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Vol. 40
Issue 3

SEPT-DEC
2022

Silver Economy: challenges and opportunities for an aging world

Special Issue

Guest Editors
Maria Colucio, Bo Edvardsson, Vania Vigolo

Italian Society of MANAGEMENT

FONDAZIONE CUEIM

Official Journal of Italian Society of Management

Vol. 40, Issue 3, 2022 ISSN 0393-5108 ISSN 2785-549X

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italian journal of management

Official journal of Italian Society of Management

VOL. 40 ISSUE 3 N. 119	**Silver Economy: challenges and opportunities for an aging world**	SEPT-DEC 2022

Sinergie Italian Journal of Management is a peer-reviewed scholarly publication focusing on the principal trends in management studies.

Formerly *Sinergie rivista di studi e ricerche*

Published quarterly

Founded in 1983

ISSN 0393-5108 - ISSN 2785-549X

Open access at *www.sijm.it*

Indexed in Scopus (as from 2021), Google Scholar, ACNP, ESSPER

Sinergie Italian journal of management is published by Fondazione CUEIM, a foundation aiming to carry out and to promote scientific research, especially in the fields of business administration and of organizations management, both profit and non profit.

Sinergie Italian journal of management is the official journal of SIMA, the Scientific Society of Italian Professors of Management, whose aim is to contribute to the development and dissemination of management knowledge in the academic, economic and social fields, on an excellence basis.

The editing activity is sponsored by Consorzio Universitario di Economia Industriale e Manageriale - CUEIM - www.cueim.it

Peer reviewed journal

Journal accredited by AIDEA

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italian journal of management
Vol. 40, Issue 3, 2022

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Original Research Papers

Useful information for readers and authors

Aphorisms

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italian journal of management
Vol. 40, Issue 3, 2022

1. *You'll never find a rainbow if you're looking down.*
   (Charlie Chaplin)

2. *Even the darkest night will end and the sun will rise.*
   (Victor Hugo)

3. *We can complain because rose bushes have thorns, or rejoice because thorns have roses.*
   (Alphonse Karr)

4. *Choose to be optimistic, it feels better.*
   (Dalai Lama)

5. *Don't worry about the world coming to an end today. It is already tomorrow in Australia.*
   (Charles M. Schulz)

sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
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Guest Editorial: Framing Silver Economy in a management perspective: from practice to theory

Maria Colurcio - Bo Edvardsson - Vania Vigolo

Global population aging has wide implications for civil society, governments, organisations, public service providers and businesses. The silver economy refers to the 'economic activities related to production, consumption and trade of goods and services relevant for older people' (European Union [EU], 2018, p. 6). The term 'silver economy' is sometimes used interchangeably with the 'silver market' (the aging or mature market), a narrower concept that emerged in Japan in the 1970s as a result of an increase in facilities available for seniors (Gschwendtner, 2020). The silver economy encompasses a wide range of concepts related to the business challenges and opportunities presented by an aging population. Older people have long been considered a fiscal burden; however, many countries in the EU are now leveraging this demographic to create new products, services and jobs, bolstering economic growth (EU, 2018; Zhukovska *et al.*, 2021).

A report by the German Institute for Economic found that the highest population growth in recent years is occurring among older people. This is not so much a result of demographic changes as it is a paradigm shift in work activities at retirement age. In Germany, a third of total spending is attributed to people over the age of 60 years. This growing demographic requires specific solutions around housing, transport, food, insurance, robotics, health and e-health, communications, the internet, sports, leisure and travel services (Patterson and Balderas, 2020; Leino *et al.*, 2021), leading to many business opportunities (Felix, 2016). Further, older people are continuing to consume products and services for longer periods. However, their specific needs change with age; thus, businesses must be able to adjust. Technologies can assist in these adjustment processes; for example, the use of digital sensors and cameras to monitor people's health means that older people can live in their homes for longer. The term 'gerontechnology' (a combination of 'gerontology' and 'technology') refers to the various technological systems and solutions that can help aging people perform the basic activities of daily living and maintain their independence, thus providing them with necessary support (Laperche *et al.*, 2019). Moreover, these technological tools can assist those who care for older people (Shareef *et al.*, 2021).

Italy has one of the highest proportion of people globally over the age of 65 years, partly because of its low birth rate relative to that in other EU countries. A recent study on the silver economy by the Confindustria Study Centre (Centro Studi Confindustria, 2020) found that people over the age of 65 years have a higher income, more savings and better financial stability, thus spend more money compared with other groups. Therefore, as a group

of consumers, older adults present enormous business opportunities, often greater than those for young adults.

The silver economy sector refers to the 'baby boomers', the generation of people who were born between 1935 and 1960, grew up in a postwar world, took to the streets in May 1968 and brought down the Berlin Wall and now run the world. Today, these baby boomers comprise a significant component of the silver economy. Many have not been weighed down by the years and feel as young and full of life as their children. They have more free time, especially those who have retired, and, according to the American Federal Reserve, have 11 times more wealth than do millennials.

Statistics from the World Bank and World Health Organisation show that the average life expectancy in 2020 was 72.5 years, 20 years more than that in 1960, and that the total population over the age of 60 years will have doubled by 2050 from 2000 numbers. Along with a general decline in birth rates worldwide, this increased longevity will lead to a reversion of the population pyramid, meaning that there will be more older people than younger people. As revealed by the United Nations (2019), this was verified by an extraordinary event in 2018, when the number of people over the age of 65 years surpassed that of children aged under 5 years for the first time in human history.

There are many challenges that must be overcome before the silver economy can play a key role in the overall economy. The internet and new technologies will play a leading role in this process (Bianchi, 2021). The European Commission (2018) predicts that in addition to generating billions in profits, the silver economy will significantly contribute to job creation and increase the gross value added in the EU by 2025. The 'silverisation' of products and services adapted to the needs of older people will largely rely on gerontechnology, the field of study that combines technology with human aging.

In line with the United Nations 2030 Agenda for Sustainable Development, there is a need for more research-based and actionable knowledge to better understand the potentialities of the silver economy. This is the underlying reason behind this special issue, which includes contributions related to management opportunities and challenges in the silver economy. The aim is to identify, understand and address how population aging will affect the management of manufacturing and service industries and public service providers. The silver economy concept encompasses a wide range of global issues, from the micro level (individuals, families and social groups) to the meso level (organisations, industries and companies) to the macro level (governments and institutions). The global population now encompasses over 8 billion people. The increasing number of older people in many countries has created various market and management challenges and opportunities. Many of these are covered or at least touched on by the six diverse articles in this special issue that together reveal the diversity of the field, the many research opportunities and the need for more knowledge on this segment of the economy. Each article is briefly summarised in the following paragraphs.

The first article, 'The transformative power of technology to turn the silver economy into a gold society: a systematic literature review' (Caridà

et al., 2022), focuses on one of the most important and dynamic areas in the silver economy-digital transformation. In their literature review, the authors analyse the intellectual and cognitive structures of the silver economy in the business and management literature. They review the current research on technological innovations in the field and suggest topics for future research, with an emphasis on advancing the debate on the role of technologies in better responding to the challenges and opportunities of an aging population. The results are presented in terms of three periods: (i) formation (1985-2007), which centres on welfare expenditure; (ii) transition (2008-2014), which focuses on health services; and (iii) development (2015-2022), which emphasises technological change. The review highlights the fragmented nature of the literature, which lacks a holistic perspective of the relationship between the silver economy and digital technologies. The authors conclude that technological innovations for older people is an under-researched field. The paper provides relevant implications for a wide range of service ecosystem stakeholders, including business managers and policymakers, regarding the social challenges and business opportunities associated with technological innovation and the silver economy.

