether they perceived it as a potential positive or negative outcome. Another doubt if AI and technology, in general, will really shorten our worktime other than the timeframe was the fact that we are already using advanced technologies, yet the three-day long weekend is not a

general reality globally, but it's contrary. As one of the interview participants pointed it out:

(…) a Chinese businessman who is in the field of robotics said that within 5-10 years, society could reach the point where it is enough to work only 10 hours 6 days a week in order to achieve adequate results. (XYZ)

The notion of a future in which humans don't have to engage in paid work thanks to advanced robotics and in which benefits are distributed equally wasn't mentioned (Bastani, 2019; Ferry, 1964).

The differences appeared regarding the proportion of humans in the labor market and the status divide between them and those without jobs. If we accept the assumption that technology will eventually substitute human labor, therefore, the scarcity of jobs will increase over time, then we have to expect changes in the social status of those who will be able to keep their job and those who won't. As was mentioned earlier, the status of work depends on our perception of its place and importance in society. In the case of work being a drudgery but is the main indicator of status or indicator of identity, then having a job in a mostly technology-driven labor market will have high status even if the work done is perceived to be drudgery at present. In this case, because of the centrality of paid jobs, utopias mostly focus on the quality of it or the lessening of its quantity but not the elimination of it. Also, working will define the definition of "haves" in contrast to those without paid work or the "have nots" (Granter, 2009; Basso, 2003). On the other hand, if work is perceived to be drudgery and the primary status indicator is not work but consumption, then the goal is to use technology precisely to substitute humans to free them from economic necessities while using both products and wealth created by technology to maintain consumption (Bastani, 2019; Ferry, 1964). This case indicates that the ideal quantity of hours spent working is zero. Those without paid work aren't of lower status since work is not important in this regard. The question is whether society would perceive the working population as losers of the system since they can't engage freely in other activities like the rest of humanity or they would become a new type of elite still able to administer and control society (Robertson, 1985; Kahn and Wiener, 1968; Granter, 2009).

Interview participants commonly believed that either there wouldn't be a measurable difference between the proportion of unemployed to the current state because technological improvement will be slow and societies will have time to adjust, or the government would provide some kind of financial aid for those who won't be able to work due to lack of knowledge. While the theme of technological unemployment was commonly acknowledged,

especially in the negative scenarios, interviewees didn't attribute a definite, negative, or positive label to those who will be superseded from the labor market. Although their conviction in a slow, not revolutionary, or disruptive change resulted in the negligence of direct value statements, their accounts of a better future give insight into their perception of status differences between those who will work and those who can't. The fact that paid work was positioned as a safeguarding function of society against upheaval can lead us to the conjecture that those who will remain employed can be perceived as winners, while the others, especially those who will be substituted by machines during their working years, as losers. Due to their firm belief in unstoppable technological advancement and its unavoidable substituting power over humans, interviewees didn't question the rise of unemployment in the future, although they thought it to be only relevant in the transition period from the current state to a new equilibrium in which humans will find their place in different, new vocations. The scenario-building group, on the other side, didn't shy away from articulating their negative opinion regarding the economically inactive population of a society. Their starting point was the absolute primacy of paid work, and therefore, their primary goal during the creation of the best-case scenario was to broaden the opportunities for different kinds of employment to accommodate the highest possible proportion of people in the labor market. Because of this exertion of what they saw as helping everyone to be engaged in paid work, they doomed those who still wouldn't be working to be losers of the future.

5.3.3 Equality and ethical considerations

When we look at the results from both the interviews and the scenario-building workshop, we can see that equality between people in society wasn't an articulated goal for the majority of participants. Interviewees imagined a best-case scenario in which the most frequently used goal was to achieve a general increase in living- and working conditions that would result in an overall higher level of well-being and fulfillment.

> A suitable transition must be ensured so that those whose work is taken over by a machine have the opportunity to switch to another field, and then everyone will be fine because there is no resistance, but we have made a step forward in technology, and life will be easier then. Participant X

Presently relevant social inequalities and class differences, like the growing wage gap between the richest and the poorest and the vulnerability of those most exposed to technological unemployment, were acknowledged, but the goal was never to solve or address these problems, only to mitigate them to a minimal level. Research participants never

questioned the inevitability of hierarchical social structures, but they wanted to see the closing of the gap between the wealthy and those in need. Interviewees mostly shared the opinion that a future in which the proportion of those working in what they defined to be higher quality jobs grows will be better for everyone in society.

