Technological Forecasting & Social Change 168 (2021) 120739

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

journal homepage: www.elsevier.com/locate/techfore

Neurodiversity of the workforce and digital transformation: The case of inclusion of autistic workers at the workplace

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ARTICLE INFO

Keywords:
Neurodiversity
Inclusion
Digital transformation
Work organisation
Skills
Technological change
Autism

ABSTRACT

This paper analyses the productive complementarities between the digital transformation, the skills of autistic workers and neurodiversity management. Based on a qualitative approach and interviews with leaders or experts of neurodiversity initiatives, we provide a theoretical framework to analyse the links between the neurodiversity of the workforce and digital transformation at the individual, organisational and industry levels. We identify several ways by which the digital transformation may provide a context favourable to autistic workers. This includes creating new opportunities, valuing their performative abilities, cognitive differences and creativity, removing stereotypes and biases during the recruitment and improving the management of psycho-social risks. Neurodiversity management also contributes to the digital transformation by closing the digital skills shortage, shaping algorithms of artificial intelligence and providing a competitive advantage for innovation. Most importantly, neurodiversity management provides an effective model of inclusion that can mitigate the development of inequalities associated with the digital transformation.

1. Introduction

Over the last thirty years, rapid technological change, driven by increased computing power, the explosive proliferation of digital data and the vast improvement in algorithms, has brought about significant evolutions in workplace employment practices. As Schwab (2017) mentioned, while the previous technological revolutions were mainly due to advances in general purpose technologies, namely steam power, electricity, computerisation, the current fourth industrial revolution involves a shift of paradigms (Last, 2017) in all disciplines, economies and industries since it challenges what it means to be human and consequently raises important political and ethical issues. For example, algorithms of artificial intelligence (AI) "are trained" on big data from the past and embody stereotypes and values of their designers and coders (Montes and Goertzel, 2019). As algorithms scale at a global level, they exacerbate stereotypes and reinforce human biases against most vulnerable individuals. Integrating moral and human values into technologies becomes a necessity (O'Neil, 2016). Indeed, in a context of growing income inequalities between workers (Piketty, 2017), the disconnection between the technological and social progress is not sustainable anymore. It is urgent to create new models and narratives for an inclusive prosperity (Last, 2017).

This paper brings into question whether there is a role for digital technologies to favour inclusion and reduce inequalities at the workplace and if so, what role it may be. To answer this question, we focus on the adoption and implementation of neurodiversity management practices, which aims at creating conditions of inclusion of neurodiverse workers. In psychology, the concept of neurodiversity acknowledges the combination of strengths and difficulties associated with neurological differences between individuals. These differences include conditions referred to as dyslexia, dyspraxia, Attention Deficit Hyperactivity Disorder (ADHD), autistic spectrum and others. In this paper, the term neurodiversity more specifically refers to autistic workers, as autism is currently a focus for most programs of employment to favour neurodiversity. Autism is a neurological psychiatric life-long condition, resulting in differences in perception and cognition of individuals. While most of the academic literature on diversity, inclusion or discrimination focuses on tangible differences such as gender, age or race, the neurodiversity paradigm encompasses intangible differences between individual minds and intelligences.

By analysing the relationships between the adoption of neurodiversity practices at the workplace and digital transformation, we

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https://doi.org/10.1016/j.techfore.2021.120739
Received 9 March 2020; Received in revised form 20 August 2020; Accepted 7 March 2021
Available online 1 April 2021

answer two inter-related questions: Does the digital transformation of the workplace provide a favourable context for neurodiversity? Do neurodiversity management practices contribute to the digital transformation? We address these questions by identifying complementarities between a) the skills of autistic workers, b) organisational practices towards neurodiversity and c) the digital transformation including elements such as artificial intelligence and digital platforms of the gig economy.

The first trend explored, that of neurodiversity management practices, is a relatively new area of academic study. Neurodiversity management provides an exciting insight on organizational design of inclusion at the workplace. These practices constitute organisational innovations that activate and enable the value created by idiosyncratic talents and differences of individuals, by adapting the work environment to the workforce (Austin and Sonne, 2014).

The second trend studied is the digital transformation of workplaces. We investigate different mechanisms by which the digital transformation is disrupting the labour market, reshaping workforces and stereotypes. By taking a neurodiversity perspective, we reformulate some important discussions on the displacement of workers by AI and mass automation (Camiña et al., 2020; Dengler and Matthes, 2018; Frey and Osborne, 2017; Mitchell and Brynjolfsson, 2017), the rise of crowd-work and on-demand work through centralised platform technologies of the gig economy (Rosenblat, 2019) and the digital skills shortage (Cappelli, 2015; Weaver and Osterman, 2017).

Most importantly, we highlight the close relationships between the digital dimension of neurodiversity management and the human dimension of the digital transformation. These relationships represent an ecosystem of intelligences, rooted in a rebalancing between human intelligence and machine intelligence. To analyse the links between the digital transformation and a neurodiverse workforce, we have created a research framework underpinned by the theory of productive complementarities (Milgrom and Roberts, 1990). At the firm level, two managerial practices are complementary if the development of one increases the productivity of the other, which involves that managers should coordinate adoption of complementary practices. We analyse bundles of organisational practices and technologies, which combine both productivity and inclusion of autistic workers, to understand the design of an inclusive work organisation.

This paper provides an original conceptual framework to analyse various links between neurodiversity and the digital transformation, that we consider as a complementary pair. To the best of our knowledge, neurodiversity management and the digital transformation, although strongly connected, have not yet to be studied together. To identify the complementarities between neurodiversity and digital transformation, we conducted semi-structured interviews with experts of neurodiversity initiatives.

2. Framing the problem

Empirical papers show that the computerisation of workstations and the general adoption of information technologies are not neutral, since they increase inequalities between unskilled and skilled workers, by improving the relative productivity of skilled workers compared to less skilled workers. These technologies are also routine biased, substituting and replacing workers performing routine tasks (Goos et al., 2014) and generating a polarisation of work.

To understand the rising inequalities at the workplace associated with technological change, researchers have developed two significant and related theories, collectively referred to as skill-bias technological and organisational change (SBTC and SBOC) and productive complementarities. According to these theories, the criteria of differentiation between workers are their skills or ability levels. Heterogeneous skills or abilities are embodied into homogenous workers. Obviously, when recruited or promoted, other criteria differentiate workers. Workers are stereotyped and discriminated on the labour market and at the workplace. It is a necessity to consider the diversity of the workforce, i.e. who are the workers. Our analytical framework does it, by considering both the specific skills, abilities and stereotypes related to autism. In a field experiment, Ameri et al. (2018) showed that applications for accounting job positions mentioning that a worker was autistic with Asperger syndrome received 26% fewer expression of interest for the same level of skill. In the following sub-sections, we use the SBTC, SBOC and productive complementarity theories to frame the relationships between the digital transformation and neurodiversity of the workforce.

2.1. The links between technology, organisation and skills

The SBTC theory (Acemoglu and Autor, 2011) argues that technological change transforms the division of labour between machines and workers who are characterised by their skill levels, depending on the degree of substitutability or complementarity between different inputs. In economic terms, technological progress involves two movements. The first movement focuses on a shift in production function as technologies become less expensive or improve in quality (as demonstrated by the Moore law or more recently by the Kurzweil law[1]). The second is directed towards the deformation of the production function as technologies complement and substitute other inputs. Recently, to measure the displacement of labour associated with mass automation, labour economists estimated the substitution between technologies and labour at the task level (Dengler and Matthes, 2018), at the occupational level (Frey and Osborne, 2017) or at the macro level (Acemoglu and Restrepo, 2020).