The second article, 'Seniors and technology: can cognitive age and life events explain the gaps?' (Codini *et al.*, 2022), also focuses on issues related to technology. This paper identified differences among older people in terms of how they benefit from technology. The authors conducted a survey that aimed to compare cognitive age and life events to demographic age. Three clusters emerged as a basis for segmentation-cohort, cognitive age and life events. Cluster analysis highlighted multifaceted technology consumption trends that differ according to cognitive age and life events. These findings improve the understanding of consumption trends and use of technology among older consumers and may be used to design products and services that respond to the specific needs of older people in different segments. The article also calls for more empirical studies focused on different types of technology and specific needs among older consumers.

The third article, 'Social network sites and ageing: roles of Facebook in enhancing seniors' well-being' (Di Bernardo *et al.*, 2022), also focuses on technology and its relationship to wellbeing. The use of social network sites among seniors is rapidly growing, presenting new opportunities for social interactions. The authors conducted a netnographic analysis of 411 posts in 10 online communities to explore the role of Facebook groups in the wellbeing of aging people. Building on a psychological wellbeing framework, the study shows that Facebook groups play three roles in enhancing seniors' wellbeing: as information providers, social facilitators and loneliness reducers. The proposed integrative framework offers initial evidence of how Facebook groups can improve psychological wellbeing among older adults. The empirical results may assist service providers in providing effective services and communication tailored to seniors' needs.

The first three articles address the various challenges and opportunities presented by technology for older people. The fourth article, 'Promoting innovation in the fashion industry to support active ageing: can independent European centers take the leadership?' (Friel and Borrione, 2022), takes

a different focus-the opportunities presented by the European fashion industry for the silver economy. Adopting a mixed method approach, a desk analysis of the websites of independent innovation centres in Europe, a qualitative survey with open-ended questions and in-depth interviews with experts, the authors analyse how fashion innovations in Europe are meeting the needs of older people. The results show that while actors in the fashion and textile fields are creating multiple innovations targeted at social inclusion, few consider the over-65 segment a specific target. The authors recommend the application of skills and innovations to the over-65 segment that have been successfully used in other social areas and creative industries. The study offers managerial implications for innovative fashion and textile products tailored to the needs of older people.

The fifth article, 'Silver entrepreneurship: a new trend in startups' (Greco *et al.*, 2022), investigates the motivations of people over the age of 50 years who decide to create startups, a group often referred to as 'silver entrepreneurs'. The study adopts a qualitative approach, grounded in a literature review and case studies, to identify the dynamics of silver entrepreneurs and their reasons for choosing to become entrepreneurs. The author analysed 29 startups, with a focus on entrepreneurial experiences and skills. The results highlight the interplay between the silver entrepreneurs and their technical skills, with a scatter map depicting three dominant combinations of technical skills and entrepreneurial competences. This research deepens the understanding of the potential local economic benefits brought by startup entrepreneurs over the age of 50 years. Moreover, the authors argue that entrepreneurial training programs will enable the proliferation of new business ventures in the startup ecosystem.

The final article, 'Fifty years of research on silver economy: a bibliometric analysis' (Colurcio *et al.*, 2022), reviews the state-of-the-art of management literature on the silver economy published between 1969 and 2022 to identify emerging issues and future research directions. Bibliographic coupling revealed 10 clusters showing the heterogeneity of the research on the silver economy in the management literature. A thematic map reveals five main silver economy research topics, classified in terms of relevance and development. Service quality and service providers are the 'motor themes' in the silver economy management literature, showing high development and importance. The authors suggest a research agenda for management scholars and practical implications for firms and policymakers.

While the abovementioned articles cover some important dimensions of the silver economy, gaps in the understanding and management of silverisation remain. Thus, future management researchers have many opportunities to contribute new knowledge on the silver economy. In the Europe of 2060, one in three people will be over the age of 65 (European Commission, 2018). This trend of increasing life expectancy and reversal of the population pyramid will be repeated in other developed countries. Therefore, older people, who have strong purchasing power, will become the main engine of the economy, leading to changes in product and service consumption. Older people have many needs related to aging that require attention, including nutritious and calorie-rich food, health issues,

declining hearing, sight and mobility and the ability and willingness to adopt digital technologies and platforms. None of the articles published in this special issue address these important areas. The silver economy is not a homogeneous segment but comprises a wide range of subgroups in need of special attention; in other words, one size does not fit all.

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italian journal of management
Vol. 40, Issue 3, 2022

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sinergie
italian journal of management

ISSN 0393-5108
ISSN 2785-549X
DOI 10.7433/s119.2022.01
pp. 11-16

Special issue accepted papers

The transformative power of technology to turn the silver economy into a gold society: a systematic literature review

Received
23rd June 2022
Revised
06th October 2022
Accepted
03rd November 2022

Angela Caridà - Nicola Varrone - Ambra Altimari
Monia Melia

Abstract

Purpose of the paper*: To analyze the intellectual and cognitive structures of silver economy research in the business and management literature, systematize current studies on technological innovations in the field, and propose future research directions to advance the debate on the role and impacts of technologies, better address the challenges and maximize the opportunities of an aging population.*

Methodology*: A systematic literature review and science map analysis were conducted by applying bibliometric techniques to represent the current status of the research field.*

Findings*: The results revealed three main research periods: the formation phase (1985-2007), the transition phase (2008-2014), and the early development phase (2015-2022), where the focus of scholars' interest shifts from welfare expenditures (1985-2007) to health policy, services (2008-2014), and technological change (2015-2022). The study reveals fragmented literature on the relationship between the silver economy and technology, which points out the lack of a holistic perspective of technological innovation for older people.*

Research limitations*: The study has some limitations typical of most studies of a similar nature, such as the possible exclusion of research papers in the gray literature or the subjectivity bias of the researcher. These limitations were mitigated by the coordinated efforts of four researchers who, after working independently on each phase of the study, reached common agreements through discussion and improved the rigor and objectivity of the results.*

Practical implications*: The paper provides relevant implications to a wide range of service ecosystem stakeholders, including business managers and policy makers, regarding the social challenges and business opportunities associated with the links between technological innovation and the silver economy.*

Originality of the paper*: This paper presents a comprehensive systematic literature review of the silver economy in the business and management literature, with a particular focus on technological innovation.*

Key words: silver economy; bibliometric analysis; older people; technology; technological solutions; social innovation service ecosystem innovation

1. Introduction

"Closing our eyes will not make the demographic challenge disappear (…)" (Ahtonen, 2012). Ten years later, the challenges and opportunities of an aging population are high on the agenda of policy makers at the EU and national levels and continue to attract the interest of researchers and practitioners alike (Aceros *et al.*, 2015).

The 2021 Aging Report (European Commission, 2021) declares aging pressures to be a global priority. The ratio of people aged 65 and older to people aged 20-64 will continue to increase to 59% by 2070; since this ratio is increasing, the labor force and productivity growth in Europe are declining. This trend likely has two opposing effects: i) increasing social and economic pressures, which will have profound implications for the entire social system (i.e., the health and welfare system, the labor market, public finances, etc.); ii) a new market promise of the "silver economy".

The silver economy refers to existing and emerging economic opportunities related to the production, consumption, and trade of goods and services relevant to an aging population (European Commission, 2018). Older people provide an impetus for the development of new goods and services because they engage in a wide range of activities (sports, cultural events, tourism, higher education, volunteering, etc.) to stay active and connected with family and friends and society at large.