As was mentioned in the interview results section of the paper, only a minority of interviewees mentioned some kind of universal basic income as a solution to tackle social tension, but with different reasonings. As always during the research, every aspect and debate, every opinion and reasoning center around the assumption that paid work is essential for humans and for society. It has already been established that neither the interviewees nor the scenario-building workshop participants considered an entirely workless future. Yet, for interview participants, the imperative of working seems to diminish when technological improvements are involved in the discussion. Interviewees accepted the growing number of technological unemployment as a necessary side effect of change and showed only limited empathy towards those who will be left behind. The general idea was that technology would gain ground in our work life by mostly only augmenting our skills, not completely substituting us. Their techno-optimist worldview centered around those highly skilled and highly educated who would benefit from the changes and left only a very limited space for others. Most of the interviewees had to be directly asked about the potential negative aspects and outcomes of an even more technologically immersed future. Otherwise, they overly emphasized the optimal outcomes of faster, better, and smarter technologies. The number of unemployed in this future state was expected to be so small that they wouldn't cause problems for the majority of society. When the topic of social resistance was brought up, they admitted that if the transition from the current state to one with a significantly lower level of demand for human labor is shorter, then those left behind must be attended to by the government. While most of the interviewees didn't elaborate on their views on how the government should handle such a situation, two elements were recurring. First, technological improvement mustn't be stopped or halted. As one of the interviewees stated:

(…) the whole AI line is the next step in evolution, and this is how society progresses, this is how the world progresses, and if an essential by-product of this is that, say, the two layers of society completely separate from each other, then this should not be the case should not be the reason for saying no, then we could now go ahead and say that it will be better for everyone anyway, but we won't go in that direction, because it will be much better for you than for me (..) so I'd rather say that this is a no go. (Participant)

Different versions of basic income were mentioned for various reasons but mostly to avoid social unrest. Since the basic rules of consumption of modern capitalism weren't challenged, the interviewees substituted income from labor with income from the government as a redistribution of wealth generated by technology. Interviewees never intended to use basic income to create equality, only to ensure the survival of the status quo. Their logic about the essential need to possess a job seemed only to apply to those winners who will be able to work in a highly automated, AI-augmented future, too. Their assumption that government-provided financial aid to the unemployed or for those who won't be able to enter the labor market will be received well and that it will negate the need for a job assumes that for these people, work isn't; only money and consumption are essential. Only one participant mentioned basic income as a tool to change our relationship with work and to enable us to have more power over our decisions about when and how much to work. Interestingly, the most knowledgeable participant out of the six who mentioned basic income was the only one who handled it, not as an aid or help. In his account, the level of the pervasiveness of technology could reach a level that humans don't even realize that they are creating or generating wealth. The ever presence of AI and the services provided for free by it will be so natural that we don't even see it. The similar results and opinions reflected throughout the interviews show us that there is a generally accepted worldview among IT professionals, while results from the scenario-building workshop shed light on the group dynamics of world creation. The topic of universal basic income was initially supported by half of the group, but the idea of involving it in the best-case scenario was rejected by the end of the debate. Participants continuously reminded themselves that the year 2050 is not far enough to achieve real change, therefore they decided to limit their imagination to an optimist version of the status quo. This limited timeframe was one of the main counterarguments against a basic income. The notion of a society that is not based on paid work, that is not production-centered seemed only possible in the distant future. The final reason to neglect the debate even about parts of a basic income was to make it a political question. One part of the group reasoned that the goal of the workshop is not to make actual predictions, and therefore, they found it fit to at least consider otherwise polarizing ideas and radically different system buildups from the current situation. The counterargument was short and decisive: universal basic income is a synonym with communism. After this statement, the room fell silent. To get clarity and understanding of the underlying meaning of this sentence, the participant stated this comparison was asked to elaborate further. The basis of the following explanation was the strong conviction in meritocracy and capitalism's incentive to make people want to achieve

more than what they have. According to this participant, only in capitalism it is possible to freely pursue one's dreams through education and hard work. Price and coverage of the internet was perceived as affordable and available for everyone, which can be used to gain knowledge even outside of the educational system. Official certificates and diplomas were thought to be overrated in comparison to actual, practical skills. Tangible expertise was commonly believed to have higher importance than educational credentials in the group. From this point on the conversation took a turn. Instead of talking about the possibility to work less without losing the necessary financial background to cover at least the basic expenses, participants mutually agreed that, at least some of the jobs that are crucial to maintaining society would not be done without the financial pressure generated by only being able to make a living through wages.