SBTC theory is deterministic since it ignores the organisational dimension of work. Technological determinism means that technologies may generate a specific division of labour between workers and technologies and impose the organisational design of workstations. Consequently, researchers are also analysing the organisational dimension of technological progress and demonstrate that investments in training and organisational changes are required to generate productivity gains with the adoption of new technologies (Camiña et al., 2020). In other words, there are productive complementarities between the use of technologies, skills and the organisational design practices (Milgrom and Roberts, 1990). In microeconomic terms, if the complementary variables of a function increase simultaneously, the value of that function increases by more than the sum of the value of the changes induced by the increase in each of the variables when taken separately. This approach is very deterministic too. Technological determinism is replaced by economic determinism. The search of productivity drives the coordination of technological and organisational choices.

Another way to highlight biases of technologies consists in reversing the causality to analyse the role of human determinism in the design of technologies. Rather than looking at the impact of technologies on the workforce, let us understand the impact of the composition of the workforce on technologies. Designers of technologies generate biases in the values and characteristics embodied in technologies. While the obvious lack of women in the IT industry is attracting a lot of attention (Lambrecht and Tucker, 2019), algorithmic biases associated with disabilities also raise new questions on norms and stereotypes of our society (Whittaker et al., 2019) and barriers to employment. As neurodiversity initiatives target a more inclusive recruitment, they tackle the question of stereotypes at the workplace.

This paper adopts and adapts the framework of productive complementarities to understand the relationships between a neurodiverse workforce and the digital transformation. When determining if the

[1] Moore's law describes the permanent improvement in quality translated in reduced cost of technologies. Since the statement of Gordon Moore in 1965, co-founder of Intel, it states that the power of microprocessors is doubling every 18 months. Kurzweil's Law focuses on accelerating returns and the idea that technology and evolutionary processes progress in an exponential fashion.

digital transformation is complementary to neurodiversity practices, the trigger of change emerges from both the social and technical change. Economic performance is not dissociated from social performance. Rather managers coordinate digital transformation with neurodiversity practices, thereby seeking improved performance through better productivity, increased quality and better inclusion.

2.2. Neurodiversity at the workplace

Neurodiversity acknowledges that the variability of perceptive and cognitive abilities marks the human singularity of each individual. Neurodiversity requires understanding what makes people different. Let us take the example of the Gaussian distribution of the intellectual quotient (IQ) showing that 95% of the population has an IQ between 70 and 130. In the tails of the distribution, individuals are different because they are statistically distant from the average or norm. Obviously, multiple cognitive, emotional and perceptive traits define each individual. However, for most of the population, the difference between two individuals is low compared to all that they have in common. For autistic individuals, these differences are higher (Fung, 2019), thus raising the question of how they uniquely contribute to the workplace.

Autism is one aspect of neurodiversity which is currently diagnosed in 1 in 68 individuals (Christensen et al., 2016). Autism is a neurological psychiatric life-long condition, resulting in differences in perception, learning style and thinking, behaviours, traits and mannerisms. The autistic condition is defined as a disorder, a deficit or a dysfunction by the American Psychiatric Association (2013), potentially contributing to negative stereotypes on autism. The literature in experimental psychology analyses the combination of individual cognitive-perceptual abilities of autistic individuals. It shows the variety of combinations in social cognition, executive functions, information processing, perceptual processing, systemising and pattern abilities of autistic persons. Reviewing this rich literature is outside the scope of this paper since our purpose is to frame inclusion of autistic workers from an economic perspective.

However, let us note that specific skills and abilities of autistic adults are difficult to map due to the heterogeneity of individuals on the autism spectrum which covers conditions going from severe disabilities (such as non-verbal language, low IQ) to Asperger syndrome for individuals with high intellectual functioning autism. The quote "If you've met one person with autism, you've met one person with autism" illustrates the importance of individual differences in autism. Individual differences are reinforced by physical and mental co-occurring conditions that sometimes combine with autism such as hearing or visual impairment impacting perception, anxiety and depression (Hollocks et al., 2019) or sleep problems.

The positive inclusion and social impacts of neurodiversity practices are recognised at both the macroeconomic and microeconomic levels (Krzeminska et al., 2019). Beyond reputational benefits, multinational and large companies[2] across industries have pioneered a shift in the way they manage their workforce and have developed programs of employment of hitherto untapped autistic talents. As such, they are tangibly gaining a competitive advantage linked to these innovative initiatives (Austin and Pisano, 2017). Neurodiversity employment practices are increasingly adopted in firms of different sizes and across different industries (Autism Europe, 2014).

Nevertheless, it is important to mention the divergence on the way papers in management and psychology analyse abilities of autistic workers. The literature in management points out a "neurodiversity advantage" (Austin and Pisano, 2017), based on productivity arguments observed at the workplace, where individuals are screened and trained for their job. In psychology, Bury et al. (2019) warns that this narrative of an "autism advantage" is not scientifically evidenced and tend to generalise individual experience that may generate new stereotypes, even positive. Happé and Frith (2009) highlight that even if all autistic people may have a different potential to develop singular skills and talents, individual abilities must always be analysed within the specific context where they are observed.

In this paper, our main objective is to identify the relationships between the skills of autistic workers, the use and implementation of technologies at the workplace and work organisation of neurodiversity. We combine literature in psychology, management and economics to propose a framework of analysis of these relationships at the level of the individual, the organisation and the industry.

2.2.1. Individual level

At the individual level, traits of excellence of autistic workers include abilities to concentrate, to recognise patterns, to complete repetitive tasks, strong attention to details, strong focus and involvement (Boucher, 2008). This may be a reason why software-testing jobs or coding jobs are offered by numerous companies specialised in the placement of autistic workers. These jobs may match the skills of some autistic workers who have a low propension to error on tasks requiring high attention to details (Mottron et al., 2006) and also systemising abilities associated with strong capacities to build rule-base systems (Baron-Cohen et al., 2009). Repetitive patterns of behaviour, interests, or activities pointed out by the American Psychiatric Association (2013) could also be a strength for autistic workers completing repetitive tasks in their area of interest. However, with the automation of routine tasks and supplantation of rule-based high skilled jobs by AI, the digital transformation could have a destructive impact on these jobs (OECD, 2017a, 2017b). This observation raises the question of the substitutability of skills of autistic workers with machines. Indeed, tasks involving pattern recognition and/or routine tasks may be more at risk of automation (substitution).

Another manifestation of autism is different thinking and cognition. Recruiters may look for these talents to improve their organizational creativity, their innovative potential (Austin and Pisano, 2017) and also drive the digital transformation. Two OECD reports (OECD, 2017a, 2017b) show that critical thinking, creativity and innovation will be in demand as they complement the development of artificial intelligence (AI). From that perspective, cognitive differences of autistic workers may be complementary to the digital transformation (complementarity).

2.2.2. Organizational level

At the firm level, the employment of a neurodiverse workforce requires the creation of an inclusive environment that accommodates workers on the autism spectrum (Markel and Elia, 2016; Seitz and Smith, 2016). Autism Europe (2014) underlines a variety of issues and practices implemented to drive the employment of autistic workers, across different national, organisational and institutional settings. Austin and Pisano (2017) distinguish seven core elements of the process towards recognizing neurodiversity at the workplace: a) the collaboration with social experts of neurodiversity to have a good awareness of specificities of the workforce; b) the design of non-stereotyped recruitment procedures; c) the training of workers and employers, d) the customisation of a supervision ecosystem, e) the specification of methods for career management, and finally f) the development of methods for scaling and g) mainstreaming the program.

By analysing the relationship between neurodiversity management and the digital transformation, our paper highlights the digital dimension of the organisational design of neurodiversity. To the best of our knowledge, these relationships have not been analysed up to now.

2.2.3. Industry level

At industry level, the literature on the management of neurodiversity mainly focuses on IT industry (Austin et al., 2017; Austin and Pisano,

[2] SAP, DXC technology, Hewlett Packard Enterprise (HPE), Microsoft, Willis Towers Watson, Ford, EY, Caterpillar, Dell Technologies, Deloitte, IBM, JPMorgan Chase, UBS, ANZ, Symantec, and others.