With an aging population recognized as driving consumer megatrends (Euromonitor International, 2020), the silver economy is relevant and attractive to any business. Indeed, the silver economy can be a source of competitive advantage for companies that offer innovative technological solutions capable of meeting the growing demand for goods and services from the silver market (Laperche *et al.*, 2019; McGuirk *et al.*, 2022). Surprisingly, while technology is now part of the silver culture (i.e., seniors use it daily to maintain social networks, intellectual growth and participation, and physical well-being: Loe, 2015) and the silver market is widely viewed as an excellent application area for technological innovations and solutions (Kohlbacher and Hang, 2011), some authors note that older people are not fully prepared to adopt technological innovations (Bowles and Baugh, 2007). This finding requires attention to the in-depth use of technology of seniors (Heart and Kalderon, 2013) to better understand the factors that hinder their adoption of innovative technological tools (Mostaghel, 2016).

Despite the clear relevance of this area of research, the established strands of the silver economy in the business and management literature offer only a partial understanding of the role and impact of technology on the lives of older adults and the development of this market promise (Oget, 2021). This is consistent with Mostaghel's (2016) call for further research for a deeper understanding and systematization of current knowledge on the relationship between technological innovation and the silver economy.

Accordingly, this paper aims to a) map the knowledge base of the silver economy in the business and management literature, b) discuss the hot topics and state of technological innovation in the field, and c) propose future research directions to turn the silver economy into a golden society.

To this end, a systematic literature review and a bibliometric analysis were conducted following the protocol proposed by Turzo *et al.* (2022). Bibliometric methods are widely used in different research areas, such as knowledge management (Gaviria-Marin *et al.*, 2019; Manesh *et al.*, 2020), innovation (Casprini, 2015; Klarin, 2019; van Oorschot *et al.*, 2018) and entrepreneurship (Rey-Martí *et al.*, 2016), to describe the status, trends and potential future research of a particular area.

Thus, this study contributes to a better understanding of the research field of the silver economy, presents the conceptual structure of the subject and traces its evolution over time through a funnel approach based on three levels of analysis.

Specifically, a general overview of the silver economy is first provided from the broad perspective of "Business&Economics" and "Operation Research and Management Science" - Web of Science (WoS) Research Areas. Second, the analysis is restricted to the WoS category of "Business and Management". Third, the focus is on technological innovation studies within "Business and Management".

The funnel approach allows embedding the topic within the broader stream of the business and economics literature and taking a detailed look at the studies that examine the relationship between technological innovation and the silver economy in the business and management literature.

Compared to previous systematic literature reviews, the current study provides a wider perspective on technological innovation related to the silver economy instead of focusing on a specific type of technology (e.g., Barakovic *et al.*, 2020) or specific countries (e.g., Mostaghel, 2016).

In addition, the study proposes a broad and transdisciplinary paradigm that combines the perspectives of service ecosystem innovation (Storbacka *et al.*, 2016; Storbacka 2019) and social innovation (Caulier-Grice *et al.*, 2012; Rubalcaba, 2016; van Wijk *et al.*, 2019) to better inform research, policy, and practice and improve coherence with current trends of aging populations in the real world.

The article is organized as follows. In Section 2, the methodology is reported. In Section 3, the results of the study are presented, organized by the three levels of analysis. In Section 4, the findings are discussed. Finally, in Sections 5, 6, and 7, indications for future research, implications, and limitations of the study are reported.

2. Methodology

A systematic literature review (Tranfield *et al.*, 2003; Denyer and Tranfield, 2009) and a science mapping analysis were conducted following the protocol proposed by Turzo *et al.* (2022) to represent the knowledge base of the silver economy, highlight the state of technological innovation in the field and track possible research directions that would turn the silver economy into a golden society.

Science mapping is one of the main procedures used in bibliometrics; it is useful to depict the cognitive structure of a research field (Cobo *et al.*, 2011). Often, bibliometric analysis suffers from limited transparency

and reproducibility caused by the discretion of the process. The approach followed here ensures transparency and replicability of the process (Turzo *et al.* 2022).

The Bibliometrix package (Aria and Cuccurullo, 2017) in R-Studio was used to create strategic maps of the research field, as shown in Cobo *et al.* (2011). Strategic diagrams cluster publications and plot them in a bidimensional diagram according to their Callon's centrality and Callon's density; this representation helps to better understand structural (cognitive structure) and dynamic aspects (evolution) of the research field (Cobo *et al.*, 2011).

Following the protocol proposed by Turzo *et al.* (2022), the process of data collection and analysis was organized into ten steps.

First, the literature on what is currently known as the "silver economy" was analyzed to obtain an overview of the topic, fill a list of the most popular keywords in the field, and determine how the most popular keywords have changed over time, according to the evolution of the topic.

Second, the research query was defined based on the results of step one and the authors' experience. In January 2022, the following query in WoS was defined using the operator TS: OR "silver economy" OR "elderly economy" OR "longevity economy" OR "senior economy" OR "aging economy" OR "silver market" OR "elderly market" OR "longevity market" OR "aging market" OR "senior market" OR "silver society" OR "elderly society" OR "longevity society" OR "aging society" OR "senior society" OR "aging economy" OR "aging market" OR "aging society" OR "population aging" OR "population aeging" OR "active aging" OR "active aging" OR "healthy aging" OR "healthy aging" OR "older people".

Third, the same query was run on Scopus using the operator TITLE-ABS-KEY, and no significant differences were found in the results; thus, WoS was used as the main database. The choice of WoS as a data source is consistent with its reputation as one of the most important bibliographic databases (Aria *et al.*, 2020; Cobo *et al.*, 2011).

Fourth, the analysis was limited to documents classified as "article" or "proceedings" (Glänzel *et al.*, 2006), written in English, within the "Business & economics" and "Operations research and management science" research areas over the entire timespan (1985 to 2022). The decision to include proceedings is consistent with the emerging nature of the topic, whose production has doubled since 2015: the keyword "silver economy" appears very few times in articles but is widely used in proceedings. This result confirms that the silver economy is a new topic, as also shown by the analysis of strategic diagrams (Fig. 3 and followings). We obtained 1,511 documents during 1985-2022: 1,157 articles and 354 proceedings.

Fifth, an automatic cleanup of the keywords was performed using OpenRefine (https://openrefine.org/). An additional cleanup of the keywords was also manually performed to standardize them (i.e., spelling between British and American English was uniformized, for example, using "aging" instead of both "aging" and "aging", wrote out the acronyms, and reworded all numbers).

Sixth, a bibliometric analysis was performed of the 1,511 documents using the Bibliometrix package in R-Studio (Aria and Cuccurullo, 2017). To

trace the evolution of different research topics and areas, the main sources and keywords were analyzed using a three-field plot (Sankey Diagram) where each field corresponds to one time slice. Then, the conceptual structure of the dataset was examined by analyzing the thematic or strategic maps (Cobo *et al.*, 2011). In this method, a clustering algorithm was applied to the keyword network; each cluster in the thematic map corresponded to a topic (Aria and Cuccurullo, 2017). The author's keywords were selected to label the clusters. Since this method does not allow direct categorization of documents by topic, four researchers independently read the text, discussed, compared, and categorized the documents. Then, the researchers' categorizations were compared with the thematic map and thematic network to combine them.

Seventh, new boundaries for the analysis were set: only documents belonging to the Business and Management WoS categories were eligible. We excluded 972 documents because they did not belong to the Business and Management WoS category; thus, a subset of 539[1] articles was obtained. A bibliometric analysis was performed, as in the sixth step.

Eighth, a further restriction was made by selecting only documents that focused on technology, which yielded 126 documents.

Ninth, manual cleaning of documents was performed by reading the full text of the 126 documents from step 8. We excluded 70 documents because they only mentioned *technology* but did not focus on it. At the end of the cleaning process, a dataset of 56 documents was obtained.