We must remember that this workshop was conducted during the COVID-19 pandemic, a time that perfectly proved the importance and the vulnerable situation of the essential workers who couldn't work from the safety of their home or move out from the city to their weekend houses. The fact, that a group of the highest earners, highly educated, highly skilled of the country mutually agreed that those at the bottom of the social hierarchy must be forced to work even in an ideal future proves that after all we are not that different from the creators of previous utopias. Universal, or any kind of basic income was rejected due to two reasons. First, the group agreed to accept that in an ideal society everyone has to work and earn a living. The economic pressure and strive to achieve higher living standards are what motivates people to study longer and work harder. A basic income would lead to group of illiterate stand byers and general moral decay. Secondly, universal basic income was positioned as a tool of politics that would create a modern caste system with two classes: recipients of the basic income living at the bottom of the hierarchy in a stable and unchangeable level of poverty and those who will work and, therefore, can compete for better social positions through their education and career. This statement disconnects one's future capability to work from the future aspiration to learn new set of skills and knowledge that would help them gain additional financial resources. The imperative of paid work was paired with a narrow understanding of what can count to be work. As was mentioned before in the section of the paper discussing the results of the scenario-building workshop, activities done presently as unpaid work were dismissed to be involved in the definition of work in the future. Although there is space to further discuss the differences between what we would like to achieve with a basic income and what economically and technologically possible to achieve

(Kelly, 2023), participants of the scenario-building workshop didn't take time to properly map out the possibilities. Instead, the notion that people would be content with living on a lower standard in return to have time to engage in informal ways of working or to do things without the need to achieve a goal was ridiculed. Thus, we can state that the best-case scenario of the workshop was built on the assumptions that economic pressure is needed and beneficial to enhance healthy competition in society, and that unpaid work and unemployment is not tolerable. Technology and especially AI should be used to invent technologies that aim to involve everyone in the labor market. This intention to include most of the population in the workforce was signaled by focusing on the situation of disabled persons. AI specialists of the workshop listed potential innovations of AI applications that would enable these people to work remotely from the safety and comfort of their home. Different user interfaces, wearables and AR technologies were discussed in a lively conversation. The idea of AI making remote working more available was later broadened to able bodied persons too, who would control robots from a distance. Given the fact that the workshop was held during the COVID-19 pandemic, it wasn't surprising that a group of AI developers have technological solutions that focusing on remote working. The example of disabled persons suggested their intention to create a best-case scenario for every citizen, although their presumptions are questionable. First, they assumed that for disabled persons the best solution is to stay at home while still working. As was discussed earlier in the research the value of work and its signaling capacity of self-worth is so high in the Hungarian population, and also in the group of experts at the workshop, that finding a solution to work for the disabled, a group AI developers perceived as a majority of the unemployed, must be welcomed. While that might be true, they didn't search for ways to enable them to work alongside able-bodied persons and to create more inclusive work environments but decided to keep them at home.

6 Discussion

After reviewing the topic of how the future of work is imagined by representatives of the social sciences, economists, futurologists, laypersons, and experts, I gave a short depiction of the national context in which this research took place and presented the methodology that was used to conduct it. The previous chapter demonstrated the research findings separately and then compared to each other. This section will provide the answers to the research questions and embed them in the literature or note the novelties.

6.1 Reflecting on the Preliminary Assumptions

Preliminary Assumption no 1.: The presence of mainstream discourses in the account of Hungarian AI developers and IT professionals

6.1.1 Preliminary Assumption 1/a: The fundamentality of work as a value

Based on data presented in the Hungarian context part of the Background chapter, the preliminary expectation for this research question was that since Hungarians think that work is important both on a personal and societal level, IT professionals participating in this research will have the same opinion. Although interviewees and AI developers of the scenario-building workshop put different levels of importance on work on the personal or social level, there was an overarching agreement that paid work must be part of the future, too.

It cannot be denied that attitudes towards work dated before the Industrial Revolution (Granter, 2009) were still relevant and seemed preferable for IT professionals in the interviews. According to Gorz, they perceived the definition of work as an activity done for financial compensation outside the home to achieve someone else's goals (Gorz, 1985) as drudgery. In their vision, an ideal future shouldn't involve any work in the Gorzian sense or should be redefined to emphasize satisfaction and self-expression.