2017), which is not a coincidence. Indeed, the complaint of skill shortage is recurring, in a fast-moving industry where skills become rapidly obsolete and constantly change. Our paper contributes to improve the understanding of the role of the digital skills shortage and dynamic of creative destruction of IT jobs and their potential links with the implementation of neurodiversity initiatives.

In the academic management literature, the digital skills shortage is presented as a key driver of neurodiversity initiatives (Austin et al., 2017; Austin and Pisano, 2017). However, there is no empirical evidence of a digital skills shortage (Weaver and Osterman, 2017). For Cappelli (2015), the skill mismatches, including the skill gap between supply and demand and skill shortages are mainly generated by employers due to an insufficient vocational training at the workplace. It means that the source of the digital skills shortage is not exogenous to firms but is endogenous and comes from the behaviour of firms themselves. Indeed, biased recruitment procedures and discrimination reduce the pool of employable applicants and may generate a digital skills shortage. As such, promoting neurodiversity at the firm level represents an important means to source an untapped pool of creative talents.

2.3. Dimensions of the digital transformation related to neurodiversity

Neurodiversity is largely ignored in the literature on the digital transformation. Debates on the future of work and the digital transformation mainly focus on two technologies: artificial intelligence (Mitchell and Brynjolfsson, 2017) and platforms (Rosenblat, 2019). We integrate a neurodiversity perspective in this debate and determine if opportunities and risks associated with these technologies are the same or different for workers on the autism spectrum compared to the general population.

When explaining what tasks can be performed by machine learning, Mitchell and Brynjolfsson (2017) pointed out six economic factors that will impact labour demand and wages in the future: substitution and complementarities between machine and human work, business process redesign, price elasticity, elasticity of labour supply and income elasticities. By exploring the complementarity and substitution between AI, the skills of autistic workers and the organisational design of neurodiversity, our paper provides some evidence on the three former factors. It informs the understanding of the division of labour between workers and machines while considering the dynamic of creation and destruction of tasks and jobs brought by these technologies.

AI and neurodiversity are especially interesting to analyse together, since they are both associated with the redesign of the ecosystem of intelligences. Montes and Goertzel (2019) argue that artificial intelligence represents the interests and values of a minority of IT workers. To represent the diversity of human values and neurodiversity of thinking, they call for an artificial *general* intelligence that may be achieved by the decentralisation in the production of AI allowed by blockchain technologies. McAfee and Brynjolfsson (2018) have a similar argument when they highlight the importance of opening firms to the crowd, in order to benefit from a diversity of abilities and a diversity of thinking. In this paper, instead of focusing on the role of a crowd external to the firm, we focus on neurodiversity management that is internal to the firm and also analyse the role of crowdworking platforms for neurodiversity.

The codification of work is a characteristic of platforms, which enable crowdsourcing at a global scale and at an unprecedented level of granularity. Crowdworking platforms, from Amazon Mechanical Turk for lower-skilled workers to Upwork for higher skilled workers, allow users to reach crowds of very diverse workers. They allow workers to complete tasks without geographical barriers and allow workers to choose the tasks they want to complete. As they rely on the self-selection of workers rather than a selection procedure, they may offer new employment opportunities. Zyskowski et al. (2015) show that platform technologies may offer different opportunities for workers with disabilities, including workers on the autism spectrum. At the same time, the current debate in the industrial relations literature points out the potential exploitation of workers on such platforms. In this regard, our paper collects opinions from participants about platforms of crowdworking.

Fig. 1 synthesises the proposed research framework exposed in part 2, to analyse the links between neurodiversity and the digital transformation. It distinguishes our three levels of analysis (individual, organisational and industry/macro).

3. Research methodology

This research is exploratory in nature and aims at understanding why and how neurodiversity management and the digital transformation may be connected. We used a phenomenological approach to guide the research. Phenomenology is a qualitative research technique to describe lived experiences of participants and gain a deeper understanding of the nature or meaning of our everyday experiences (Manen, 2018). Using phenomenology is appropriate in this study because it enables individuals working with neurodiverse workers and more specifically autistic workers, to reflect upon and thereby communicate their viewpoints and understandings. In turn, these experiences and the variances in experience between participants expand our capacity to understand their lived reality.

The research itself was guided by two primary questions:

- Does the digital transformation provide a favourable context for neurodiversity?
- Do neurodiversity management practices contribute to the digital transformation?

And four sub questions related to the different levels of analysis outlined above:

- Is there a complementarity and/or substitutability between the skills of autistic workers and the digital transformation?
- Do complementarities between the organisational design of neurodiversity and the digital transformation exist? If yes, what is the nature of these complementarities?
- How does the digital skills shortage relate to neurodiversity practices?
- Is there a role for digital technologies to favour inclusion and reduce inequalities at the workplace? If yes, what role is it?

3.1. Participant recruitment

Aligned with the phenomenological method, we used a purposive sampling strategy to meet the objectives of the study. We used two criteria to identify potential interview participants: leadership or expertise in neurodiversity initiatives and good knowledge of the IT sector. In the first stage of recruitment, we looked at experts of neurodiversity and leaders who attended conferences on employment of workers with autism. As IT roles are well represented in neurodiversity initiatives, we identified several potential participants that matched our two criteria. We also collected information on the website of the firms or organisation where they were working. Via the platform LinkedIn, we collected more details on the professional trajectory of potential participants, to make sure that they had the expertise and knowledge we were looking for. We initially contacted potential participants

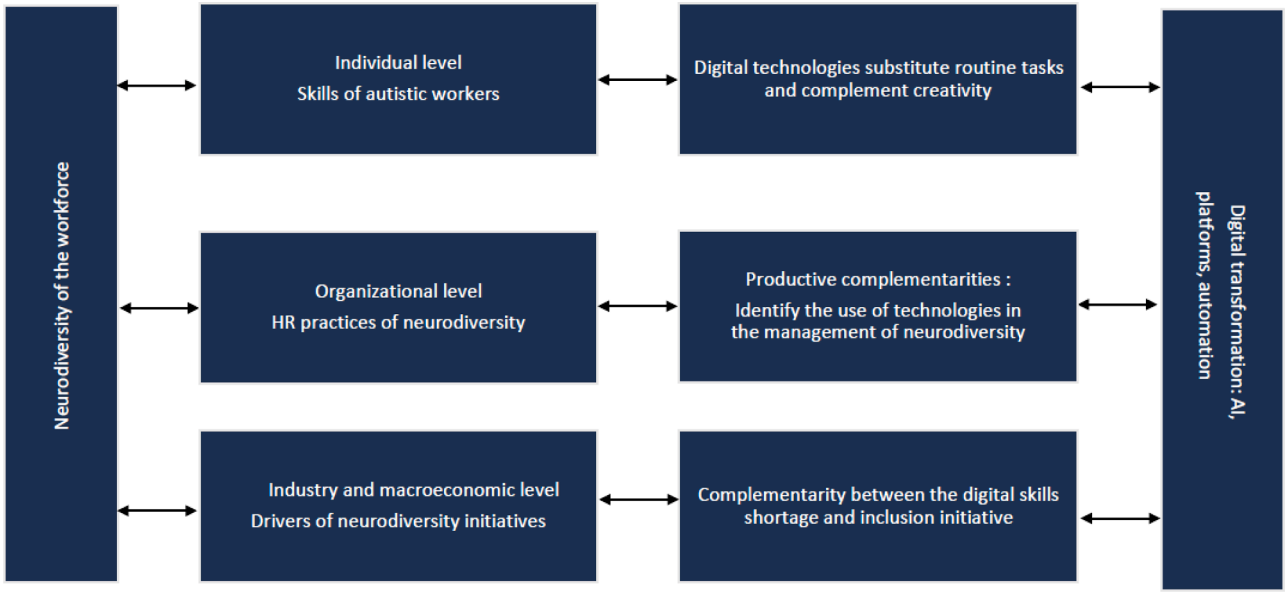

Fig. 1. Proposed research framework.