Tenth, a thematic map analysis of the 56 documents was performed, and documents were clustered according to the topics identified in the network map and related thematic diagrams (Cobo *et al.*, 2011). The network map shows the descriptors (e.g., keywords) of each cluster and their connections (Pinto, *et al.*, 2014). Table 1 shows the three levels of our research and the related steps according to the funnel approach.

Tab. 1: Levels or research aims and related steps

Research level	Research boundaries WoS Research Areas/ Categories	Records	Aim	Steps #
1	Silver economy in business & economics" and "operations research and management science"	1,511 records	To get a general overview of the academic research on silver economy	4, 5, 6
2	Silver economy in business & management	539 records	To outline the current state of the silver economy in the business and management literature	7
3	Silver economy and technology in business & management	56 records	To trace the relationship between the topics of technological innovation and silver economy in business and management literature	8, 9, 10

Source: Authors' elaboration

[1] Software automatically excluded 5 documents from clustering because they were not linked to any other document. Thus, the thematic and cluster analysis are based on 534 documents (see Section 3.2).

3. Results of bibliometric analysis and literature review

According to the aim of the study, our results present the conceptual structure and evolution of the research field of the silver economy over time. To this end, they are divided into three complementary sections, which correspond to three levels of research that were followed in the systematic literature review. Each section is characterized by a different focus and level of analysis (Table 1).

The first section (3.1.) provides a comprehensive overview of silver economy research in Business & Economics and Operation Research and Management Science (WoS Research Areas).

The second section (3.2.) outlines the current state of the silver economy in the Business and Management literature (WoS categories) by analyzing thematic maps.

The third section (3.3.) combines thematic and cluster analysis and provides detailed insight into the relationship between the topics of technological innovation and the silver economy in business and management (WoS categories).

3.1 Silver economy: A general perspective

This section provides a general overview of research on the silver economy from 1985 to 2022[2]. During these 37 years, scientific production on the broad phenomenon of the aging population has steadily increased (McGuirk, *et al.*, 2022; Mostaghel, 2016), reaching an annual maximum of 158 articles and proceedings in 2018. During this period, the most productive journals on this topic were the Journal of Nursing Management (43 articles), Health Economics (38 articles), Journal of Economics of Ageing (35 articles), Journal of Transport Geography (31 articles), and European Journal of Health Economics (23 articles). Evidence suggests that most of the debate has developed in the health management, economics/labor, and social policy literature.

Analysis of the annual production series reveals two breaks in 2008 and 2015 that delineate three subperiods (Fig. 1), which we refer to as the formation phase (1985-2007), transition phase (2008-2014), and early development phase (2015-2022). To analyze each period and how different themes were interlinked and evolved across periods, a three-field plot was used (Sankey Diagram) (Fig. 1). Thus, the links among the three time slices and their flows (from left to right) show the evolution of themes (Morante-Carballo *et al.*, 2022).

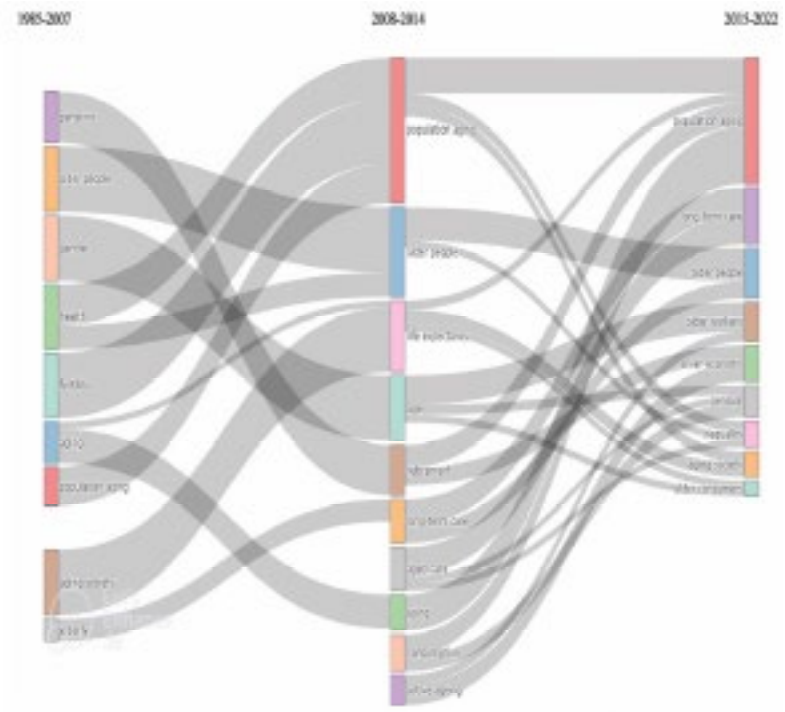
Scientific production in the formation phase (1985-2007) includes relatively few publications (an average of 12 per year), which mainly address the demographic change and the economy from a policy perspective.

[2] Our dataset dates back to the late 1980s; it reflects the use of a wide range of keywords (see step in Section 2) to directly and indirectly intercept the silver economy theme, where many authors refer to the broader phenomenon of aging populations. Most studies in the 1985-2015 period were intercepted by other keywords (e.g., aging society, population aging), while the emergence of the silver economy keyword only began in 2015, which suggests that the use of the term silver economy is relatively recent.

The focus is on the drivers and broader implications of economic life for aging and society's treatment of older people. The occurrence of author keywords (Kws) during this period suggests that the research topics have a very specific and narrowed focus, such as social welfare expenditures (i.e., pensions and health care spending) and the links between gender and age difference in the labor context.

Fig. 1: Top five sources in the three subperiods and Sankey diagram

1985-2007 167 documents 168 sources Top 5 sources cover 45% of production	**2008-2014** 405 documents 210 sources Top 5 sources cover 44% of production	**2015-2022** 939 documents 485 sources Top 5 sources cover 27% of production
Canadian Public Policy - Analyse de Politiques (8)	Journal of Nursing Management (27)	Journal of the Economics of Ageing (35)
Journal of Population Economics (6)	Health Economics (15)	Health Economies (20)
Journal of Macroeconomics (5)	Journal of Transport Geography (15)	Technological Forecasting and Social Change (18)
Japan and the World Economy (4)	Journal of Population Economics (10)	Journal of Nursing Management (16)
Journal of Macroeconomics (4)	European Journal of Health Economics (9)	Journal of Transport Geography (16)
National Tax Journal (4)	Transport Policy (9)	European Journal of Health Economics (14)
World Development (4)	Journal of Health Economics (8)	International Journal of Consumer Studies (14)
Health Economics (3)		
Journal of the Operational Research Society (3)		
Pharmacoeconomics (3)		
Public Finance - Finances Publiques (3)		
Review of Income and Wealth (3)		
Total Quality Management & Business Excellence (3)		



Source: Authors' elaboration

The transition phase (2008-2014) opens up new research directions on management, innovation and leadership in care and health, workforce aging and retirement, and the quality of transport policy, travel and mobility. Very specific themes (fertility and health) in the initial phase of the studies converge here with the general theme of research on the older and aging population. Meanwhile, some emerging themes (consumption, life expectancy, and active and healthy aging) shift the focus from the decline of older people's health and associated costs to the policies and practices to improve their independence, quality of life and society as a whole (savings in pension and health care costs).

Most of these emerging themes will be further developed in the early development phase (2015-2022).

