

Understanding the Relationship between Assistive Technologies and Disabled People's Entrepreneurship

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ABSTRACT

This research aims to enhance our understanding of the relationship between assistive technologies (ATs) and disabled entrepreneurs, specifically who these latter are and how they perceive the value of assistive technologies. Nineteen in-depth semi-structured interviews were carried out remotely with disabled self-employed individuals from France to answer the research question. Semantic analysis was used to make sense of and synthesize the main emerging ideas. The results identified five themes grouped into three main categories. The first is related to the description of the disabled entrepreneurs' profile, which goes beyond the classic categorization of entrepreneurship. They have developed through their experiences some specific entrepreneurial competencies: personal self-knowledge, self-management, self-awareness, self-assertion, resilience, persistence, courage, emotional intelligence, innovation and adaptability. The second is related to the perceived value of assistive technologies to disabled entrepreneurs and their impact on their daily life. In fact, the disabled entrepreneurs' use of assistive technologies was found to have implications for the enhancement of their social inclusion and quality of life by gaining more independence, self-control, self-confidence and self-esteem, as well as knowledge and skills. Finally, despite the personal and professional benefits of assistive technologies, issues of digital accessibility were noted as challenges (desires for future assistive technological devices).

Keywords: Assistive technologies, Disabled entrepreneurs, Self-employment, Disability, Entrepreneurship.

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فهم العلاقة بين التكنولوجيات المساعدة وريادة الأعمال لذوي الاحتياجات الخاصة

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ملخص

يهدف هذا البحث إلى تعزيز فهمنا بشأن التكنولوجيات المساعدة (ATs) وأصحاب المشاريع ذوي الاحتياجات الخاصة. وبشكل أكثر تحديداً، تستكشف هذه الورقة من هم هؤلاء وكيف يدركون قيمة التكنولوجيات المساعدة. تم إجراء تسعة عشر مقابلة شبه منظمة متعمقة، عن بعد، مع رواد الأعمال الفرنسيين من ذوي الاحتياجات الخاصة. وتم إجراء تحليل البيانات باستخدام التحليل الدلالي لفهم الأفكار الرئيسية الناشئة وتجميعها. وقد حددت نتائج هذه الدراسة خمسة مواضيع مجمعة في ثلاث فئات رئيسية. تتناول الدراسة أولاً وصف الملف الشخصي لرواد الأعمال المعاق الذي يتجاوز التصنيف الكلاسيكي لريادة الأعمال. فقد طور رواد الأعمال المعاقون عبر خبراتهم بعض الكفاءات الريادية المحددة، مثل: المعرفة الذاتية الشخصية، والإدارة الذاتية، والوعي الذاتي، وتأكيد الذات، والمرونة، والمثابرة، والشجاعة، والذكاء العاطفي، والابتكار، والقدرة على التكيف. ويتعلق الأمر الثاني بالقيمة المتصورة للتكنولوجيات المساعدة من قبل رواد الأعمال من ذوي الإعاقة وتأثيرها في حياتهم اليومية. علاوة على ذلك، وجد أن استخدام التكنولوجيات المساعدة من قبل رواد الأعمال ذوي الإعاقة له آثار على تعزيز اندماجهم الاجتماعي وتحسين نوعية حياتهم من خلال اكتساب المزيد من الاستقلال، وضبط النفس، والثقة بالنفس، واحترام الذات، والمعرفة، والمهارات. أخيراً، تُظهر النتائج أنه على الرغم من الفوائد الشخصية والمهنية للتكنولوجيات المساعدة، فقد اعتُبرت قضايا إمكانية الوصول الرقمي على أنها تحديات (رغبات للأجهزة التكنولوجية المساعدة المستقبلية).

الكلمات الدالة: التكنولوجيات المساعدة، أصحاب المشاريع ذوو الاحتياجات الخاصة، العمل الحر، ريادة الأعمال الخاصة بذوي الاحتياجات الخاصة.

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INTRODUCTION

According to the World Health Organization (2018), more than a billion people, approximately 15% of the world's population, live with disabilities. These people face a number of challenges in today's society (Hanif et al., 2017). Although French law requires companies to integrate people with disabilities into their workforces, in practice, disabled workers in the workplace remain victims of prejudice (Hamonet, 2012). Their unemployment rate in France is around 21%, double the threshold for able-bodied people (Insee, 2014). In 2019, only 24% of disabled people had a bachelor's degree (Talenteo, 2019).

The increasing precariousness of the labor market and the precariousness of the financial or material situation are phenomena that particularly affect disabled people. According to Seuret (2021), 40% of people with disabilities consider their financial situation to be difficult. This can be explained by the fact that about 70% of disabled people suffer a form of social exclusion (EDS, 2010). They encounter daily forms of discrimination, frustration, feelings of rejection, isolation, incomprehension and injustice (Blanck et al., 2000; Boylan & Burchardt, 2002; EMDA, 2009, *as cited in* Halabisky, 2014; Hagner & Davies, 2002), leading them to leave work or even change careers, making them more likely to be unemployed or inactive (Applica/CESEP/European Centre, 2007, *as cited in* Halabisky, 2014; Greve, 2009; Pagán, 2009).

Improving the living conditions of people with disabilities, meeting their needs through social solidarity, integrating them into socioeconomic and cultural life and satisfying their fundamental rights have become a major concern for society in recent years.

Self-employment and entrepreneurship are recognized among the solutions capable of alleviating the phenomenon of exclusion of the disabled, increasing their participation in the labor market and the economic development of the country (Fabricio et al., 2014; Halabisky, 2014; Hwang & Roulstone, 2015; Jones & Latreille, 2011).

Today, France has 75,040 disabled entrepreneurs, whether they are company directors, managers, liberal professionals, self-entrepreneurs, micro-entrepreneurs, shopkeepers, craftsmen or business creators (H'up Entrepreneurs, 2021).