Table 1
Participants.

Participant No.	Industry	Gender	Country
1	IT	Male	US
2	Financial services	Male	US
3	Banking and financial services	Male	Australia
4	Social enterprise	Male	US
5	Software corporation	Female	US
6	Charitable institution	Female	Australia
7	IT and software company	Male	US
8	IT company	Male	Australia
9	IT company	Female	Australia
10	Academia	Male	Canada
11	Accounting	Female	US
12	Social enterprise	Male	Australia
13	Disability service	Male	Australia
14	Academia	Female	Australia
15	Disability service	Male	Australia
16	IT company	Female	US

Note: * country refers to the location where the participant was located during the interview, acknowledging that some participants work for multinational companies.

electronically.

Sixteen participants were interviewed in 2018 and 2019 to collect information of sufficient complexity and variation. In phenomenology, this figure is usually between 5 and 30 participants depending on the expertise of participants and the intensity of the contact (Cohen et al., 2000). Given the targeting of experts in this research and the emerging nature of neurodiversity initiatives at the workplace, we considered that sixteen participants provided the level of saturation we were looking for. Table 1 provides the list of participants.

Participants were located in Australia, Canada and the US, ensuring a variety of institutional settings. They were all leaders or experts of neurodiversity initiatives, working for multinational companies, social enterprises, charitable institutions, disability services and academia. We paid attention to having a gender mix and a range of professional backgrounds. They all had professional experience and/or knowledge of the IT industry including an extensive knowledge of IT related jobs offered to autistic and other neurodiverse workers. The details of the participants are included in the Table 1. Participants were involved in different ways in neurodiversity initiatives which had different levels of maturity and reached different scales regarding the inclusion of autistic workers. One participant spontaneously mentioned to be autistic and three participants said some members of their family were on the autism spectrum.

3.2. Interview stage

Before the interview, we sent the core questions to the participants. We did not ask them to give a representative view of their organisation, but they were encouraged to give their opinion. They could also decline to answer any of the questions if they wished. We asked for their authorisation to record and transcribe the interview. The duration of the interviews was between 55 min and 2 h. The interviews were carried out through Skype or phone and we held four face-to-face meetings.

The semi-structured interviews were organised around three sets of questions. The first set of questions aimed at identifying the skills of autistic workers and their links to the digital transformation. We probed the participants on the potential complementarity and/or substitution between work and machines in the context of neurodiversity. The second set of questions focused on identifying opportunities and threats for autistic workers associated with artificial intelligence, platforms technologies and the digital skills shortage. The third set of questions concentrated on the digital dimension of the organisational design of neurodiversity.

3.3. Data analysis and coding of material

The framework of analysis presented in Section 2 constitutes an orienting theory (Whyte, 1984) to guide the interviews and facilitate the collection of information. This framework helped us to inform our research questions and explore possible relationships between the digital transformation and neurodiversity management.

We manually coded the material. To code the material, we adopted an integrated approach. It is less constraining than a purely inductive method based on grounded theory and less biased than a start list method. Following guidelines as laid out by Moustakas (1994), we began with broad code types that are reported on Fig. 1 and then developed sub-codes from the data. Initial broad code types referred to the relationships of complementarity and/or substitution between the skills of autistic workers and digital technologies, the links between HR practices of neurodiversity and the use of technologies and finally, at the dynamic of employment of autistic workers in association with automation, AI and platform technologies (cf. Fig. 1). Note that these broad code types were not initially organised by level of analysis. After an initial reading of the interviews, we revised and enriched the initial code structure by adding codes types that emerged from the data. It led us to identify various skills and difficulties of autistic workers that interact with the digital transformation and also to identify that numerous technologies are associated with neurodiversity management.

We used open coding methods to iteratively identify themes that emerged across the interviews (Corbin and Strauss, 2015). By analysing similarities and differences across the material, we expanded the exploration of the plausible links, interactions, relationships between neurodiversity practices, the skills and difficulties of autistic workers and different technologies used at work or developed in the IT industry. We identified different productivity mechanisms governing the relationships between the digital transformation and neurodiversity of the workforce. Our sub-codes were merged to give a broader sense of productivity mechanisms associated with the complementary links between the skills and difficulties of autistic workers, HR practices targeting neurodiversity and the dynamic of employment for IT jobs. We identified different productive complementarities between neurodiversity management and digital transformation observed at the individual, organisational and industry levels that are synthesised in Tables 2–4 presented in the following section. These productive complementarities show how the combination of a dynamic of inclusion targeting neurodiversity with digital transformation of workplaces can generate productivity gains at different levels.

4. Results

The themes that emerged from the data point to several relationships between neurodiversity at the workplace and the digital transformation. The first section highlights the links between the skills of autistic workers and the digital transformation. The second section shows the role played by technologies in the organisational design of neurodiversity. The third section explores the themes that emerged at the industry level.

4.1. Individual level: skills and jobs

Table 2 shows the different forms of productive complementarities between the skill of autistic workers and the digital transformation and includes some illustrative quotes. While participants discussed a variety of areas of interest and skills that they observed within a neurodiverse workforce, they also systematically pointed out notable 'performative' abilities related to the observed performance of a worker when she/he is completing an IT-related task. Among these performative abilities were a different creative thinking and problem-solving capacity, resilience, which support innovation at the workplace and contribute to the digital transformation. Finally, participants discussed the role played by various technologies to mitigate specific difficulties faced by autistic workers such as anxiety. These findings allow us to distinguish two forms of complementarities between the abilities of autistic workers and

Table 2
Direct and indirect productive complementarities between skills of autistic workers and the digital transformation.

#	Skills of autistic workers	Link to digital transformation and source of productivity gains
16 (100%)	A **broad range of skills**, interests, and abilities	It's a stereotype to believe that only IT industry or roles match the skills of autistic workers
People with autism are more logical, but it's not necessary a skillset (…). If you take logical individuals and put them in positions where they are required to organise or synthesise information, they are going to be more adept at that. I do think that there are a lot of stereotypes about people with autism. I don't believe that they have special skills, even though people would argue that. (participants 16)		
16 (100%)	**Performative abilities** (attention to detail, concentration, focus, perseverance, low propension to error, precision, connection between codes and concepts)	**Direct productive complementarity** Productivity gains generated by matching these performative abilities with IT roles, but also risks of stereotyping in IT.
You'll get productivity gains by the types of skills and talents attention to detail, the ability to persevere with the attention to details for long periods of time. (participant 3)		
12 (75%)	**Performative abilities for innovation** (creativity, different thinking, logical thinking, learning capacity, problem-solving capacity)	**Direct productive complementarity** Performative abilities for innovation generate productivity gains, by rationalising processes, improving organisational agility and innovation. Innovation is central in IT.
In warehouse operations, an autistic worker is pointing out something that has been done a certain way for a long time for no particularly good reason and that could be done in a better way. Managers reported that this guy helps them innovate processes on a regular basis because he is actually somewhat antagonized by disorder or absence of logic, or absence in organizing principle. (participant 10) *What autistic people have in common is that they are not understood by employers, often in the school system and sometimes in the families as well (…) They can bring a wealth to companies in innovation and resilience (participant 4)*		
15 (95%)	**Difficulties** (anxiety, stress, social interactions, comorbidities, planning, mobility)	**Indirect productive complementarity** Technologies (of emotion recognition, asynchronous communication, social media, videos, digital assistants, virtual reality) mitigate difficulties of autistic workers, and improve indirectly their productivity.
Right now, things like texting, things like chats on the computer, all of those things facilitate the asynchronous communication that somebody that may have a speech hearing delay would be favoured by. (Participant 5)		

Note: The first column provides the number of participants who discussed each theme, the second column identifies abilities and difficulties of autistic workers, the third column shows the links with the digital transformation and explains the source of productivity gains underlying productive complementarities.

the digital transformation: direct and indirect productive complementarities.