Experts in this research reflected a mixture of the pessimist but mostly the "not real change" (Boyd & Holton, 2018) argument. In line with the logic of Campa (2014) and Autor (2015), they agreed that robots would be able to substitute humans in blue-collar jobs and positioned this possibility as a moral duty in case of dangerous, health-damaging working conditions. The theory of the hollowing out of middle-skilled jobs (Autor, 2015; Bessen, 2016; Ernst et

al., 2019) was present too in the accounts when they envisioned the disappearance of jobs with routine tasks as a plausible and favorable outcome. Developers participating in the interviews found it especially important to emphasize that AI will not simply destroy jobs entirely but transform them into a new, more enjoyable form that will let employers engage in more mentally stimulating tasks. AI developers of the scenario-building workshop didn't articulate this opinion openly, but their best-case scenario was centered around the idea that AI will be able to make work more enjoyable in every sector. In summary, it can be said that AI developers and IT professionals didn't envision a workless future but saw technology as enhancing humans; therefore, they only focused on the changing nature of work and not change in its importance.

It is worth noting some implications in supporting the idea of the essentiality of work in life and society throughout the research. First, although interview participants belong to the same social network and, therefore, they might loosely know each other, they were expressing their opinions and visions individually without being under peer pressure. This indicates at least some level of a common understanding of values attached to work and employment among IT professionals specialized in AI-related fields. The group dynamics of the scenario-building workshop showed how a vision that challenges the centrality of paid work in society and promotes a radically different alternative gets dismissed as irrational and even dangerous, even though it was initially supported by half of the group. Secondly, the results show the lack of narratives that support the idea of consumption substituting work as a status indicator (Kahn & Wiener, 1967; Granter, 2009; Ransome, 1999; Habermas, 1985). While traditionally, paid work done out of the home is considered a pivotal aspect of a predominantly male identity, and the type of job or occupation one has as a class membership signifier, these relations have been changing since WW2. A growing number of workers with substantial disposable income can spend their salaries on things other than necessary, such as basic goods. As Baudrillard puts it in his critique of the capitalist system, the workers are robbed of their identity and given a fake one based on the consumption of fashion, goods, and services (Baudrillard, 2016). While these products promise to give the identity of the consumer and signal their position in society, goods made in mass production not only unable to be truly personal but can artificially create needs that incentives longer working hours (Ransome, 1999; Baudrillard, 2016; Habermas, 1985; Marcuse, 1964). Regarding the future of work, the logic of consumed goods as an identity signifier could have been used in the debate for a workless future. If our identity is not connected to work and technology can generate products

and services instead of humans, then distributing the wealth created by technology can sustain our consumer habits while we enjoy participating in other activities.

6.1.2 Preliminary Assumption 1/b: Quantity of work in the future

As was discussed throughout this document, expert visions about the future of work gained popularity because of their expectations of a radical decline in the available jobs that will be done by humans in the future (Ford, 2017; Brynjolfsson & McAfee, 2016; Frey & Osborn, 2013). In a socio-economic system that's built on human labor-generated consumption and where the value of work is held highly both for the individual and as a duty towards society, the vision communicated by experts of high level of unemployment and the coming of a threat that can eliminate the building blocks of our identity naturally will get attention. Depending on their background and their perception of the capabilities of technology, people either agree with this statement or emphasize the strength of capitalism to maintain itself by shaping the use of technology to its own needs (Spencer, 2018; Huws, 2014; Autor, 2015). The research question regarded which opinion will be supported by Hungarian AI developers and IT professionals with the preliminary expectation that as members of professionals currently building these potentially disruptive technologies, they will represent an optimist, neutral position in this debate.

As was mentioned during the discussion of the previous research question, developers broadly shared the notion that while robotics will substitute humans, AI will only enhance them and simultaneously improve the experience of work. The quantity of work in the future, therefore, was perceived as stable, although slightly less than how much we work nowadays. IT professionals generally expected the workweek to be shorter, around 3-4 days, but not less. IT professionals participating in the interviews broadly shared the opinion that although change is inevitable, it will be slow enough to give time for human labor force to adjust. They generally applied the main points of Autor's (2015) and Ernst and colleagues (2019) logic that only a small part of the loss in the number of total hours spent on work will be due to the rising number of the economically inactive population while most of the decrease will be the effect of improved productivity achieved by AI and related technologies that will allow fewer working hours while maintaining levels of consumption. The limitations of this logic either weren't mentioned by the participants or weren't considered. Based on the literature, AI might not take, only enhance humans' jobs if the tasks performed are complex enough and if the labor supply is elastic (Autor, 2015; Ernst et al., 2019).

6.1.3 Preliminary Assumption 1/c: Quality of work in the future

Since its initial publication of The Future of Employment: How Susceptible Are Jobs to Computerization by Frey and Osborne in 2013, the debate on the future of work argues not only about the quantity but also the quality of jobs in the future. As always, there is a spectrum of opinions, from labor-enhancing and productivity-boosting expectations to inevitable de-skilling, inhumane jobs (Campa, 2014; Autor, 2015; Bessen, 2016, 2019; Miller et al.,2013; Ernst et al., 2019; Huws, 2014; Dyer-Whiteford et al., 2019; Spencer, 2018). The research question investigating this aspect of future visions intended to explore how AI developers and IT professionals imagine the quality of work in the future.