From this perspective, technologies play a crucial role in maintaining an active and independent lifestyle for people with disabilities (Sans-Bobi et al., 2012). Indeed, new technologies, *inter alia* assistive technologies (ATs), helped revolutionize what it means to live with a disability today. They have considerably improved disabled people's daily lives, both personally and professionally and helped change the negative image that they carry and project as incapable and useless people in society. These ATs help increase the number of opportunities for social participation among people with disabilities (Folan et al., 2015; Mattar et al., 2015; Raghavendra et al., 2015). Darcy et al. (2016) argued that ATs strengthen the autonomy and skills of people with disabilities and increase their level of participation and social inclusion. Moreover, Caute and Woolf (2016) found that technologies, such as the voice recognition system, support writing and reading in order to increase the level of social participation of people with disabilities. These ATs are increasingly based on artificial intelligence (AI). In fact, more and more companies and startups' founders are interested in implementing techniques and tools, such as machine learning, neural networks, synapses, supervised learning, predictive algorithms, transhumanism, nanotechnologies,... etc., in order to simulate the creation of a business by people with disabilities. For researchers, like Darcy et al. (2016), Manzoor and Vimarlund (2018), Mattar et al. (2015) and Raghavendra et al. (2015), ATs based on AI afford disabled people greater entrepreneurship opportunity by enhancing and expanding their communication, learning, independence, participation in society and achievement with higher levels of well-

being and quality of life. Moreover, ATs based on AI can help people with disabilities start their own businesses, first by boosting their self-esteem and self-confidence, which will improve their ability to engage in society (Seelman, 2008, *as cited in* Vaziri et al., 2014), second by helping them interact with their clients and establish relationships with suppliers, business partners, donors and creditors (Guffey & Loewy, 2008, *as cited in* Vaziri et al., 2014) and third by helping disabled entrepreneurs manage and assess their commercial processes (Vaziri & De Oliveira, 2012, *as cited in* Vaziri et al., 2014).

Socially and economically marginalized (Anderson & Galloway, 2012) people with disabilities have been the subject of very little scientific study in the field of entrepreneurship. In addition, despite the large and growing number of different technologies that have been used to develop devices for disabled people (Vaughn, 2006), the increasing number of people with disabilities worldwide (Anderson & Galloway, 2012) and the economic and professional challenges that they face, very little is known about current ATs and how they are used by disabled people to start up businesses. In order to address this knowledge gap, further research is required to better understand the relationship between assistive technologies (ATs) and disabled entrepreneurs. More specifically, this article explores the following research question: Who are these latter and how do they perceive value of assistive technologies?

The remainder of this paper is structured as follows. The article starts with a theoretical background on self-employment and entrepreneurship of disabled people and ATs. Then, the paper outlines the research methodology and the data analysis. After that, the study presents the empirical findings, followed by a discussion. The article closes with concluding remarks and future-research avenues.

Theoretical Background

To understand the relationship between assistive technologies (ATs) and disabled entrepreneurs, we need first

to characterize and determine their profile. Thus, the researcher should identify the theories that will comprise the basis of our study. In this research, we will mobilize the social cognitive theory of Bandura (1986) and the planned-behavior theory of Ajzen (1991).

The social cognitive theory (SCT) developed by Bandura (1986) proposes to capture the factors related to both the person and the environment that shape an individual's choice to engage in entrepreneurship. SCT postulates that learning occurs in a social context with a dynamic and reciprocal interaction of person, environment and behavior. Bandura (1989: 1175) stated that "*Persons are neither autonomous agents nor simply mechanical conveyers of animating environmental influences. Rather, they make causal contribution to their own motivation and action within a system of triadic reciprocal causation.*" This theory proposes that behaviors are created by bidirectional influences between (a) behavior, (b) personal factors and (c) environmental influences (Haegele et al., 2017:913).

Knowing that our study is about disabled people, SCT is an appropriate theoretical framework for exploring determinants of physical-activity behavior, as argued by Haegele et al. (2017:913). They stated that:

SCT has become one of the most commonly used and accepted theoretical models for understanding health behaviors including physical activity (Motl, 2007). . . . As such, SCT has been used in physical-activity research pertaining to typically developing individuals (Rovniak et al., 2002), as well as individuals with hearing impairments (Martin et al., 2013), intellectual disabilities (Peterson et al., 2008) and spinal-cord injuries (Martin Ginis et al., 2011).

The planned-behavior theory is mobilized, because

we are looking to explain the entrepreneurial behavior of disabled people based on their attitudes and perceptions; specifically their personal characteristics and previous experience (Ajzen, 1991, *as cited in* Salah, 2014).

Indeed, the theory of planned behavior explains entrepreneurial intention based on three cognitive antecedents (Ajzen, 1991; Salah, 2014) which are manifested through personal attitude, subjective norms and perceived behavioral control. First, the personal attitude refers to the favorable or unfavorable evaluation of the behavior targeted by the individual. Second, subjective norms capture the opinions of social reference groups, such as family and friends, about whether the individual should perform the behavior. Third, perceived behavioral control denotes the perceived ease or difficulty of performing the behavior in question.

In the following part, we will start by determining, first, the profile of the disabled entrepreneurs; second, self-employment and entrepreneurship of disabled people; and finally, assistive technologies and entrepreneurship, with a focus on the perceived value of assistive technologies.

The Profile of Disabled Entrepreneurs

The profile of disabled entrepreneurs which will be described below is focused on four components (Mota et al., 2020): age (Pavey, 2006), gender (García & Capitán, 2019; Mohan & Baruah, 2019; Williams & Patterson, 2019), entrepreneurial skills (Bagheri & Abbariki, 2017; Barba-Sánchez et al., 2019; Capitán & García, 2019; Olmedo-Cifuentes & Martínez-Léon, 2019) and psychological characteristics (Hernández & Pérez, 2019). As Pavey (2006) asserted, young or senior disabled people could be entrepreneurs. Age is not considered as a determinant component of launching their own firms and starting their careers as entrepreneurs.

Unlike age, gender is a discriminant condition for undertaking an entrepreneurial career for disabled people. In fact, many researchers have argued that people with disabilities are more likely to start an entrepreneurial career

or have the intention to do so when they are men than when they are women. For García and Capitán (2019) and Valencia (2010), a disabled woman is encouraged to start a business, because she needs greater personal independence. As for Langowitz and Minnitti (2007), disabled women start an entrepreneurial career out of necessity, to avoid either a precarious work situation or a situation of unemployment.