4.1.1. A broad range of skills and interests

All participants mentioned a broad range of abilities, skills and qualification exhibited by autistic workers, including technical degrees, math, STEM, programming and computer science degrees that are directly related to the digital transformation. They also mentioned skills in gaming, language, art, media, history, literature, HR, communication, finance, accounting, medicine, movies and films, and hospitality. The wide set of skills exhibited by autistic workers suggests that they can be a match for a variety of jobs.

4.1.2. Productive complementarities between performative abilities and IT jobs

While participants discussed a variety of areas of interest and skills that they observed among autistic workers, they also systematically pointed out some notable abilities. Attention to detail, a sustained ability to concentrate and focus, strong engagement, ability to identify patterns, learning abilities and creative thinking are abilities that were mentioned by participants who also said that these skills or their combination may strongly differ from one person to another. For five participants, pointing out these specific abilities of autistic people was problematic since it may also contribute to develop stereotypes on autistic workers. For participant 16, these stereotypes are due to the absence of autistic leaders and social diversity within teams managing neurodiversity initiatives.

If our results confirm skills or abilities identified in the literature review presented earlier, their performative nature leading to productivity gains is a unique category that emerged from this research. That is why we grouped them into the category 'performative ability'. The specificity of these abilities is that they are contextual and 'revealed' on the job, when workers are completing their task and are associated with high levels of productivity for workers exhibiting these abilities according to participants. As these performative abilities are in demand in several IT jobs, this first finding shows the existence of productive complementarities between some performative abilities of autistic workers and IT jobs. Indeed, we must keep in mind that very often participants were referring to IT roles when they were describing performative abilities of autistic workers, due to the fact that the digital transformation is the focus of the interview.

We initially assumed that the completion of routine tasks or pattern recognition tasks could be easily automated (refer to graph 1). However, participants did not observe such a substitution effect in practice, even in the IT industry. Participant 14 clearly nuanced the possibility of a perfect substitution pointing out that the human decision making cannot be removed from automated processes in many instances. She gave the example of airport security screening to illustrate the importance of human decision on tasks that could be automated but still require human decision-making involving attention to detail and low tolerance to errors.

4.1.3. Direct complementarity between neurodiversity of the workforce and innovation at the workplace

Performative abilities identified by participants also included in-depth creative thinking and problem-solving capacity, resilience that supports innovation and the digital transformation. Half of the participants discussed the problem-solving capacity of autistic workers in association with their learning abilities, logical thinking and ability to bridge new conceptual frameworks and coding of data with a high level of precision. One participant clearly showed the complementarity between the logical thinking of autistic workers, efficiency gains in problem solving capacity and incremental organisational innovation (cf. quotes in Table 2).

Another form of direct complementarity lies in the link between the cognitive diversity and innovation. 69% of participants (11 participants) emphasised the value of cognitive differences of autistic workers, their creativity and different thinking. This different thinking means that autistic workers identify and solve problems differently, thereby favouring innovation at the workplace.

Resilience was discussed by 19% participants (3 participants) in relation to organisational agility for innovation as illustrated in Table 2. There is a productive complementarity between organisational agility and the cognitive diversity, that comes from the intrinsic value of diversity in a customer-oriented context.

4.1.4. Indirect complementarities

Our research showed the role of technologies to mitigate difficulties of autistic workers. Assistive technologies, while not initially included in our framework of analysis, emerged from the interview as an important category to understand the complementarities between skills of autistic workers and the digital transformation. By reducing difficulties faced by autistic workers, technologies can also improve their performance. There are strong complementarities between 'assistive' technologies and skills of autistic workers that reduce the cost of management of psycho-social risks.

Participants mentioned specific challenges and difficulties faced by workers on the autism spectrum and the importance of an effective management of psycho-social risks. Participant 15 framed the autism spectrum in terms of intersectionalities with other mental health conditions. 69% of participants (11 participants) viewed anxiety as a challenge for autistic workers. They also identified different technologies that may help to manage and reduce anxiety. Participant 5 mentioned how some existing devices measure and recognise emotions through facial recognition and thereby help to monitor anxiety. Participant 4 also referred to a digital watch with an app for the measurement of anxiety, which may help to prevent severe anxiety. Participant 12, who was interviewed face-to-face, presented an app from his mobile phone, which was developed to support autistic workers in their organisation by setting daily routines that people can tick to monitor their day.

Another source of difficulty for some workers on the autism spectrum comes from social interactions that were mentioned by 81% of participants (13 participants). Technologies can favour different forms of communication and social interactions, favouring new forms of written and asynchronous communications as illustrated by the quote reported on the last raw of Table 2. For example, participant 6 mentioned how a worker with difficulties in social interactions used instant messaging to contact his colleagues and signal them if he was focused or approachable with coloured flags.

Finally, 3 participants also spontaneously discussed how the digital transformation could improve the mobility of workers with autism and facilitate access to the workplace. Participant 10 noted that firms such as Uber, by reducing the number of interactions may improve the mobility of autistic workers. Relatedly participant 4 mentioned that the self-driving car may, in the future, improve access to the workplace for autistic workers who are overloaded by information when they are driving. It shows how the digital transformation can, in the future, improve access to the workplace for autistic workers and reduce the recurrence of episodes of anxiety.

4.2. The organisational design of neurodiversity and digital technologies

A set of questions focussed on the role played by digital technologies in the implementation of the organisational design of neurodiversity. The results identified four areas where technologies strongly complement work organisation: recruitment, training and awareness, the

Table 3
Complementarities between neurodiversity management and digital transformation.

#	Neurodiversity management	Link to digital transformation and source of productivity gains
16 (100%)	**Recruitment** (sourcing, matching, interview and evaluation of candidates)	Technologies improve the efficiency of recruitment procedures at all levels
Neurodiversity programmes aim at getting rid of those barriers that are there, and that stigma that's attached, and the apprehension that a lot of employers do have even still when considering diversifying their recruitment strategies (Participant 6).		
15 (94%)	**Training and awareness** (training of autistic workers, co-workers, managers, awareness)	Technologies reduce the cost of training and support inclusion
Some of training are face-to-face, some of them are synchronous online, meaning that I'm presenting using WebEx, for example, or Skype and I'm making a real-time presentation. And then another one is 'I'm on demand', where we would have training for people that they can consume whenever they want, which is also asynchronous but not real-time. And those definitely allow us to help raise awareness. But we also utilize the stories of people. (Participant 5)		
12 (75%)	**Physical environment** (open space, light, noise, stimulation area)	Technologies allow flexible working environments
You need a flexible workspace, that's the thing about workplaces for neurodiverse people, you have to have that ability to have spaces and you need this whole thing around the light, colour, the sound (participant 12)		
13 (81%)	**Support and coaching**	Technologies favour remote coaching and reduce the cost of support
With an app, you can potentially do remote support. So, you have a more distributed part of people who've got this to support … and the supervisor is responsible for the dashboard (participant 12)		

Note: The first column provides the number of participants who discussed each theme, the second column identifies dimensions of neurodiversity management, the third column shows the links with the digital transformation and explains the source of productivity gains underlying productive complementarities.

support system and the physical environment. Table 3 summarises our findings on productive complementarities at the organisational level.

4.2.1. Recruitment

Our results show that digital technologies complement the procedures of recruitment of autistic and other neurodiverse workers, at three different levels: to source candidates through different communication channels and improve the matching between supply and demand. They also help to remove stereotypes during interviews and objectively assess skills of workers.