The early development phase (2015-2022) covers many additional research interests and topics (the top five journals cover 27% of the total output for the period, compared with 45% and 44% in the first and second periods, respectively) by expanding, strengthening, and legitimizing earlier areas of study (population aging, long-term care, and older people). In addition, new research emerged in the areas of technology and technological change as the drivers and outcomes of complex interactions in social, economic, and political contexts; the role of national governments in identifying socially desirable technologies; health policy and services; labor and consumer research; and new market opportunities. These trends are evident in the assessment of new Kws such as "Older Consumers" and "silver economy", which address further studies in this area, particularly from the perspectives of business and management.

3.2 Silver economy in the business and management literature

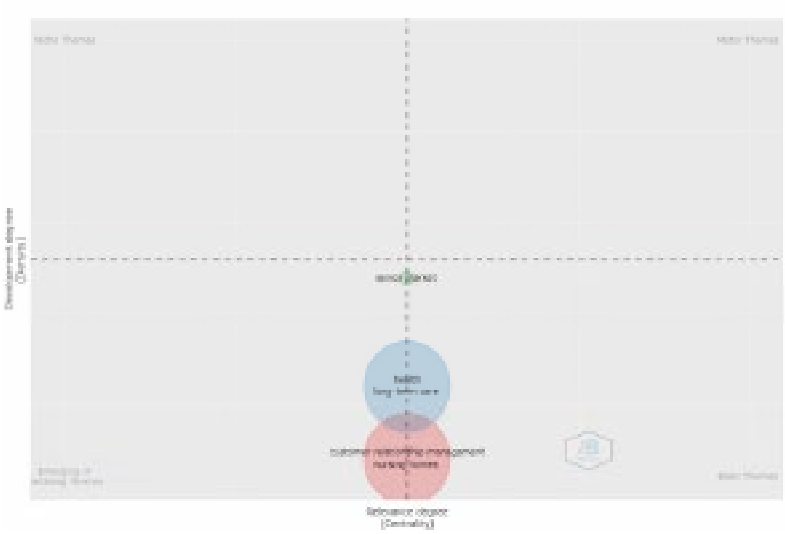
In the business and management literature, the most productive journals are the Journal of Nursing Management (43 articles), which confirms itself as the most important source (Section 3.1), Technological Forecasting and Social Change (21 articles), which published a special issue on technology and elderly individuals, International Journal of Consumer Studies (20), International Journal of Manpower (11), Action Research (9), and Research on Transportation and Business Management (9). The debate follows the same pattern as that in the general overview (Section 3.1) but with a focus on consumer preferences and needs instead of policies to be implemented.

As shown in Section 3.1, the analysis of the annual production series shows the same two breaks in 2008 and 2015. To identify the main themes and their evolution in the business and management literature, a thematic analysis was performed (Figs. 2, 3, 4) for each subperiod: formation (1985-2007), transition (2008-2014), and early development (2015-2022). The thematic map helps identify the relevance and evolution of the discussed topics and highlights the most discussed and marginal topics that have contributed to the construction of the research field in a given period (Aria *et al.*, 2022).

The formation phase (1985-2007) (Fig. 2) includes 34 articles and three main themes: *Senior market, Health/long-term care* and *Customer relationship management/nursing homes.*

The position of these themes on the map - medium centrality (horizontal axis) and low depth (vertical axis) - indicates an initial and very general attention to the topic by scholars. A deeper look at the map shows the higher density of the senior market topic compared to the others. For us, this increased interest reflects the emergence of research on consumer behavior in the senior market.

Fig. 2: Formation phase (1985-2007): Thematic map



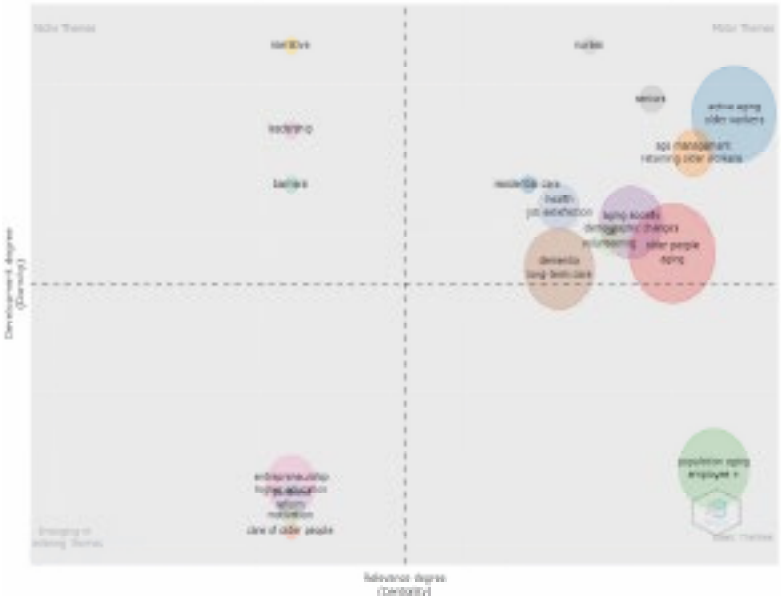
Source: Authors' elaboration

The transition phase (2008-2014) (Fig. 3) includes 136 articles and more topics than in the formation phase. This is consistent with the growing interest of scholars in the field.

The thematic map shows that active aging/older workers, aging society, and older people/aging and related issues are relevant motor themes of this subperiod. In particular, active aging/older workers is one of the motor themes with the most studies and high density and centrality. This trend follows the striking number of studies on how companies address the issues of work and retirement in the context of demographic change (Moulaert *et al.*, 2013; Bierwisch *et al.*, 2014).

To correctly define the themes in the lower left quadrant as emerging or declining, the thematic trends were analyzed across the three time periods (Figs. 2, 3, 4). For example, *entrepreneurship/higher education* is an emerging theme that shifts to the *seniors/age* theme in the third period, while *pension reform/motivation* and *care of older people* are declining themes, which neither survive nor cluster in the third period. Finally, in the last quadrant (upper left), the *narratives, leadership,* and *barrier* themes appear to be very specific to the subperiods.

Fig. 3: Transition phase (2008-2014): Thematic map



Source: Authors' elaboration

The early development phase (2015-2022) (Fig. 4) includes 364 articles and a steadily growing number of themes.

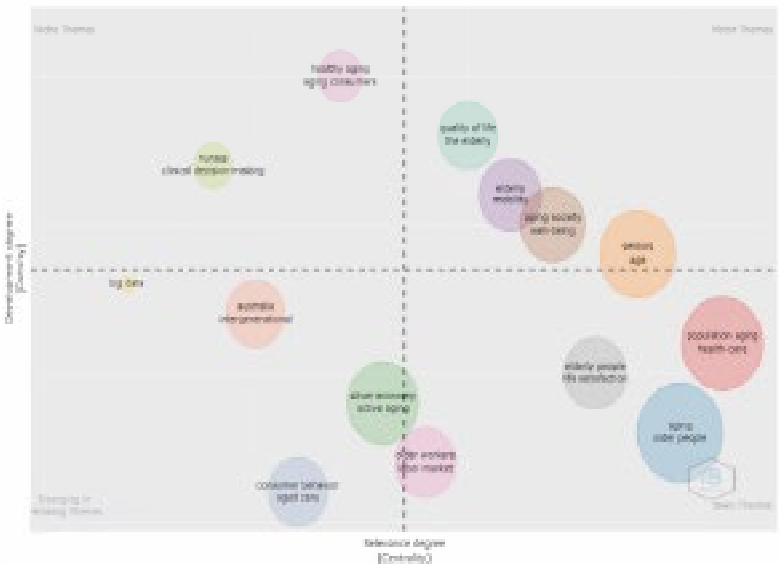
Consistent with the trend that emerged in the transition phase, the *aging society* and related aspects have confirmed their role as a motor topic in this phase. In addition, new themes have emerged as motor themes: *seniors/age, elderly/mobility, and quality of life.*

Among the basic themes, population aging has been confirmed as a relevant issue, while *elderly people/life satisfaction* and *older workers/labor market* appear as *new entries.* Interestingly, *aging/older people* are moving from a motor to a basic theme, i.e., it remains very central but has become less specific.