There wasn't any hypothesis for this research question due to the complex situation of the Hungarian context of this topic. As was depicted previously, there are contradictory perceptions of how automation and AI will shape the Hungarian labor market (Makó & Illéssy, 2020; PwC Hungary, 2019). Also, the situation of Hungarian developers as employees of global market leader companies in the development of AI and related technologies but working in subsidiaries and, therefore, being away from the center of decision-making, might impact their perceptions of the quality of work available for Hungarians in contrast to the Western expectations of universal changes. After conducting the research, it can be concluded that Hungarian IT professionals share positive expectations of improvement in the quality of work in general, thanks especially to AI in the future, regardless of where people live. The concept of quality improvement was strongly connected to the fact that technological innovations will reallocate the labor force into white-collar, high-skilled jobs that can be done in an office environment or from home. This argument is not novel in the literature. Bell's seminal book about post-industrial society (Bell, 1999) found the growing significance of knowledge and science-based jobs as the basis of the next era of economic evolution (Williams, 2008). Research done on how employees on different levels of the firms' hierarchy perceive automation's effect on their job satisfaction and expectations regarding job security found that engineers, managers, and white-collar employees usually have a positive attitude and see AI and automation as a challenge or a tool that enhance their productivity and opens new possibilities for them in their career (Keszey-Tóth, 2020; Bisht et al., 2023; Siemon & Kedziora, 2023; Bhargava et al., 2021; Brougham & Haar, 2020; Winkelhaus et al., 2022; Lingmont & Alexious, 2020).

Not only were negative expectations and the possibility of AI and automation causing de-

skilling or sub-employment (Spencer, 2018; Huws, 2014; Dyer-Whiteford, 2019) missing from the visions and expectations of participating AI developers and IT professionals, but they collectively believed that the high technological pervasiveness of a job would cause higher job satisfaction for everyone regardless of their position.

6.1.4 Preliminary Assumption no 2. Ethical considerations in the discourses about the future of work

As it was stated before, equality has never been the focus of utopias throughout history. Goals like better quality of life, better working conditions, shorter working hours, or dissemination of elements of drudgery within work might have been set to achieve a better future for humanity in general, but some level of power imbalance always remains. Slaves, women, and children were routinely used or misused for the greater good of Humanity, a.k.a. white men (Ransome, 1999). Utopias, written by distinguished thinkers of a given era, shouldn't be looked at as blueprints of a better future society but as an image of an ideal future state that we should aim for. In the eyes of the modern reader, though, these ideas often seem closer to a dystopia. Slaves, or generally speaking, foreign workers, used to take up mentally and physically tolling labor (More, 2018); women and children used as rewards for men after a hard day's work (Fourier, 1971) or the clash between victims and winners of a system to create a new, better world (Marx, 2013) would hardly be part of the mainstream imaginations of an ideal future society. For this reason, it is interesting to investigate how research participants handled the topic of equality and other ethical questions in their visions. Although they aren't trained to solve today's moral problems for the future, nor were they initially immersed in the thought of utopias, they are still members of an intellectual group with at least a university education, knowledge of foreign languages, and study or work experience from abroad which makes them more probable to have a better view of the bigger picture.

Expectations regarding the level of embeddedness of ethics and the importance of accountability in the case of a technology whose power to radically transform our lives are repeatedly acknowledged as of utmost importance. The performative power of experts' visions of a future in which AI and automation will play central roles implies that ethical issues and problems raised by them and expected to be counted for in the future will shape our mutually accepted imagined future. Also, ethical issues that are not part of the discussion might cause the consolidation of discriminatory practices within these technologies. For these reasons, it is of foremost importance to draw a picture of how and to what extent AI

developers and IT professionals think about ethical issues in relation to AI and the future of work.