At an initial level, technologies offer different communication channels to source candidates who are on the spectrum. Moreover, by improving the quality of the matching between employers and candidates, platforms such as LinkedIn can reduce the search costs and frictions on the labour market (for both firms and candidates). Matching functions of technologies can go further than usual platforms. Participant 12 mentioned the benefits of technologies using neuroscience games and AI to distinguish personality traits. While the app measures around 77 personality traits, a good screening of autistic applicant through 10 to 15 traits may improve the matching between applicant and jobs. Digital technologies may improve the matching by replacing the usual CV by "relevant" measures of personality traits:

In the second and third stages, technology helps to rationalise the assessment of skills of individuals and remove stereotypes. Participants distinguish between two components of the traditional interview. The first component includes the impressions generated by the behaviour of candidates to build a rapport with the recruiter, in terms of body language, eye contact, smiles or lengths of answers for example. The second component is the assessment of the actual skills of candidates.

Participants gave various examples of how technological interfaces, robotics, internal platforms or other technical tools are used to assign a task to the candidate that neutralise the impact of the first component of the interview on stereotypes and assess the skills of the candidates. Beyond the academic skills, traditionally measured by HR, neurodiversity recruitment procedures aim at measuring the performative ability of candidates. As performance can only be measured by doing, technology or games can offer efficient ways to screen the performative abilities.

4.2.2. Training and awareness

Training is a core element of the design of neurodiversity that concerns managers and recruiters, workers with autism and co-workers. Four participants mentioned a positive role of virtual reality tools for training purposes. The digitisation of training materials, which allows asynchronous training and computer-based training are different technological tools, which potentially improve the efficiency of training procedures. They can also reach a larger audience and reduce training costs. Participants presented a variety of delivery methods for teaching and awareness materials.

All participants highlighted that awareness was a key ingredient of the success of neurodiversity programs. They referred to social media such as Facebook, LinkedIn and YouTube as powerful tools to raise awareness internally and externally.

4.2.3. Physical environment

A key success factor of neurodiversity initiatives is in the design of "ergonomic" workplaces that minimise sensory issues faced by autistic workers. Locating workstations in low stimulation areas favours concentration. Additionally, very simple technologies, such as headsets or different light colours improves the sensory work environment for autistic workers.

4.2.4. Support ecosystem

The support ecosystem, including job coaching for a period of time, is a key ingredient of the success of inclusion of autistic workers. All participants highlighted the role of buddies and mentors for the successful inclusion of autistic workers. According to participant 12, digital technologies can play a central role, by providing a remote and distributed support network for either the workplace or the home environment.

4.3. Industry level

We asked questions to assess the dynamic of creation and destruction of jobs associated with technological change and the allocation of tasks between workers and machines in a neurodiversity context. We also probed the participants on the potential impact of artificial intelligence, platform technologies and the digital skills shortage on the employment of autistic workers.

Table 4
Links between neurodiversity and digital transformation at the industry level.

#	Impact of digital transformation on the labour market	Link to neurodiversity management
14 (88%)	**Digital skills shortage**	Correlation but no causality: Neurodiversity is a way to address the shortage; Digital skills shortage creates opportunities for a neurodiverse workforce
Largely, we presume, in the virtualisation or the digitalisation or the artificialization veins and so right now in some of those sectors, there is a very low unemployment rate and a very high number of open positions, and it is hard to find talent.(...)We're counting on talent but especially; I would say autistic talent to be a part of our way of addressing the digital revolution which we're in the middle of (participant 1). *For individuals who are on the autism spectrum and have the right technical skillset, there's a tremendous opportunity to influence what AI looks like in the future and it contributes to that. (participant 2)*		
13 (81%)	**Automation and destruction of jobs**	No specific substitution for autistic workers, but rather complementarity
About the division of labour between machines and autistic people or non-autistic people, we don't divide any differently between autistic and non-autistic (participant 1). *We see automation complementing the skills of autistic more than seeing autistic people being a threat in regard to automation. (Participant 3).*		
14 (88%)	**Platforms and crowdworking**	Platforms lower barriers to employment in general. Codification of work and lower level of direct interaction is a context favourable to neurodiversity. Some risks identified.
For people with disabilities, with autism or not, I think it's going to reduce barriers to employment which is the best thing (Participant 2). *Autistic workers don't have the risk of sitting across someone who manipulates them through their social tricks. In order to accept a task and take on a task and this being presented to you electronically, you have to relate to the content and the framework and not to a person that is sewing things and trying to manipulate you. It's more straightforward (Participant 4).*		

Note: The first column provides the number of participants who discussed each theme, the second column identifies themes related to the impact of digital transformation on the labour market and the third column shows the links with neurodiversity management.

Table 4 summarises our results with some illustrative quotes. Participants discussed several opportunities associated with the digital skills shortage. While they expressed general concerns on the destruction of jobs associated with automation, they did not point to any specific risk of automation of jobs for autistic workers. They also identified a positive role for platform technologies favouring the activity of autistic workers.

4.3.1. Digital skills shortage

The digital transformation has a high reliance on workers with digital and STEM skills that are in high demand across sectors. Hence, firms undergoing digital transformation face digital skills shortage and are incentivised to diversify their recruitment. The digital skills gap changes the rules of competition for talent in the labour market as firms from different industries compete to fill the demand for digital skills.

As autistic talents remain largely untapped, firms with neurodiversity programs expect to grow their demand for autistic labour. In this regard, neurodiversity programmes were described by some participants as a strategy to address the digital revolution. During our interviews, participants discussed several IT jobs filled by workers with autism, in software testing, coding, AI or cybersecurity. From that perspective, the digital skills shortage is favourable to the employment of autistic and other neurodiverse workers as it provides jobs opportunities.

However, there is no causal relationship linking the digital skills shortage and neurodiversity initiatives. By closing the gap between the supply of skilled workers and demand, autistic and other neurodiverse workers may contribute to the digital transformation.

4.3.2. The risk of automation is not specific to autistic workers

The interviews included questions to probe the division of labour between workers and machines and identify if the risk of automation is different for autistic workers compared to the general population. Participants acknowledged different concerns or hopes associated with the impact of automation on work, showing that the division of labour between machines and workers varies by the person's skill, the organisation and nature of the activity of the team. However, all participants who discussed this theme clearly stated that the division of labour between workers and machines does not vary with autism as illustrated in the quotes of Table 4, with the exception of participant 10 who was puzzled by the magnitude of potential substitution effects. Participants presented AI and automation as an opportunity rather than a threat to autistic workers.

4.3.3. The inclusive role of platforms

When they discussed the role of platforms for neurodiverse people, participants identified several advantages of platforms for autistic in their personal life. The platform model favours a better inclusion of all individuals since it favours, for example, indirect social interactions with Facebook, it favours mobility with Uber, and it provides an infrastructure to sell products for entrepreneurs on E-Bay. The digital economy offers the possibility of remote work that may well accommodate workers and that may reveal their entrepreneurial capacity. Participant 5 presented the example of a young autistic man who had a passion for baking and decided to run a biscotti baking business from home, due to some sensory problems, and to sell them online. While the digital economy revealed his entrepreneurial abilities, this young man also

contributes to the expansion of the digital economy.

Our interviews more specifically focused on crowdworking platforms. 88% of participants (14 participants) considered these platforms as new employment opportunities for autistic workers, as for the general population. First, as there are no selection procedures on these platforms, they do not exclude workers with autism through biased recruitment procedure. This is why they are more inclusive. The second characteristic of crowdworking platforms is the reduced level of social interactions and a detailed codification of the task to be realised. They offer a context favourable to the work of autistic workers. However, participants also highlighted some potential problem in the platform model, with very heterogeneous views about the potential vulnerabilities of autistic workers in this context. This is especially the case where there is no mentor or support.