In order to investigate and understand the relationship between disability and gender “*as social categorizations which can shape entrepreneurial opportunities and experiences for disabled women entrepreneurs*” (p. 1706), Williams and Patterson (2019) concluded that becoming entrepreneurs and starting their own businesses are more challenging for women than for men, which supports the findings of Mohan and Baruah (2019). They found that the prevalence rate of entrepreneurship among women with disabilities is very low. However, they argued that disabled women entrepreneurs manage their businesses better in terms of higher turnover and capital employed than disabled men entrepreneurs, who manage better in terms of profits, diversification and return on investment.

Olmedo-Cifuentes and Martínez-Léon (2019) showed that the competencies of disabled entrepreneurs, such as detecting others’ personal development needs, promoting their growth, encouraging change in the organization and managing conflicts in negotiating agreements appropriately, are significantly related to their intention to develop their own businesses.

As for Bagheri and Abbariki (2017), they showed that entrepreneurs with physical and mobility disabilities have developed through their lived experiences two kinds of entrepreneurial competencies: personal and functional. The first kind includes attitudinal competencies, entrepreneurial self-efficacy and entrepreneurship learning self-efficacy.

The second kind encompasses entrepreneurial competencies, commitment and social competencies.

Sanchez et al. (2019) retained four dimensions of the entrepreneurial competence of the interviewed disabled people which influenced their entrepreneurial intention and action (or behavior: personal self-knowledge, self-management, alterity and social competence.

Capitán and García (2019) determined six vital moderating competences for empowerment of entrepreneurship in people with disabilities: self-confidence, initiative, adaptability, teamwork, optimism and self-evaluation. Hernández and Pérez (2019) called some of these competences “psychological characteristics” of disabled entrepreneurs and classified them into two categories. The first category refers to personal characteristics that define disabled entrepreneurs. It includes the following 12 competences: self-esteem/self-confidence, security/strength, adaptability, self-realization/self-improvement, optimism, realism and mental clarity, resilience, utility and social recognition, autonomy, self-appraisal, emotional intelligence and motivation. The second category refers to social characteristics projected toward the company. It is composed of eight competencies that are considered as “specific characteristics” of entrepreneurs with disabilities to relay to others and their capability to manage social relations and develop their businesses: business initiative, empathy/ service orientation, feeling supported/ accompanied, teamwork, leadership, social skills/sociability, transparency and conflict management.

Self-employment and Entrepreneurship of Disabled People

Before identifying the factors explaining the self-employment and entrepreneurship of disabled people, the researcher thinks that it is valuable to define what entrepreneurship and disability are and who disabled entrepreneurs are.

Sandri (2016: 419) defined entrepreneurship “as the process of new ventures’ creation.” He argued that one could not dissociate entrepreneurship from the entrepreneur,

whom Reitan (1997) considered as the owner and/or founder of a firm and as someone who assumes risk, takes responsibility and innovates.

The World Health Organization (2011) defined disability as an *impairment that may vary in terms of the type, duration, stability and severity. . . . According to the World Health Organization, disability is an umbrella term that has three components: (1) impairments, (2) activity limitations and (3) participation restrictions. This is a broadly-based definition included for medical classification referred to as the International Classification of Functioning established by the World Health Organization (2011). This includes people with mental and physical disadvantages that are affected by society in which they live* (Maritz & Laferriere, 2016: 46).

Maritz and Laferriere (2016:47), based on the OECD report (2010), defined disabled entrepreneurs as all people or groups who “are disadvantaged and under-represented in entrepreneurship and self-employment”. Hence, this kind of entrepreneurship is called “inclusive entrepreneurship,” as it “contributes to social inclusion to give all people an equal opportunity to start and operate a business” (Maritz & Laferriere, 2016:46).

There is an extensive literature that gives valuable information on the determinants of self-employment and entrepreneurship among disabled people. Kitching (2014) argued that these determinants could be divided into two groups: pull factors and push factors. A pull factor is related to individuals’ choices to become self-employed and entrepreneurs, which are motivated by their search for independence/autonomy value (Kašperová & Kitching, 2014; Miller & Breston-Miller, 2017) and their freedom from access-related obstacles (Tamara, 2001); namely, difficult work environment, cultural misfit, transportation, the need for personal assistance and fatigue (Saxena & Pandya, 2018). Pagán (2009) showed that people with

disabilities were more likely to be self-employed than people without disabilities. Moreover, self-employment provides flexibility in working hours, a better adjustment between disability status and working life (e.g. location of work, accommodation of special needs in the workplace and a high degree of job satisfaction). Ashley and Graf (2018) showed that self-employed people with disabilities desired an opportunity to thrive in areas of interest and passion and were interested in controlling their own destinies, creativity and financial gain.

The push factors include unemployment, employer discrimination, skeptical opinion and negative experiences (Pagán, 2009) or others' negative perceptions about disability (Schur, 2002). For Larsson (2006), entrepreneurship should also be considered as a viable option for people with disabilities. Ashley and Graf (2018) have found that people with disabilities are motivated by previous negative work experiences. They see self-employment as a last resort and chance. Moreover, various studies have emphasized the lack of opportunities from a push perspective assimilated to a kind of employer discrimination (Maritz & Laferriere, 2016). Employers see disabled people as non-viable employees. They are underpaid, they lose their benefits and their abilities are not recognized by companies that do not offer them work (Korpysa, 2009). Thus, self-employment might be considered by disabled people as an opportunity to start and succeed in a professional and entrepreneurial career (Ostrow et al., 2019). For Pagán (2009), self-employment could be considered a viable and feasible alternative to enter or re-enter the labor market. In addition to push factors and pull factors, there are many other barriers that face people with disabilities starting a business or pursuing an entrepreneurial career (Harris et al., 2014). Among these obstacles, the literature in this area provides us with a diverse set that could be personal, economic/financial, social (Csillag et al., 2019) and physical (Casado & Casau, 2019; Lloret et al., 2019). Mohammed and Jamil (2015) examined the barriers faced by disabled entrepreneurs and compared them with those faced

by other types of entrepreneurs. They found that the former have to overcome more barriers to obtain funding and governmental support.