6.1.5 Preliminary Assumption 2/a: Top-of-mind awareness of ethical issues

Both the structure of the interviews and the scenario-building were intentionally designed to leave space for participants to articulate their ethical concerns before they were directly asked about them at the end of the discussion. Given their educational credentials and foreign language knowledge, the preliminary expectation of the research was, that scandals and negative publicity around AI and robotics that were making headlines during the time of the research will be mentioned and reflected on for two reasons. First, the assumption is that participants would be interested in news regarding their field of expertise and, therefore, be aware of the ongoing issues. Secondly, they were expected to mention pieces of media coverage of AI and robotics to defend it since the nature of the newsrooms is to volume up problematic aspects of a technological novelty that is surrounded by such great hype.
In contrast to these assumptions, neither the interviewees nor the scenario-building workshop group mentioned ethically questionable aspects of AI and related technologies without being directly asked to do so. Only two developers discussed the difficulties blue-collar workers will face in the future once robots take their jobs at the beginning of our interview. One of them believed that it is the duty of developers and engineers to invent new ways of production that substitute humans in dangerous or health-damaging environments, and it's the responsibility of both the government and those involved in the newly unemployed to find a better use of their working capabilities. The other developer mentioned the necessity of universal basic income to level the benefits and drawbacks of AI within society.
Similarly, the AI developers of the scenario-building workshop didn't bring up any ethical issues during the creation of either scenario. During their debate about the best-case scenario, they admittedly tried to create a vision that puts the happiness and satisfaction of everyone in the forefront without actually discussing ethical questions of any sort. Instead, they assumed that a flexible and inclusive labor market, fewer working hours, and a reformed education would satisfy the requirements of a just society.

6.1.6 Preliminary Assumption 2/b: Ethical issues after directed questions.

In the last module of the interviews, AI developers and IT professionals were asked directly to consider the ethical considerations of their visioned optimal future and the consequences of AI applications in general. As was described in detail in chapter 5 of this document,

participants presented only limited interest in the possibly unethical applications of AI or negative consequences posed on certain social groups. In accordance with their optimist expectations about AI and automation in general and their perception that these technologies have the potential to bring better living conditions regardless of social status, it would be logical for them to share the ideas of Keynes (1930) or Miller and Atkinson (2013) and expect the redistribution of productivity gains in the form of either lower prices or shorter working hours. On the contrary, one repeatedly recurring theme was the widening of the wealth gap between the richest and the poorest that AI will not be able to lessen but can be used to widen it even further. This point of view is widely shared in the literature among the critics of the promised prosperity and equality of an AI-imbued future economy and except forecast the growth of existing inequalities (Spencer, 2018; Autor, 2015; Huws, 2014; Dyer-Witheford et al., 2019).

6.1.7 Preliminary Assumption 2/c: Perceived responsibility

The last research question targeted participating AI developer's and IT professionals' views about their personal role in shaping what kind of AI technologies will be marketed in the future. Do they realize their potential to influence the direction of development or put the responsibility elsewhere? While there are examples of IT professionals showing organized opposition against certain developments (Tung, 2019), the semi-peripheral situation in Hungary might translate into a more passive observer mentality of AI developers and IT professionals. The future of work debate is often framed in the logic of technological determinism when the topic of development and intended use is removed from the realm of society. Engineers and developers are often pictured as working along an internal, scientific logic that is independent of the socio-economic structure in which these people work and the technologies will be used (Wyatt, 2008; Campa, 2014; Ernst et al., 2019; Vicsek, 2021).

Based on the research, it can be stated that Hungarian AI developers and IT professionals participating in the study fit mostly into the category that Vaast (2022) called a tangential model of expertise, with their self-identification as scientists or explorers, their conviction that the real change is in the far future, and their abstention from liability.
They clearly saw themselves as members of an elite group. First, they perceived their educational background and the respective universities they attended as the best in the country and thought the field of their studies to have higher prestige and importance than others. They also believed that within the field of IT, being an AI developer or working closely to this field

is the top of the profession. Hard work and a general interest in mathematics were listed as needed skills to become an AI developer. Participants admitted that the small size and importance of the Hungarian market makes it even more difficult to join a company that develops AI, but this fact was only mentioned to present their own achievements in an even better light, therefore showing little sympathy towards other IT professionals.
Participants didn't take responsibility for how AI is developed or for what it will be used. The Hungarian context wasn't mentioned or used as a reason for their opinion. Developers, in general, were believed not to have the power to have a say, nor to have the responsibility or duty to do so. This belief was broadened to the neutrality of technology itself. There's no evil, or malicious AI, only low quality of data used to teach the algorithm that is produced by humans who either weren't trained properly to use the correct labels for datapoints, or the company wasn't providing efficient information.

Responsibility was mostly delegated to the state or the government to reorganize entire systems and to prevent or punish firms when they misuse AI or related technologies. Both during the interviews and the scenario-building workshop, participants positioned AI and technology in general as having neutral or positive attributes only.