4.4. Limitations and extensions

This research has a few limitations. Aligned with the phenomenological approach, our own biases on autism and the digital transformation may be translated in this research. Moreover, the results are not generalizable to other groups. Let us note that results obtained at the individual level showing direct complementarity links between performative skills of autistic workers and IT roles may not be transferable for other neurodiverse workers or for autistic workers with developmental delays. Moreover, additional studies into the same phenomenon may reveal different and additional meanings. Nevertheless, our research may be used to inform similar studies.

Secondly, for the question on the role of crowdsourcing platforms, we did not manage to reach the level of saturation to allow a conclusion on what kind of risks these new technologies may present for autistic workers. However, the material provides different insights that may be useful to guide future research.

Thirdly, challenges when implementing neurodiversity initiatives were also presented by participants. They were related to comorbidities that some autistic workers may exhibit, such as severe anxiety, mental issues and learning delays. However, these challenges were not directly connected to digital transformation. That is why they were not detailed in this paper, even if they represent an important aspect of neurodiversity management. Clearly, the digital transformation was presented as a facilitator of neurodiversity management. Note that the role of technologies to mitigate anxiety was presented in Section 4.1. It shows how technologies may be leveraged to support the management of mental health issues and psycho-social risks at the workplace.

Fourthly, understanding stereotypes associated with autism and neurodiversity is central when analysing questions related on inclusion and diversity. Analysing these stereotypes goes beyond the scope of this paper but remains an important question to be analysed in the future. Our sample included only one participant who declared to be autistic. This participant extensively discussed positive and negative stereotypes of parents of autistic children, co-workers and leaders of neurodiversity initiatives. This idiosyncratic interpretation of stereotypes on autistic workers was not related to digital transformation. Note that the absence of a representative number of neurodiverse leaders in our sample may bias our results. It may be a reason why the role of technologies for self-advocacy and self-determination that are important aspects of inclusion and diversity were not discussed. It could also reflect the low maturity of neurodiversity management that is still an emerging trend.

Finally, our unit of analysis (experts of neurodiversity initiatives) also imposes some limits. For example, to have a good description of the organisational design of a workstation and the work content, autistic workers should be interviewed too. Matched employer-employee data should be collected.

5. Discussion and concluding remarks

This paper provided an original conceptual framework to analyse the relationship between neurodiversity practices and the digital transformation. It shows strong complementarities between neurodiversity management and the digital transformation at the individual, organisational and industry level.

First of all, this paper analysed the complementarity and/or substitutability between the skills of autistic workers and the digital transformation. Our results at the individual level show that autistic workers supply skills and abilities that strongly complement the digital transformation.

While autistic workers offer a wide range of skills, some of them exhibit performative abilities that are in high demand in IT roles. Their cognitive differences, creativity and resilience are also in high demand in the context of the digital transformation. These kinds of skills generate productivity gains since they favour innovation and organisational agility. It demonstrates a strong complementarity between the cognitive skills of autistic workers, innovation and skills demanded in IT roles.

However, jobs of autistic workers are also at risk of automation, especially when workers' roles are defined by routine or repetitive tasks. For leaders of neurodiversity initiatives, automation represents a general phenomenon and an opportunity for autistic workers. While the risks of destruction of jobs are the same for autistic workers and for the general population, growing opportunities offered by the digital transformation represent an excellent match with the skills of some autistic workers. For example, the development of artificial intelligence and platform technologies offer new opportunities of employment for autistic and other neurodiverse workers.

Assistive technologies are a major source of productive complementarities with the skills of autistic workers. Indeed, assistive technologies reduce and mitigate difficulties related to anxiety or social interactions faced by autistic workers at the workplace. This complementarity of assistive technologies with "disabilities" of autistic workers improves their efficiency. More generally, digital technologies support the management of mental health issues and psycho-social risks at the workplace, which is an essential element of neurodiversity management. Indeed, digital technologies can help to monitor anxiety and stress, support digital feedbacks and asynchronous communication and support workers in their organisation.

The second purpose of this paper was to explore the technological dimension of the organisational design of neurodiversity. We found that technologies strongly complement the organisational design of neurodiversity at the level of recruitment, training and awareness, to favour a physical environment and a support system which is neurodiverse friendly.

The use of technologies for removing behavioural stigma and directly measuring the performative abilities of individuals are strong complements of neurodiversity practices of recruitment. Apps that evaluate applicants on their personality traits represent a new way to screen applicants that may be favourable to autistic workers who may have difficulties to describe their trajectory in a CV. Said differently, digital technologies contribute to reduce both the stereotyping of autistic workers and consequent hiring discrimination. Digital technologies also facilitate the sourcing of candidates and a better matching between neurodiverse employers and candidates. At all stages of the recruitment process, sourcing, screening, interviewing and matching, digital technologies complement inclusive practices by controlling or removing the stereotypes associated with autistic workers.

Awareness and training represent key elements of neurodiversity programmes. By going digital, online neurodiversity training programs reach a larger audience at a lower cost. Virtual reality offers new ways to drive efficient learning. Moreover, the use of social media to increase awareness of neurodiversity initiatives offers powerful ways to involve different internal and external stakeholders. Once again, we observe productive complementarities in the management of neurodiversity and digital technologies.

The physical environment generates stimuli that can impact

perception of workers. Simple technologies such as headsets can help to develop an ergonomic environment that supports autistic people to work effectively. Moreover, digital technologies reduce the cost of the support and coaching systems for autistic workers. By distributing the support system and allowing remote advice, new applications of support can improve the efficiency of neurodiversity initiatives.

This paper also aims to determine if the digital skills shortage relates to neurodiversity practices. We observed that at the industry level, the digital skills shortage is strongly connected to the development of neurodiversity initiatives. By helping to close the digital skills shortage, a neurodiverse workforce favours the digital transformation. Tapping in the pool of autistic talents is an efficient and inclusive way to diversify the recruitment practices. By providing employment opportunities to autistic workers, the digital transformation also favours neurodiversity.

Finally, by exploring various neurodiversity initiatives as described by the research participants, we wanted to check if there is a role for digital technologies to favour inclusion and reduce inequalities at the workplace. We observed that neurodiversity management provides an effective model of inclusion, emerging from the private sector, that can mitigate the development of inequalities associated with the digital transformation. This model of management, focused on the singularity of each worker, can produce positive externalities for the whole workforce by reducing hiring discrimination and improving the management of mental health and psycho-social risks at the workplace. Neurodiversity initiatives provides a model to make the digital transformation inclusive and improve well-being at work for all workers.

Author statement

Dr Emmanuelle Walkowiak is the single author of this paper. She collected and analysed the data. She wrote the paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.techfore.2021.120739.

Reference

Acemoglu, D., Autor, D., 2011. Chapter 12 - skills, tasks and technologies: implications for employment and earnings. In: Card, D., Ashenfelter, O. (Eds.), Handbook of Labor Economics. Elsevier, pp. 1043–1171. https://doi.org/10.1016/S0169-7218(11)02410-5.

Acemoglu, D., Restrepo, P., 2020. Robots and Jobs: evidence from US Labor Markets. J. Polit. Econ. 128, 2188–2244. https://doi.org/10.1086/705716.

Ameri, M., Schur, L., Adya, M., Bentley, F.S., McKay, P., Kruse, D., 2018. The disability employment puzzle: a field experiment on employer hiring behavior. ILR Rev. 71, 329–364. https://doi.org/10.1177/0019793917717474.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders, 5 edition. American Psychiatric Association Publishing, Washington, D.C.

Austin, R.D., Fieldhouse, M., Mohan, A., Quinn, P., 2017. Why the Australian defence organization is recruiting cyber analysts on the autism spectrum. Harv. Bus. Rev.