Casado and Casau (2019) identified that the physical inaccessibility of education and of information and communication technologies limits disabled people's autonomy and consequently affects their likelihood to access to the job market even through entrepreneurship. Lloret et al. (2019) undertook a study to identify economic and organizational barriers to disabled entrepreneurship. Their findings have shown that the choice of the sector in which to operate and develop business activities and/or projects is crucial to overcome barriers in terms of financing, which are related to the entrepreneurs' type of disability. In order to cope with these barriers and obstacles, Lin et al. (2019) introduced the notion of "digital entrepreneurs," which is based on the use of the internet as a crucial determinant for disabled people to be included in the professional and entrepreneurship sphere. In fact, using the internet is a vital way to generate activities and to promote hidden skills and potential. Subsequently, most important barriers for disabled entrepreneurs can be diminished or even eliminated through technology, especially through ATs (Vaziri et al., 2014).

Assistive Technologies and Entrepreneurship: The Perceived Value of Assistive Technologies

ATs are considered as part of the accessible technologies enabling disabled people to enhance their daily life, maintain an active and independent lifestyle (Vaziri et al., 2014) and be part of and participate fully in society (Sans-Bobi et al., 2012; Seelman, 2008, *as cited in* Vaziri et al., 2014). For many authors and official institutions, ATs are fundamentally related to artifacts, products, devices or "*any item, piece of equipment or product system . . . that is used to increase, maintain or improve functional capabilities*

of individuals with disabilities” (Part A, Sec 602 (1) in Lewis, 1998: 16). For Angelocci et al. (2008), ATs are defined as “a generic term that includes rehabilitative, adaptive and assistive devices and the procedure used in selecting and using them (Assistive Technology, Wikipedia, n.d.)” (p. 2). These technologies find their foundation in 1890, when the first hearing aid was patented (Miltimore, 1892, as cited in Vaziri et al., 2014: 3). After this crucial invention, several others followed, such as the first artificial speech synthesizer, developed by Dudley in 1936 and the first speech recognition system, developed by Bell Laboratories (Green & Blair, 2011, as cited in Vaziri et al., 2014). Moreover, “in 1975, Kurzweil Technology invented the first optical character recognition (OCR) technology, which allows the translation of written text into digital language” (Green & Blair, 2011, as cited in Vaziri et al., 2014: 3).

More recently, ATs are increasingly based on information-technology accessibility (IT accessibility). Vaziri et al. (2014) distinguished gesture-based input devices for interaction with information systems (Christiansen et al., 2011; Vatavu, 2009), cloud-based ATs like screen readers or screen magnifiers (Caldwell, 2011; Hill, 2011) and brain-computer interfaces, which allow the operation of computer systems or the control of artificial limbs with one’s mind (Carmena, 2012; McCullagh, 2010; Wolpaw & Wolpaw, 2012). These technologies are also differentiated according to the nature or type of handicap. For instance, individuals suffering from hearing loss use a telecommunication device for the deaf (TDD) to access the telephone. Entrepreneurs *via* the relay service, which is a free service provided nationwide, often use the technology known as a teletypewriter (TTY). The video relay service, cell phone technology and FM amplification systems are commonly used by small-business owners with hearing disabilities (Angelocci et al., 2008). For people with vision loss, ATs like closed-circuit television (CCTV), electronic magnification systems or optical character recognition (OCR) technology can be used to read incoming mail, faxes

and other documents (ordinary or electronic format) with both text and images (Angelocci et al., 2008).

However, IT accessibility and internet accessibility are considered crucial issues for the establishment, implementation and use of ATs. These cannot exist without their alignment with both private and public software and websites. In the 1990s, the U.S. government promulgated the Rehabilitation Act (adopted in 1973) requiring that all IT tools purchased by the U.S. government must meet specific accessibility standards. Many studies undertaken in Europe have concluded that more than 80% of websites are not compatible with the international standards published in 2008, the WCAG (Web Content Accessibility Guidelines), to make web content more accessible to people with disabilities (Vaziri et al., 2014). The WCAG is primarily intended for who want or need a standard for web accessibility, including for mobile accessibility (Web content developers, Web authoring-tool developers, web accessibility evaluation-tool developers, ... etc.). Other related resources are intended to meet the needs of many different people, including policy makers, managers, researchers among others (<https://www.w3.org/WAI/standards-guidelines/wcag/>).

IT accessibility and internet accessibility support the inclusion of people with disabilities in online activities, specifically those who want to start their own businesses, to become entrepreneurs. Therefore, new research and design in AT are rapidly removing, not only physical barriers, but also IT accessibility barriers, and providing significant opportunities for disabled entrepreneurs to pursue their goals of self-employment.

The Big Five of technology (GAFAM) have been particularly interested in digital accessibility for people with disabilities and have invested heavily in projects based on AI, more specifically deep learning. Operating thanks to a network of artificial neurons, this

branch of machine learning allows GAFAM to develop intelligent assistants, such as Google Now, Alexa, Siri and Cortana, to understand the voice of users and thus respond effectively to their requests without the need to move around and manipulate the devices. In addition to tools based on voice recognition, there are others based on voice transcription that allow dictating and formatting text for people who have difficulty using a keyboard and/or a mouse.

Many other devices based on digital technologies, haptics, home automation and robotics exist today to help people with disabilities in their daily lives. For example, blind and visually impaired people can move around more easily and safely using the following technologies: Lechal Connected Insoles, Echolocation Wristband, BuzzClip, ... etc. They can also see images, describe their content using systems developed by Facebook and Microsoft (Seeing AI, ... etc.), read text and identify products in the supermarket or people using a small device called MyEye that includes visual-recognition technologies. For people with a mobile disability, several technological solutions have been developed to help them walk and make it easier to perform physically demanding tasks. For example, for people suffering from tetraplegia or reduced mobility, the development of robotic exoskeletons is of great benefit to them. These devices restore their ability to stand up, walk or climb stairs. Many players have invested in the exoskeleton market. They include the American Ekso Bionics and StrongArm Technologies, the French Exhaus, HMT, Enedis, ... etc.