7 Conclusions

The history of thoughts about the future and what it holds for us is as long as the history of humankind itself. There wasn't an age when humans wouldn't try to foresee what might come to them. There are special circumstances that define who is entitled or thought to be capable of telling what the future holds and to what extent these forecasts influence actions in the present. Expert visions about their imagined futures can have significant consequences in the present because their expectations have the power to move financial investments, innovations, and human capital in one direction toward a mutually accepted outcome (Adam, 2008; Beckert, 2016; Birch, 2017; Borup et al., 2006).

Investigating the future of anything is not only not scientific but also not possible. Therefore, this research aimed to examine how a group of experts envision their imagined future without measuring the probabilities of them becoming realities. The objective of this document is to provide a comprehensive picture of how humans were thinking about the future of work in the past, how both laypersons and experts think about it in the present, and most importantly, what aspects and measurements Hungarian AI developers and IT professionals consider when building their own version of it.

The most important findings of the research are summarized in the following section.

7.1 Strong presence of technological determinism

Whether AI developers and IT professionals talked about best- or worst-case scenarios, some presumptions were irrefutable. First, the coming of an AI-dominated future is unstoppable. Second, it shouldn't be halted because it will cause a general increase in our living standards. Interviewees either belittled the negative effects of AI (slow change, it won't be drastic, society will have time to adjust) or thought other actors like the Big Five or, generally speaking, "the market" for abusing AI.

The inevitability of the growing importance of AI was justified by their belief that the improvement of AI equals the improvement of society, too. The notion that technology in itself is neutral was the basis of their arguments, but this conviction often depended on the nature of the aspect of AI they were talking about. Technology, and especially AI, was depicted as neutral only as long as its negative aspects were debated. In the case of scandals

about racial profiling or autonomous weaponry, AI was a neutral tool in the hands of malicious politicians or greedy companies. On the contrary, AI was given agency and mentioned as a conscious actor when its use in education or health services was mentioned. In many cases, AI was perceived to be better than humans, even when decision-making directly affects humans' lives, like the job of a judge or medical doctor. Scenarios created during the scenario-building workshop exemplify this best. While in the best-case scenario, AI and other technologies connected to it were the foundation of a better, more inclusive, and self-expression-centered world of work, AI developers couldn't envision a worst-case scenario in which AI and technology in general would be the cause of a negative, dystopian future. Instead, the technological determinist way of thinking was used. They imagined a future where politicians start a war causing suffering that will only survive because AI will help citizens.

7.2 Ethical convictions and the lack of solidarity

According to the sociology of expectations, how experts envision the future can influence a wide range of other actors' decisions in the present and can create a mutually accepted imagined future towards which humanity should approach. If we take this logic, we also have to admit the importance of what aspects are mentioned in these visions and the consequences of what has been left out. If we build technologies and shape entire systems of education, economy, and societies around it, if the central goal is solely to develop AI without giving equal importance to considerations of how technology will affect those systems it interacts with, not only might we solidify existing inequalities but also won't be prepared for the unintended consequences we didn't want to see.

As was stated before, Hungarian AI developers and IT professionals fit mostly into the category of the tangential model of expertise (Vaast, 2022), meaning that their strong sense of techno-optimism is paired with the perception of the future as distant and abstract and with self-identification of being a scientist working outside of the realm of social mechanisms. By this description, research participants overemphasized the positive aspects of technology and downplayed the risks. The lack of empathy and solidarity towards those who will lose their jobs because of technology and the depiction of them as potentially dangerous, aggressive neo-luddites who must be tamed to maintain a better future for the winners of the future is problematic for many reasons. Developers participating in the research thought that the transition from the current way of production to a more AI-enhanced, complex, and enjoyable

state would be slow and gradual. Therefore, the state would easily handle the number of blue-collar workers who are losing their livelihoods while everyone else would enjoy better jobs and working conditions. Participants believed that the broad implementation of AI would lead to higher productivity; therefore, "the market" would obviously invest in it. Since labor demand for highly skilled, tech-savvy employees will be constant, participants believed that expectations of the market and actors of the economy regarding the skillsets and level of expertise needed in this AI-led economy would be effectively communicated and accepted by society in general.

Reasons for the lack of ethical considerations can be explained from different points of view. First, we mustn't forget that the importance of work as a value was central to the research developers because they agree with this statement on a hypothetical basis and are all employees. As was demonstrated before, IT professionals are high earners with great bargaining power in the labor market. For this reason, it is irrational for them to agitate against their employees and against the industry they are prominent members of. At the same time, they could be the whistle-blowers and caution the public if needed (Strümke et al., 2022). Another reason is their strong belief in meritocracy and hard work, which was repeatedly mentioned when asked about their career progress and why they chose to work in IT. Throughout the research, participants presented a strong belief in meritocracy independent of their age, stage of career, gender, or place of residence. Finally, participants might not put ethical problems in their focus and thought that the overall situation of society would not change because of the timeframe of the research. The next thirty years might not be far enough, while the current system's stability and the perceived prosperity it has brought can be believed to originate from its efficiency (Granter, 2009).