Austin, R.D., Pisano, G.P., 2017. Neurodiversity as a competitive advantage. Harv. Bus. Rev. 95, 96–103.

Austin, R.D., Sonne, T., 2014. The Dandelion principle: redesigning work for the innovation economy. MIT Sloan Manag. Rev. Camb. 55, 67–72.

Autism Europe, 2014. Autism and work together we can.

Baron-Cohen, S., Ashwin, E., Ashwin, C., Tavassoli, T., Chakrabarti, B., 2009. Talent in autism: hyper-systemizing, hyper-attention to detail and sensory hypersensitivity. Philos. Trans. R. Soc. Lond. B Biol. Sci. 364, 1377–1383. https://doi.org/10.1098/rstb.2008.0337.

Boucher, J., 2008. The Autistic Spectrum: Characteristics, Causes and Practical Issues, 1 edition. SAGE Publications Ltd, Los Angeles.

Bury, S.M., Hedley, D., Uljarević, M., Dissanayake, C., Gal, E., 2019. If you've employed one person with autism: an individual difference approach to the autism advantage at work. Autism 23, 1607–1608. https://doi.org/10.1177/1362361318794937.

Camiña, E., Díaz-Chao, Á., Torrent-Sellens, J., 2020. Automation technologies: long-term effects for Spanish industrial firms. Technol. Forecast. Soc. Change 151, 119828. https://doi.org/10.1016/j.techfore.2019.119828.

Cappelli, P.H., 2015. Skill gaps, skill shortages, and skill mismatches: evidence and arguments for the United States. ILR Rev. 68, 251–290. https://doi.org/10.1177/0019793914564961.

Christensen, D.L., Bilder, D.A., Zahorodny, W., Pettygrove, S., Durkin, M.S., Fitzgerald, R.T., Rice, C., Kurzius-Spencer, M., Baio, J., Yeargin-Allsopp, M., 2016. Prevalence and characteristics of autism spectrum disorder among 4-year-old children in the autism and developmental disabilities monitoring network. J. Dev. Behav. Pediatr. 37, 1–8. https://doi.org/10.1097/DBP.0000000000000235.

Cohen, M.Z., Kahn, D.L., Steeves, R.H., 2000. Hermeneutic Phenomenological Research: A Practical Guide for Nurse Researchers, 1st edition. SAGE Publications, Inc, Thousand Oaks, Calif.

Corbin, J., Strauss, A., 2015. Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, Fourth edition. SAGE Publications, Inc, Los Angeles.

Dengler, K., Matthes, B., 2018. The impacts of digital transformation on the labour market: substitution potentials of occupations in Germany. Technol. Forecast. Soc. Change 137, 304–316. https://doi.org/10.1016/j.techfore.2018.09.024.

Frey, C.B., Osborne, M.A., 2017. The future of employment: how susceptible are jobs to computerisation? Technol. Forecast. Soc. Change 114, 254–280. https://doi.org/10.1016/j.techfore.2016.08.019.

Fung, L., 2019. Neurodiversity is strength! The power of neurodiversity in school and at work. Presented at the 2019 Summit ' transitioning to a neurodiverse workplace', autism at work, Melbourne, Australia.

Goos, M., Manning, A., Salomons, A., 2014. Explaining job polarization: routine-biased technological change and offshoring. Am. Econ. Rev. 104, 2509–2526.

Happé, F., Frith, U., 2009. The beautiful otherness of the autistic mind. Phil. Trans. R. Soc. B 364, 1345–1350. https://doi.org/10.1098/rstb.2009.0009.

Hollocks, M.J., Lerh, J.W., Magiati, I., Meiser-Stedman, R., Brugha, T.S., 2019. Anxiety and depression in adults with autism spectrum disorder: a systematic review and meta-analysis. Psychol. Med. 49, 559–572. https://doi.org/10.1017/S0033291718002283.

Krzeminska, A., Austin, R.D., Bruyère, S.M., Hedley, D., 2019. The advantages and challenges of neurodiversity employment in organizations. J. Manag. Organ. 25, 453–463. https://doi.org/10.1017/jmo.2019.58.

Lambrecht, A., Tucker, C., 2019. Algorithmic bias? An empirical study of apparent gender-based discrimination in the display of STEM career ads. Manag. Sci. 65, 2966–2981. https://doi.org/10.1287/mnsc.2018.3093.

Last, C., 2017. Global commons in the global brain. Technol. Forecast. Soc. Change 114, 48–64. https://doi.org/10.1016/j.techfore.2016.06.013.

Manen, M.van, 2018. Researching Lived Experience: Human Science for an Action Sensitive Pedagogy, 2nd edition. Routledge, London New York.

Markel, K.S., Elia, B., 2016. How human resource management can best support employees with autism: future directions for research and practice. J. Bus. Manag. 22, 16.

McAfee, A., Brynjolfsson, E., 2018. Machine, Platform, Crowd: Harnessing Our Digital Future, 1st edition. W. W. Norton & Company, New York London.

Milgrom, P., Roberts, J., 1990. The Economics of modern manufacturing: technology, strategy, and organization. Am. Econ. Rev. 80, 511–528.

Mitchell, T., Brynjolfsson, E., 2017. Track how technology is transforming work. Nature 544, 290–292. https://doi.org/10.1038/544290a.

Montes, G.A., Goertzel, B., 2019. Distributed, decentralized, and democratized artificial intelligence. Technol. Forecast. Soc. Change 141, 354–358. https://doi.org/10.1016/j.techfore.2018.11.010.

Mottron, L., Dawson, M., Soulières, I., Hubert, B., Burack, J., 2006. Enhanced perceptual functioning in autism: an update, and eight principles of autistic perception. J. Autism Dev. Disord. 36, 27–43. https://doi.org/10.1007/s10803-005-0040-7.

Moustakas, C., 1994. Phenomenological Research Methods, 1st edition. SAGE Publications, Inc, Thousand Oaks, Calif.

OECD, 2017a. OECD Digital Economy Outlook 2017. OECD. https://doi.org/10.1787/9789264276284-en.

OECD, 2017b. Getting Skills Right: Skills for Jobs Indicators, Getting Skills Right. OECD. https://doi.org/10.1787/9789264277878-en.

O'Neil, C., 2016. Weapons of Math Destruction. Crown Publishing Group, New York.

Piketty, T., 2017. Capital in the Twenty-First Century, 1st edition. Belknap Press.

Rosenblat, A., 2019. Uberland: How Algorithms are Rewriting the Rules of Work. University of California Press, Berkeley. https://doi.org/10.1525/9780520970632.

Schwab, K., 2017. The Fourth Industrial Revolution. Currency, New York.

Seitz, S.R., Smith, S.A., 2016. Working toward neurodiversity: how organizations and leaders can accommodate for autism spectrum disorder. J. Bus. Manag. 22, 18.

Weaver, A., Osterman, P., 2017. Skill demands and mismatch in U.S. manufacturing. ILR Rev. 70, 275–307. https://doi.org/10.1177/0019793916660067.

Whittaker, M., Alper, M., Bennett, C.L., Hendren, S., Kaziunas, L., Mills, M., Morris, M.R., Rankin, J., Rogers, E., Salas, M., West, S.M., 2019. Disability, Bias, and AI (No. MSR-TR-2019-38). AI Now Institute.

Whyte, W.F., 1984. Learning From the Field: A Guide From Experience, 1st edition. SAGE Publications, Inc, Newbury Park, Calif.

Zyskowski, K., Morris, M.R., Bigham, J.P., Gray, M.L., Kane, S.K., 2015. Accessible crowdwork? Understanding the value in and challenge of microtask employment for people with disabilities. In: Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing - CSCW '15. Vancouver, BC, Canada. ACM Press, pp. 1682–1693. https://doi.org/10.1145/2675133.2675158.

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