ATs are evolving rapidly. Although they are not directly aimed at supporting entrepreneurship, they can help entrepreneurs create their businesses. ATs afford disabled people greater entrepreneurship opportunity by enhancing and expanding their communication, learning, independence (Darcy et al., 2016), participation in society (Caute & Woolf, 2016; Folan et al., 2015; Manzoor & Vimarlund, 2018; Mattar et al., 2015; Raghavendra et al., 2015) and achievement with higher levels of well-being and quality of life.

ATs can help disabled people start their own businesses and be self-employed in three different ways (Vaziri et al., 2014). First, they improve the capacity of persons with disabilities to be involved in society, which enhances their self-esteem and self-confidence and increases the likelihood that they will start their own businesses (Seelman, 2008, *as cited in* Vaziri et al., 2014). In fact, ATs (as detailed above) enable entrepreneurs with impairments to access and gather digital information, which is essential to build a business strategy and make decisions. Second, ATs help disabled entrepreneurs interact with their clients and establish relationships with their suppliers, business partners, donors and creditors (Guffey & Loewy, 2008, *as cited in* Vaziri et al., 2014). Third, these technologies can help disabled entrepreneurs manage and assess their commercial processes. In fact, to reach commercial objectives, entrepreneurs need to plan them and control their achievement. ATs need to be compatible with the business process-management software and enterprise-resource planning systems (Vaziri & De Oliveira, 2012, *as cited in* Vaziri et al., 2014).

Angelocci et al. (2008) discussed the different types of ATs available to a small business owner in the United States with learning, hearing, visual or physical disabilities. They argued that ATs allow people with disabilities to compete as small-business owners. In addition, they claimed that for each of these disabilities, a specific AT intervenes as a facilitator. For instance, entrepreneurs with vision loss can use AT devices to enhance opportunities in the operation of small businesses, such as a vending stand. According to Angelocci et al. (2008),

“audio feedback has been added to cash registers, thermometers, scales and vending machines. Specialized bar-code scanners have speech output which helps identify merchandise and maintain inventory. Handheld devices can

announce the denomination of paper money or the color of an item” (p. 3).

For small-business owners with learning disabilities or attention-deficit disorder, software programs can be used to assist them with reading, grammar, spelling and composition of documents. Therefore, AT includes rehabilitative, adaptive and assistive devices and the procedure for selecting them (Angelocci et al., 2008).

Method

Data Collection

A comprehensive qualitative approach was adopted in this study. The data-collection tool used in this study was the interview. Those eligible to participate were contacted to schedule an interview. A total of 19 interviews were conducted with French entrepreneurs with different types of disabilities: motor, visual and hearing impairments. Participants were selected on a reasoned, non-probabilistic basis. A list of inspiring portraits of disabled entrepreneurs was constructed by documenting the website and Facebook page of “H’up entrepreneurs,” an association that supports disabled entrepreneurs in the success of their businesses. The interview method is the most suitable one, allowing the recording of episodes of meaning creation. Participants were encouraged to reflect on their experiences and articulate their thoughts in a discursive way.

Before the interviews began, interviewees were assured that they could skip any question that they did not wish to answer. Indeed, interviewees’ anonymity was maintained with everyone.

The way in which the interviews were conducted was atypical. Given the geographical distance between the author of this article and the respondents, videoconferences replaced face-to-face interviews. This option is relevant given that people with disabilities use new technologies more often and with greater sophistication than abled people. The choice of videoconferencing software was determined by the respondent. These interviews began with general, non-directive questions to allow respondents to say anything

that came to mind spontaneously. The interviews were not all conducted in the same way. Some of them were conducted in two or three phases, depending on the interviewee’s type of disability. The interview time ranged from 30-90 minutes.

In addition, the originality of the methodology lies in the fact that written interviews were conducted with two hearing-impaired participants, since the researcher does not understand lip-reading. These two interviews took place in several written exchanges. First, an interview guide consisting of pre-specified questions was sent to the participants. Then, as soon as the answers were received, follow-up questions were sent to them to go into greater depth on certain aspects.

Data Analysis

Content analysis can be defined as “*a technique which aims at the systematic and objectified treatment of messages/communications in order to identify their meaning and produce inferences on the conditions which lead to the production of these meanings*” (Dany, 2016: 8). According to Bardin (1998: 31), adopting a content-analysis approach means giving up “*the illusion of the transparency of social facts*” and trying to avoid the “*dangers of spontaneous understanding*” (Dany, 2016).

There are several types of content analysis (categorical analysis, evaluation, enunciation, propositional-discourse analysis, lexical analysis, ... etc.) which in their application could meet the researcher’s objectives. For the purpose of this study, categorical content analysis was adopted, particularly thematic content analysis. It is a question of “*finding, by a horizontal approach, the recurring themes between the various documents or interviews of the corpus and the contents which are attached to them*” (Gavard-Perret et al., 2008: 261).

To conduct this analysis rigorously, the study relied on the approach proposed by Intissar and Rabeb

(2015), who established a synthesis of three qualitative data-analysis methods; namely, the grounded theory of Strauss and Corbin (1998), the qualitative analysis method according to Miles and Huberman (2003) and the thematic analysis by Paillé and Mucchielli (2008). Thus, six fundamental stages have been distinguished: pre-analysis, coding, categorization, linking, presentation of results and verification of data.

The transcription of the various interviews carried out and the sorting of the secondary data collected allowed to develop a deep knowledge of data, thereby familiarizing ourselves with our corpus. The familiarity thus acquired facilitated the coding and categorization process; that is to say, the development of our analytical reading grid. We would like to point out that the development of our coding and coding grid was done in two stages. A first classification was made on the basis of the interview guide. The themes thus identified were subsequently refined or modified as we progressed in the analysis, taking into account the elements that emerged from the field. It should be noted that a particular effort has been made to define the codes and themes clearly and precisely in order to ensure the reliability of the coding established and the subsequent linking between the themes. Similarly, the verification of the data collected was applied from the selection of the disabled entrepreneurs, during the analysis (through a report of the exchanges sent to the participants in order to allow them to validate, clarify or invalidate certain information) and until the results were filed. Similar to a dictionary, our grid presents the main themes (or categories) that have emerged from both the field and the literature. The construction of the theme dictionary was carried out in strict compliance with the following five conditions: homogeneity, exhaustiveness, relevance, exclusivity and objectivity.