As described in Section 3.1, silver economy/active aging and consumer behavior appear as emerging themes (lower left quadrant) for the first time in this last phase (2015-2022). This result confirms the novelty of the topic, which has gained momentum since 2015 with the European Commission's first paper on the subject (Eatock, 2015). The strategic map confirms that it includes different but interconnected areas that relate to new and growing markets to meet the new needs of the growing number of older people.

Finally, the niche topics (upper left quadrant) include *nurses/clinical decision-making* and *healthy aging.* They are strongly developed but no longer central in this last phase. They follow the development of *health/ long-term care* and *customer relationship management/nursing homes,* which were central and relevant topics in the formation phase (1985-2007). Most articles on these topics were published in the Journal of Nursing Management, which was the most fruitful source throughout the entire period and especially during the transition phase (2008-2014).

Fig. 4: Early development phase (2015-2022): Thematic map



Source: Authors' elaboration

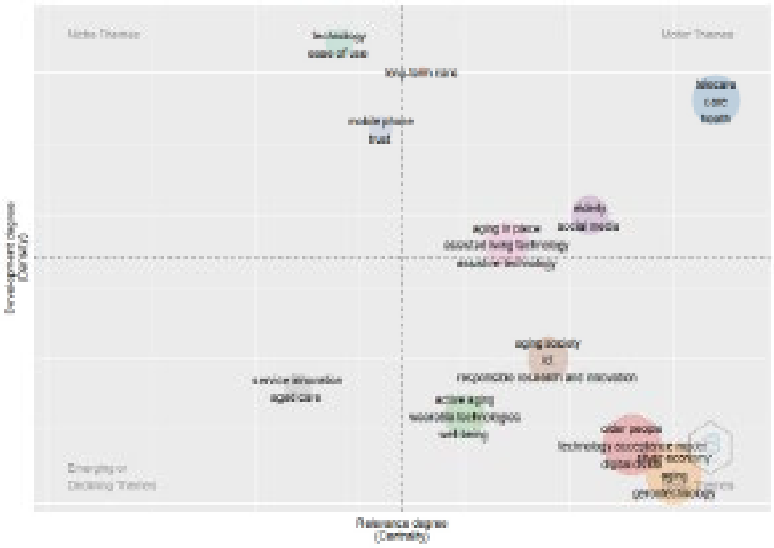
3.3 Silver economy in the business and management literature: focus on technology innovation

Although the silver market is widely recognized as a successful application area for technological innovation and solutions (Kohlbacher and Hang, 2011), our results (strategic map analysis in Section 3.2 - Figures 2, 3, 4) do not directly address this issue in the silver economy business and management literature. The results confirm our initial expectations (i.e., the number of articles and proceedings on technological innovation accounts for barely 10% of the total scientific output in the business and management literature - Figure 1). This result contrasts with the reality of technological development and its trends and impact on the social context, and it confirms a relevant gap in research on the silver economy in our area of interest. Accordingly, considering the purpose of our study, the following subsections show the results of the thematic map analysis (Fig. 5) and cluster analysis (Fig. 6). They are limited to the 56 articles and proceedings that address the topic of technological innovation in the silver economy literature (Fig. 1).

3.3.1 Thematic map analysis

The next lines present the most discussed topics (e.g., motor and basic) and the marginal topics (emerging/declining and niche) that determine the knowledge structure of studies on technological innovation in the silver economy (Fig. 5).

Fig. 5: Technological innovation in the silver economy domain: Thematic map



Source: Authors' elaboration

Motor theme: *Telecare/care/health, elderly/social media,* and *aging in place/assistive technology,* which are in the upper right quadrant, have high centrality and density, so they are the most important themes developed and critical to structuring the research field.

Basic themes: *Silver economy/gerontechnology, active aging/wearable technologies/well-being,* and *older people/technology acceptance model,* and *aging society/ICT,* which are in the lower right quadrant, are characterized by high centrality and low density. They are critical to the field, since they relate to general themes that cut across various research strands on technology and the silver economy.

Emerging/declining theme: *Service innovation/aged care* to implement and deliver health and social care innovation, which is in the lower left quadrant, has low centrality and low density, i.e., it is weakly developed and marginal. It can be classified as an emerging topic because publications on service innovation have appeared for the first time in a particular journal (e.g., Journal of Service Marketing) in the last ten years and fall into the third period.

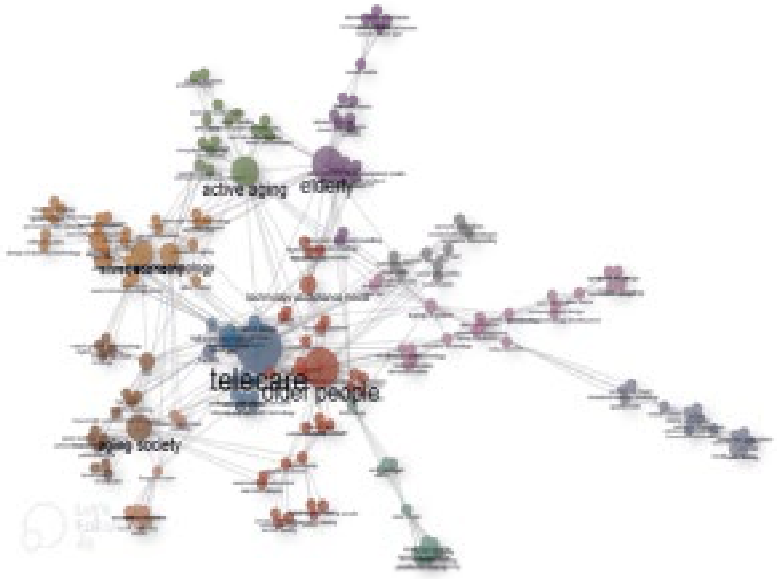
Niche themes: *Technology/ease of use and mobile phone/trust* appear in the upper left quadrant as very specialized and isolated topics. Their position on the map indicates that they have well-developed internal links (high density) but insignificant external links; thus, they have limited importance in the field (Aria *et al.*, 2020).

3.3.2 Cluster analysis

The network map (Fig. 6) shows eleven clusters that correspond to the themes in the thematic map (Fig. 5). Clusters were named according to their main descriptors (Appendix 1) and according to the themes that emerged

from the analysis and interpretation of the contributions. They are #Elderly and Social Media (purple); #Assistive technology for aging in place (pink); #Telecare implementation process (blue); #Technology acceptance and use of mobile devices (red); #Silver economy and gerontechnology (ochre); #ICTs for aging society (brown); #Wearable technologies for active aging (green); #Service innovation for aged care (gray); #Trust and senior online consumption (gray-blue); Human-Machine interaction in long-term care (salmon); #Age-friendly mobile devices (turquoise).

Fig. 6: Technological innovation in the silver economy domain: network and clusters



Source: Authors' elaboration

Below is a detailed description of each cluster based on the thematic map analysis (Fig. 5).