7.3 Research conclusions from the sociology of expectations point of view

Experts' visions about the future of work are important because they influence other actors' strategies and actions in the present (Adam, 2008; Beckert, 2016; Birch, 2017; Borup et al., 2006). If we look at the visions of Hungarian AI developers and IT professionals from this point of view, we must first clarify some details. Can it be said that Hungarian participants are experts? In the research, participants were collected by using a mixed method of deciding who can be considered an expert based on the article of Mauksch and colleagues (2020). The difficulty of definition lay in the fact that being an expert in AI involves a variety of occupations, university majors, and, in the case of a small market such as Hungary if they

could find an AI-related job at all or had to move to other professions while being active in the IT community. Participants identified themselves as experts and referred others they considered experts.

The second question is whether Hungarian participants shared the same visions as those shared by their Western counterparts. The answer is yes, although with a strong emphasis on the techno-optimist, techno-determinist strain. The narrative of "robots will take our jobs" and the implication that it will bring the destruction of capitalism or our civilization (Brynjolfsson & MacAfee, 2016; Ford, 2017; Frey et al., 2013) was rejected, and an optimistic-neutral position was supported (Gordon, 2014; Miller & Atkinson, 2013; Ransome,1999).

Finally, we should ask if they agree that the way they imagine future outcomes will inform others how to act. The answer is no. Participants didn't believe that their personal convictions and views could affect anyone's decisions regarding the future. Part of their reasoning was their situation as experts living in Hungary, a country they regarded as situated far from the center where decisions are made, and their position as employees, therefore, being only a small cog in a big machine.

7.4 Limitations and further research areas

The research presented in this paper was limited to a few experts from the field of AI development. Although data saturation was reached, findings cannot be generalized. Due to the current nature of IT as a profession and the concentration of workplaces in the capital, the overwhelming majority of participants were male, in their thirties, living in Budapest. As was stated, participants either self-identified as experts or were referred by others as experts. This added to the fact that female AI developers and IT experts are underrepresented. Females, with one exception, who were referred were pleasantly surprised and wouldn't self-identify as experts otherwise. This points to the need for further research with different methodologies to select participants that could address this problem.

Due to the limitations posed by the COVID-19 pandemic, the scenario-building workshop had fewer participants than planned. The fact that the timeframe of the research and the uncertainty about the next waves of lockdown made it impossible to conduct more workshops that would have ensured wider coverage of opinions is a huge limiting factor of the research. Further research should be done with more scenario-building workshops with AI experts working in different fields in different locations.

The final limitation to every research exploring topics around AI is its rapidly changing and improving nature. The data presented in this paper is already outdated. Even the developers and experts participating in this research couldn't clearly define AI, and this confusion is expected to continue with the introduction of a faster and smarter version of it.

This research attempted to shed light on a very narrow slice of the vast knowledge of the interplay between society and technology, therefore there is plenty of room to explore other aspects of it. Further research should focus on the role and responsibility of universities in shaping students' attitudes toward their role in how AI will be developed. Do students enter these institutions already with a techno-deterministic attitude? How does a university facilitate this or redirect it to a more inclusive direction?

While females are underrepresented both in this research and among AI developers in general, it would be worthwhile to examine their situation and role in a mixed-gendered work environment. Can we find any differences in how they approach a project? Are they employed in the same positions as their male counterparts? Would an only-female study show different results, and if so, why?

Maybe the most obvious next step is to widen this research's scope and repeat it internationally. Results from the V4 countries would highlight the existence of regional similarities or showcase differences. Also, as one of the key assumptions of this research was that AI developers and experts perceive their role in shaping and directing AI innovation is different in the USA, it would be beneficial and ambitious to conduct the same research with them.

Finally, it would be beneficial to investigate the expectations of parents whose children are in the first few years of elementary school regarding how they envision the labor market that awaits their children. Are they expecting a mostly AI-driven labor market or even a jobless future? If so, are they actively planning to provide the necessary skills and knowledge for a potential career in AI development or related fields? This question would move the timeline of this research further away and put in focus one of the most important stakeholders of a peaceful and prosperous future: the parents of those whose present it will be.

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