Raw data from transcripts of semi-structured interviews and internal and external documents was semantically processed and condensed to make sense (Creswell, 2003; Graneheim & Lundman, 2004; Miles & Huberman, 2003). Striking and recurring expressions were underlined,

keywords were colored, comments were noted and excerpts with similar meanings were selected to assign coding nodes (categories and sub-categories) to them. A condensation of the narrative presentations and the graphs and tables from the semantic analysis of the data was carried out in order to synthesize the main emerging ideas. Finally, preliminary conclusions were drawn, which were verified, clarified and rooted as the analysis of the results progressed.

Findings

The interviews identified five themes grouped into three main categories, which are summarized in the following paragraphs with illustrative quotations from the respondents. The first main theme, entitled “disabled entrepreneurs’ profile,” includes the following sub-themes: internal triggers for entrepreneurial decision-making, sensemaking and disabled entrepreneurs’ specific profile. The second main theme is called the perceived value of ATs and their impact in daily life. The third one is related to the desires for future assistive technological devices.

Disabled Entrepreneurs’ Profile

To understand the specific profile of disabled entrepreneurs, we will focus first on the internal triggers for entrepreneurial decision-making and then on sensemaking.

Internal Triggers for Entrepreneurial Decision-making

At the beginning of the interviews, the respondents compared how they felt today as entrepreneurs with their past as employees. They all considered the events and discriminatory situations that they had experienced in their previous work experiences as the triggers for their business ideas and the creation of their projects. In fact, the respondents stated that people with disabilities are less likely to find a job than able-bodied

individuals and more likely to be unemployed. Even in employment, the situation of workers with disabilities remains precarious and destabilizing. The results of the study even reveal a dismissal based on disability: *"I decided to hide my disability in order to be able to work; when I told the truth about my disability, I scared everyone away, I found myself unemployed."* According to the respondents, such a situation causes feelings of disruption, instability, insecurity and ambiguity among disabled employees. These feelings generate the feeling that others have a better working life than they do. In other words, it is the emotion of envy that occurs when someone feels that they lack some quality or success and want to do the same. In addition, the interviewees stated that people with disabilities are more likely to work part-time and are more likely to be unskilled workers than managers. The feeling of inferiority and the lack of involvement and responsibility in the organizational environment generate a sense of unease, exclusion, lack of fulfillment, lack of self-confidence and lack of self-esteem:

"Companies see me as a disabled person and not a competent person. They don't make me responsible because of my disability. They think that I am incapable. They never let me show what I am capable of. They didn't listen to me. I wasn't integrated like any of my colleagues who are able-bodied".

Furthermore, companies' lack of responsibility to make accommodations and adaptations as well as their lack of means to invest in instruments adapted to people with disabilities, such as computers adapted for the visually impaired, offices adapted to certain pathologies, ... etc., hinder their access, maintenance and career development:

"The company did not have the equipment and tools adapted to my situation so that I could develop and work properly within the company. Companies need to understand that disability is something that should not be put aside; it is something that is often forgotten".

"The toilets are not accessible, no parking space in front of the companies".

Sensemaking

All the problems mentioned in the above paragraph led to a devalued perception by disabled employees of themselves as professional beings (devaluation of identity, etc.). They then tried to understand the reasons for this devaluation by interpreting clues from their environment in order to make sense of what was happening. Giving sense to what happens to them helps maintain a positive sense of self in chaotic emotional situations and cognitively reframe a person's experience. According to respondents, all the clues extracted from their professional experiences that are fraught with pitfalls, social isolation, ... etc. are action signals or stimuli providing information on what to do to get to know oneself better, feel at ease, blossom, progress more quickly in one's career, gain self-confidence, re-establish a positive self-image, succeed professionally and restore cognitive and emotional balance. In other words, people with disabilities challenge the sense of "value" and trigger an awareness aimed at rationalizing what is happening to them and finding their place in society. This is made possible by entrepreneurship, which is a way of identifying the interruption in the damage to one's self-image: *"My previous professional experience has been like a revelation, telling me, tomorrow, how I imagine my life. I want to be free of my word, for that I would have to be independent".*

The meaning that interviewed disabled entrepreneurs attached to their new roles and responsibilities and to themselves was reshaped by the cues that they received from those around them. The entrepreneurial action of people with disabilities changed the way in which others looked at them and how they represented themselves.

Disabled Entrepreneurs: The Specific Profile

Entrepreneurs have succeeded brilliantly after starting their own businesses, despite their disabilities.

It then appears that disabled entrepreneurs have a specific profile that goes beyond the classic categorization of entrepreneurship. They are resilient and persevering people: *"I decided to turn the page on the critical events of my past life, the inherited attributions and the stereotypes that people have about people with disabilities and that limit my true potential"*; *"I was in pain and thanks to it, my entrepreneurial project was born"*; *"The shock I had helped me a lot recover and get back on my feet; I didn't give up"*; *"The day I decided to become an entrepreneur is the day I decided to look to tomorrow with hope and focus on the present."* They are persons who have emotional intelligence: *"inside me, I have a path that carries me ... it's small, but I figured out how to make it available to a project that can probably make a difference and help people with disabilities like mine."* They are courageous persons: *"I had the courage to face my fears, to go beyond my personal and functional constraints linked to my disability to become an entrepreneur"*; fighting people: *"the stupidity of stereotypes when we judge a person on a single criterion, his skin color, his disability . . . I fight against these stereotypes . . . I am disabled, but I have managed to become an entrepreneur, I earn a good living and I contribute to the economic growth of my country," "we are warriors who fight every day against a disease and against stereotypes"*; innovative persons: *"We are innovative because someone who has lost their sight, smell or eye will develop other abilities to live more or less like able-bodied people," "For me, people with disabilities are the professionals, the experts in innovation, because in their life paths they have developed virtues and qualities that a conventional person has not developed."* In addition, they are digital natives, especially people with disabilities at birth, because they have appropriated digital tools throughout their lives. These people are and always will be, in a process of constant negotiation with new technologies. Additionally, people with disabilities are often more adaptable and sensitive than people without disabilities, as they face much greater challenges than able-bodied people: *"Given my limited functional abilities, I have learned to react quickly to*

find solutions to problems that arise."