Motor themes

#Elderly and Social Media (purple): This cluster focuses on understanding the factors that influence the relationship between older people and social media as predictors of acceptance and use of different technologies. In particular, some scholars focused on the acceptance and intention to use smart technologies as a potential solution for their independence and safety at home (Tirziu *et al.*, 2020; Wong and Leung, 2016) or gaming technologies to improve their mental and physical health (Wang and Sun, 2016). Other researchers mainly refer to interactive/communication technologies (e.g., Facebook) to avoid social isolation by staying in touch with family and friends (Matilainen *et al.*, 2016). Within the cluster, Israeli *et al.* (2019) proposed a narrower focus on older people's intention to use social media to complain when a service failure occurs.

#Assistive technology for aging in place (pink): this topic relates to the use of and interaction with technology in their homes among older people. Some authors discuss the shortcomings and weaknesses associated with the use of assistive technologies, while others focus on solutions that enhance the use of technology to support the independence of older people. A first group of studies specifically addressed the negative effects of personal alarm systems. According to Pritchard and Brittain (2015), alarm pendants tend to be ineffective and increase feelings of dehumanization in older people. Similarly, Aceros *et al.* (2015) found that alarm systems tended to confine older people to aging in place and prevented them from engaging in outdoor activities, and telecare systems could exacerbate problems related to social isolation among older people. In the second group of studies, Compagna and Kohlbacher (2015) focused on the adoption of care robots for elderly individuals and emphasized the need to strengthen a bottom-up approach in participatory technology development to improve the development of ambient assisted living technologies that meet the real needs of older people. Additionally, according to Östlund *et al.* (2015), a better understanding of social and domestication processes (i.e., the integration of technologies into households) can make welfare technologies (a group of heterogeneous technologies that reduce social/welfare expenditures) more effective for older consumers. Meanwhile, Holliday *et al.* (2015) argued that greater development of the market for electronic assistance systems could help older consumers independently purchase products and services while maintaining their independence and lifestyle.

#Telecare implementation process (blue): The papers in this cluster focus on the successful acceptance and use of telecare. They take a user-centered perspective to adapt products and services to the needs and abilities of older people and make them user-friendly. Bjørkquist *et al.* (2015) referred to the involvement of seniors and other potential users (health and care professionals, relatives of seniors, etc.) in the process of defining their needs and selecting appropriate telecare solutions to meet them. Horton (2008) examined the experiences of users (older patients with chronic obstructive pulmonary disease and staff) with telecare to better understand the subjective definitions of patients regarding acceptability and usefulness (i.e., why patients liked or disliked a service) and identify areas of success, best practices, and problems in implementing telecare technology. Wilson *et al.* (2017) used the Total Social Organization of Labor (TSOL) framework to paint a broader picture of the impact of telecare systems from the diverse perspectives of project teams, clinicians, social workers, volunteers, and elderly individuals. They related to sociotechnical environments instead of on-site technologies/services. This broader perspective has strong implications for the design and implementation of telecare systems that are intended to create (social) value for all users (Wilson *et al.*, 2017).

Basic themes

#Seniors' acceptance and use of technology (red): The articles in this cluster focus on the factors of acceptance and use of different technologies

by older people depending on their specific applications and purposes. They reconceptualize and integrate the existing Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) model (Macedo, 2017) to demonstrate the positive impact of internet acceptance and use on active aging (Macedo, 2017) and examine the acceptance/use of mobile devices by older people from both technical and sociological perspectives (Klimova, 2018). According to Azuddin *et al.* (2018), the design and functions of the mobile device (technical factors - device context) and the social inspiration and awareness of the usefulness, communication, and economic benefits (sociological factors - social context) are critical to mobile device acceptance and use. Technology acceptance and use are closely related to the digital divide and digital exclusion of older people. On this topic, Huterska *et al.* (2018) noted hindering factors (i.e., soft factors primarily related to older people's lack of knowledge and skills) in online shopping use that lead to digital and social exclusion. Adamczyk and Betlej (2021) recalled the dimensions of digital exclusion and related social factors in an aging society (i.e., motivation to use new technologies, physical access, skills, and usage). They argued that people aged 60-75, 75-85, and over 85 had relevant differences in their needs and activities. Hwang and Nam (2017) compared computer-based technologies with mobile-based technologies and found that the latter helped reduce the "digital divide", especially for social relationship services (i.e., social media) and convenience services (i.e., administrative services). The issue of exclusion from smart public services is a central theme in studies of aging. Nowakowska-Grunt *et al.* (2021) explored the role of technological innovations (e.g., virtual assistants/avatars) in reducing the digital exclusion of seniors in the context of e-government, while Cirella *et al.* (2019) reflected on the possibilities of integrating mobile technology into transportation to promote seniors' mobility and their social inclusion through accessibility, affordability, availability, and acceptance of new services.

#Silver economy and gerontechnology (ocher): the articles in this cluster mainly refer to the links between the promising silver market and the development of innovation. Here, innovation, including technology, is considered a potential solution to the problems of aging and a driver of new market opportunities (Kohlbacher and Herstatt, 2011).

The focus of this group of studies is heterogeneous and includes several research directions and theoretical approaches. Cukanova (2015) identified digital consumption by seniors as the main stimulus for innovation and a prerequisite for the coming dynamization of businesses in the service sector (i.e., information technology services, online sales, transportation services, medical and nursing services and assistance, sports, culture, recreation, etc.). Laperche *et al.* (2019) examined the supply side of the silver market and assessed the role of demographic aging on innovation development. More specifically, the authors went beyond the established concept of gerontechnology and introduced the concept of geront'innovation as a solution that combined multiple forms of innovation (i.e., product, process, organizational, and marketing innovations), including but not limited to technology. Similarly, Oget (2021) stated that

the most innovative part of this new market was its organizational and marketing innovations. Technological innovations are not a milestone for the silver economy and currently play only a minor role; instead, they reinforce and enable marketing and organizational innovations. Due to the complex nature of such innovations, both open innovation (Laperche *et al.*, 2019) and networks (Laperche *et al.*, 2019; Oget, 2021) are critical to their effective development. Another relevant research direction calls for a holistic interpretation of technology according to the science and technological studies (STS) approach. The new role of technology as an obstacle or enabler of new practices and roles in seniors' lives replaces the traditional view of technology as an instrumental and passive object that only acquires meaning through the way people use it. Some studies in this subgroup focused on the area of complex telecare systems (Leonardi *et al.*, 2009; Gòmez, 2015), while others focused on the assisted living environment as an enabler of autonomy and independent living for older people (Neven, 2015). Leonardi *et al.* (2009) broadened the focus from the needs of older people to the complex web of emotions and practices (daily routines) of independently living seniors to design and develop acceptable and useful advanced home technologies. In the same vein, Gòmez (2015) noted the ontological status of autonomy-enabled innovations for later life and asserted that such technologies must interact with the social and cultural context of older people and evolve accordingly to be concretely and meaningfully integrated into their lives. Against the backdrop of actor-network theory and other theories of user representation, Neven (2015) noted that representations of users (i.e., people who want to live independently at home for as long as possible) formed the basis for the design of technologies; thus, they have a wider influence on usage and practices so that particular views of aging are written into the technology. This paper draws attention to the changes at the physical, virtual, and emotional levels that technologies introduce in the home, focusing on two main effects. On one hand, technology enables older people to have greater and lasting autonomy, especially at home. On the other hand, technology can undermine the emotional experience of being at home.

More broadly, the latter contributions focus on the role and linkage between seniors' lives (practice and daily routines), science, and the design and use of technology in shaping new practices and patterns of aging.

The positioning of this cluster opens the door to links between two other relevant groups of studies: #ICTs for an aging society (brown) and #wearable technologies for active aging (green).