Moreover, the interviews revealed that before becoming entrepreneurs, they lacked self-knowledge, self-confidence and self-esteem. Afterwards, everything changed; they gained self-awareness and greater self-assertion when they turned to realize their dream of starting their own businesses.

Perceived Value of Assistive Technologies and Their Impact on Daily Life

With regard to "perceived value of technologies and their impact on daily life," five sub-themes emerged from the semantic analysis: better quality of life, independence and sense of control, social participation, self-confidence and self-esteem and acquisition of knowledge and skills.

Better Quality of Life

All the respondents affirmed that technologies had made their lives easier and more comfortable at personal and professional levels. With technology, they were able to do a whole series of things that able-bodied people do automatically and save precious time in organizing their daily activities: *"Technologies make daily tasks easier"*; *"With these devices, I can read and reply to messages, I can make entertainment that was previously inaccessible"*; *"I can communicate, interact with my environment, work, shop, order meals and play online"*; *"Technology has allowed me to work and earn a living without having to leave my home. Given my mobile disability, it's much more comfortable that way"*; *"Speech-recognition tools save me a lot of time when writing documents, e-mails, ... etc., but also when navigating between different menus and windows"*; *"They save me a lot of movement and therefore fatigue. I use them regularly"*.

The interviewees have also referred to their use of portable devices for keeping track of appointments and

scheduling their day-to-day activities: *"I plan my activities and organize my tasks thanks to the application"; "The application that I use facilitates the management of my daily planning; it makes me gain in productivity and efficiency"*.

Others made note of how they used information available on the internet to plan outings into the community. For example, visually impaired entrepreneurs used an application that geo-locates their location and provides them with useful information about where they are. They would type in a location on their phone to hear the information that they need to get around; e.g. to meeting places with stakeholders: *"I no longer need to ask someone for directions; I plan my outings on my own thanks to the mobile application"*.

Independence and Sense of Control

With the use of technology, respondents no longer feel fully dependent on external factors, such as luck, other people, society, ... etc. On the contrary, they feel that they have more or less control over their environment and their feeling of powerlessness has greatly diminished: *"I can do so many things by myself"; "I don't need the help of others anymore"; "I have always attached a lot of importance to independence, to be able to go out without depending on outside help; this has been possible thanks to the technologies I use."*

Technology offers the opportunity for disabled entrepreneurs to manage things on their own. They use technology to contact other people, organize meetings and exchange information, more or less independently: *"I used to feel that my life was slipping away from me, it is controlled by my boss or my family members; now I am my own boss and I can manage almost every aspect of my work on my own."*

Gaining independence from people has been accompanied by an increase in dependence on the technologies that they use: *"Thanks to technology, I can do almost everything on my own without the help of a third party"; "I can't live without it"; "I would be lost without it."*

Social Participation

All respondents affirmed that the use of technologies enabled them to overcome barriers and to deal with issues that limit their participation and integration in the society: *"Thanks to technology, I participate fully and actively in the society and I feel empowered"; "Technologies extend my connection to the world, extend my reach and help me realize my dream."* These assertions were accompanied by opposing and contradictory views on the social participation of their disabled friends. Some believed that despite the perception of a significant improvement in accessibility conditions thanks to technological evolution, disabled entrepreneurs continue to encounter barriers on a daily basis and to be expelled from participating fully in society: *"And yet, in this age of exoskeletons and robots, technology itself sometimes remains the source of an accessibility problem and does not allow disabled people to participate fully."*

Self-confidence and self-esteem are examples of important aspects of participation.

Self-confidence and Self-esteem

Technologies have offered interviewees new hopes for improving or regaining their self-confidence and developing their self-esteem: *"The technologies provide me with ways of resolution and an opportunity to gain self-confidence and develop my self-esteem"; "Today, there are very important people calling me (CEO . . .), they are interested in me, I feel valued, I've been on a national radio station, I do interviews, I'm solicited in schools to testify about my experience."*

With the help of technology, they felt that they had the necessary resources and ability to deal with a particular situation. In addition, they felt that they were valid, legitimate and very important people with humility:

"Before when I spoke, people didn't listen to

me. Today, when I speak, I am listened to. It is very important for me to see that my speech has become legitimate and that people give me great importance and listen to me attentively and with interest . . . I have become completely legitimate in what I do”.

Knowledge and Skill Acquisition

Thanks to information and communication technologies, respondents could have a large amount of information readily available with just a few keystrokes and clicks. It was easy for them to learn, try something new, deepen their knowledge or enrich their awareness: *“All by myself, I learned how to develop computer programs”*; *“Thanks to technology, I was able to develop my social skills and mindset.”* However, the information available to some respondents was not always sufficient, reliable and accurate. It did not allow them to act effectively; i.e., to make the right decisions at the right time.

Desires for Future Assistive Technological Devices

The interviewees described various modifications to technological devices to facilitate access. For example, respondents with a hearing impairment used an application (Roger Voice) to translate their interlocutors' words into messages as the discussion progressed. They could also transcribe what they were unable to say thanks to a voice-synthesis tool available in several languages. In addition, respondents with visual disabilities used specific equipment, such as a Braille keyboard, to make reading and writing texts and e-mails accessible on computers or smartphones (TalkBack created by Google, insideONE touch tablet). They also used specific software, such as screen magnification, screen review and voice-recognition software, to facilitate the use of information and communication technologies. Thus, technological devices have the merit of facilitating the daily life of people with disabilities, especially in the professional world and in community places.

However, they did not solve all their problems. Some of

the interviewees reported that they encountered difficulties in getting to certain events or meetings with employees, including limited access to public transportation and parking lots.

Moreover, the issue of digital accessibility was raised by some interviewees. According to them, while a few emerging companies integrate digital accessibility from the very beginning of their project, other companies do not even include people with disabilities in their business model and later realize the need to adapt technologies to make them accessible to everyone:

“In most companies, technology designers do not provide equitable access for everyone to digital resources. I would like to see a large number of companies align themselves in terms of digital accessibility . . . in addition, it is very interesting to invest in it, because there is a high percentage of the French population with disabilities, but also these companies will have a positive impact on their image... they will be perceived as socially responsible companies”.

“Unfortunately even with many disabled people, ICT accessibility is not a priority for suppliers or developers involved in ICT nor for web designers”.

Discussion

This study was designed to gain insight into the ways disabled persons use ATs in their daily lives and how these devices increased their likelihood of being entrepreneurs.

Overall, the identified themes indicated that disabled entrepreneurs have a specific profile that goes beyond the classic categorization of entrepreneurship. As argued by Bagheri and Abbariki (2017), Capitán and García (2019), Hernández and Pérez (2019) and Sanchez et al. (2019), the findings of this study show

that disabled people have through their experiences developed specific entrepreneurial competencies: personal self-knowledge, self-management, self-awareness, self-assertion, resilience, persistence, courage, emotional intelligence, innovation and adaptability. Similar to previous results of scientific studies that give valuable information on the determinants of the self-employment and entrepreneurship of disabled people (Ashley & Graf, 2018; Casado & Casaú, 2019; Csillag et al., 2019; Kašperová & Kitching, 2014; Kitching, 2014; Korpysa, 2009; Lloret et al., 2019; Maritz & Laferriere, 2016; Miller & Breston-Miller, 2017; Mohammed & Jamil, 2015; Pagán, 2009; Saxena & Pandya, 2018; Schur, 2002; Tamara, 2001), the themes identified in this study indicate that the motivation to become entrepreneurs is as much about the need to face unemployment, get out of precariousness and control their own destinies and financial gain, as it is about the quest for better quality of life, independence, self-reliance, self-actualization and fulfillment.

Similar to previous findings in the disability literature, the use of ATs by the participants of this study was found to have implications for the enhancement of their social inclusion and the improvement of their quality of life by gaining more independence, self-control, self-confidence and fulfillment. These findings are consistent with those of Buchholz et al. (2013), Caute and Woolf (2016), Darcy et al. (2016), Folan et al. (2015), Mattar et al. (2015), Raghavendra et al. (2015), Sans-Bobi et al. (2012), Seelman (2008) and Vaziri et al. (2014), who highlighted that technologies play a crucial role in increasing people with disabilities' social participation and their maintenance of an active and independent lifestyle, enhancing their self-esteem and self-confidence and thus increasing their likelihood of becoming entrepreneurs. In addition, as pointed out by Darcy et al. (2016), the findings show that ATs strengthen the skills of people with disabilities. Despite the personal and professional benefits of ATs, issues of digital accessibility were noted as challenges. This result is in line with Gregor et al. (2005) and Vaziri et al. (2014), who argued that the

main challenge that faces industries and decision-makers is how they are to integrate technologies and services in everyday routines of disabled people.

Regarding the theme "modification allowing access to technologies," the interviews show that disabled entrepreneurs have been able to find solutions to digital-accessibility problems by using assistive-technology devices. However, as the National Council on Disability points out, it can be difficult for them to adapt technological innovations based on closed systems (for digital rights' management or security reasons) or to apply ATs to access them.

Conclusion

A vast body of literature examined the determinants of entrepreneurial ventures, but less attention has been paid to the utilization of ATs and their relationship to entrepreneurship by disabled people. This paper has explored who disabled entrepreneurs are and how they perceive the value of ATs. This study is of relevance to the identification of further research on the issues which have to be considered in the context of the adaptation of existing technological innovations and the development of new ones that are aimed at promoting or facilitating entrepreneurship for people suffering from different types of disabilities.

Practical Implications

Given the important role of disabled entrepreneurs in the economy and society, there will be a substantial interest in fostering disabled entrepreneurship.

Also, the evidence that people who suffer from different types of disabilities make extensive use of technology to launch and manage their entrepreneurial projects provides a new justification for policies or reforms intended to promote entrepreneurship by supporting R&D of new products and services for the disabled; by investing more in AT infrastructure in

working, coaching and mentoring spaces to support people with disabilities, as well as by developing inclusive business training to help them improve their entrepreneurial skills.

Moreover, this study can increase awareness of the importance of developing inclusive technologies to foster entrepreneurial activity, self-employment and small-business ownership among those facing a disability.

Limitations and Future Research

While the research was successful in many ways, there were three key limitations identified in the study. First, the sample size was small and recruited from one association in Paris, France; thus, the results are not conclusive and may not be generalizable to other contexts. Second, the findings cannot be generalized to the entire disabled entrepreneur population. The inability to be generalized is often a criticism levied towards qualitative studies. However, the goal of this study was to provide a rich, contextualized understanding of respondents' experiences. In particular, we developed a conceptualization of disabled entrepreneurs' experiences using ATs through in-depth scrutiny. This can be considered as analytic generalization (Thorne et al.,

2009). Third, the transferability of these findings is limited by the nature of the interviewees' disability and their individual characteristics.

Despite these limitations, our current research opens future research perspectives. First, the literature on gender, innovation and adoption clearly shows that gender strongly affects the adoption of new technology (AT). For instance, we mention the systematic literature review provided by Le Loarne-Lemaire et al. (2020) on *Technological Forecasting and Social Change*. Secondly, education, social classes, networking (this is called "imprinting"), age and the nature of the business are some factors that could be taken into account to explain the nature of disabled entrepreneurs. Finally, there is a vast field of research in the field of entrepreneurship for people with disabilities. The expanded scope of this research may include a detailed analysis of the entrepreneurial and managerial practices of entrepreneurs with disabilities. Studying various behavioral features and the decision-making process would provide an exhaustive understanding.

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