#ICTs for aging society (brown): the contributions of this cluster focus on the role and importance of silver generation in business, which is considered an entrepreneurial opportunity but has strong ethical and social consequences. Indeed, an increase in aging population represents a remarkable societal change that requires the diffusion of a new and more inclusive culture of aging (Bechtold *et al.*, 2017). Therefore, companies, academics and policy-makers are called upon to design and develop ICT solutions for the social inclusion of older people (Butt *et al.* 2021; Flick *et al.*, 2020). Thus, future technologies should be easy to use, accessible, inclusive, and able to overcome the older population's resistance to change

due to their inherent digital incompetence (Butt *et al.*, 2021). Depaoli *et al.* (2010) noted that according to the "e-Inclusion Strategy" developed by the European Union, ICT for older people is becoming an enabler to achieve inclusion goals. ICT technologies can help include people who are not readily able or willing to use them, including for basic services (Bechtold *et al.*, 2017; Frau *et al.*, 2019).

#Wereable technologies for active aging (green): publications in this cluster see older people as an economic opportunity due to their longevity and vitality. Older people are not considered a threat but a challenge that requires rethinking the impact of aging on the economy and society as a whole (Bojanic and Erceg, 2017). Consistent with this approach, technology is becoming a tool to shape the lives of older people while promising better quality of life and reduced public spending. These technologies help senior people who are younger, more independent, and self-motivated (Lassen *et al.* 2015) to become truly savvy tech operators (Loe, 2015). They are active agents who, for example, make conscious decisions about whether to use biomedical devices (Loe, 2015) or adopt wearables such as smartwatches and fitness trackers (Morozova and Gurova 2021). Thus, they do not like uncomfortable devices that are considered something for sick people. In doing so, they collaborate and participate in the development of textile-based clothing, such as high-performance sportswear, to improve their daily lifestyle and well-being.

In summary, active aging technology enables older people to take responsibility for their own bodies instead of treating them as patients (Flick *et al.*, 2020). This is confirmed by the cluster's position on the map, which is quite isolated and on the opposite side of the assistive technology for the aging-in-place cluster, which focuses on telecare.

Emerging themes

#Service innovation for aged care (gray): the studies in this cluster focus on the implementation and delivery of innovations in health and social care. Barlow *et al.* (2006) referred to telecare as a set of services (i.e., safety and personal monitoring and care-related information delivery) that directly brought care to the end user. Because telecare involves a combination of technological and organizational innovation in a multiactor context, the authors emphasized the need to align the value systems of different stakeholders to meaningfully integrate telecare services into the overall system of care: "The higher the level of dependency of a patient, the greater the need for integration of the telecare service they receive into the care system as a whole" (p. 399). Drawing on research on innovation in other service sectors, the authors identified factors that affected the adoption of telecare (i.e., organizational context, user needs and demand, project complexity, and a local framework for support). Although not directly, they introduced the concept of resource integration and service ecosystems. Khaksar *et al.* (2016) explored and evaluated the factors that enabled social robots (a new generation of assistive technologies) to provide innovative services to reduce social vulnerability and improve the well-being of older people in elder care facilities. The authors referred to social robots as service innovators and catalysts for service innovation in elder care "because they

not only seek the best solutions to the problems of aging, but also play a preventive role for any other problems they might encounter in the future" (p.442). For example, social robots can entertain and engage the elderly in social activities such as group games (bingo), detect mental impairments during games, and help caregivers monitor the elderly's performance. Thus, it is not only a "talking machine or pet" but an actor that offers new opportunities to personalize services, improve the social interaction and independence of older people, and improve the quality of social services by supporting caregivers. From an organizational perspective, Khaksar *et al.* (2017) referred to providers of services to older people and described social robots as a means to transform and improve their existing business models, increase the quality of their services, and develop innovative service offerings. The authors noted that service delivery through social assistive technologies supported the process of value co-creation between service providers, caregivers, and people in need of assistance and improved well-being through transformative services (Ostrom *et al.*, 2015).

Niche themes

#Trust and senior online consumption (gray blue): The trust levels in mobile shopping vary across age groups. Studies in this cluster show the relationship between older people's willingness and trust to use information and services in an online context. Rajaobelina *et al.* (2020) confirmed the relationship among the cognitive, positive affective/sensory, negative affective, and social dimensions of mobile banking experience and trust. They found that the social dimension, which refers to the opportunity to interact with staff, was particularly relevant for individuals over 65 years of age in the context of mobile services, overall when the complexity of the transaction increased and trust in the online service or in oneself decreased. Therefore, social support is crucial and closely related to trust (Bae *et al.*, 2021). Heldal *et al.* (2020) found that older people lacked trust in eHealth information, especially when the symptoms or concerns were severe. In this case, dialog and social support from physicians, peers, and family could be very helpful for older adults, as they partially compensated for the lack of trust, which affects the eHealth literacy of the senior people and their ability to recognize, understand, evaluate, and critically apply eHealth information to solve health problems.

#Human-Machine interaction in long-term care (salmon). The papers in this cluster identify a strong connection between the topic of telecare and long-term care. For example, Grzybowski *et al.* (2017) identified a model to assess the utility of smartphones for the elderly as a proxy for the benefits of mobile telecare, while Tan *et al.* (2021) identified technological risks and five ethical issues in the use of robotics and autonomous systems in long-term care.

#Age-friendly design for mobile devices (turquoise). This cluster includes two very specific studies on mobile device usability and online mobile shopping. The first study, proposed by Iancu and Iancu (2020), discusses the role of design in the technology adoption process. They provided a specific theoretical overview of the main features that should be built into mobile devices to meet the needs of older people. In particular,

the authors argued that more user-friendly features were needed in terms of device design and menu and applications to improve the usability of mobile technology for older people. The second paper by Hou and Elliott (2021) addresses how consumer demographic characteristics and motivations may influence the mobile shopping intensity. In this context, the authors noted that ease of use was among the most important drivers of online and mobile shopping.

4. Discussion

This paper offers interesting new perspectives on innovation for the well-being of older people by tracing the current state and evolution of research on the silver economy and particularly the state of technological innovation in this area. To our knowledge, this is the first study to combine a systematic literature review and a quantitative bibliometric approach for the silver economy in the business and management literature. The study was developed through a funnel approach based on three levels of analysis, each characterized by a different focus.

The first level of analysis provides a broad overview of the field of the silver economy domain within Business & Economics and Operation Research and Management Science (WoS research areas). It covers topics (e.g., elderly, longevity, aging society, active aging, etc.) with a well-defined literature that was intentionally included because they are closely related to the silver economy, which is the focus of this paper. Three main research periods were identified: the formation (1985-2007), the transition phase (2008-2014), and the early development phase (2015-2022), where the focus of scholars' interest shifts from welfare expenditures due to the declining health of the elderly (1985-2007) to health policy, services (2008-2014), and technological change (2015-2022) to use opportunities of population aging to develop a growing and diverse market.

The second level of analysis addresses the thematic analysis of the field of the silver economy in the business and management literature. It shows the evolution of the themes - motor, basic, emerging, and niche - that characterize the research field in each of three subperiods: formation (i.e., 1985-2007), transition phase (i.e., 2008-2014), and early development phase (i.e., 2015-2022). The silver economy, active aging, and consumer behavior themes emerged for the first time in the early development period (2015-2022). These themes mark a relevant shift in perspective; they underscore the need for a new research agenda that moves from issues of age-related decline to new market opportunities that arise from positive and active aging.

The third level of analysis addresses the issue of technological innovation and the silver economy in the business and management literature. A quantitative and qualitative approach combines both thematic and cluster analysis to clarify the role and impact of technological change on the lives of older adults and evolution of the silver market.

Although the clusters focus on specific technological solutions for frail seniors in need of care and/or healthy and active seniors, some

general themes run through various research strands. For example, a basic theme in most clusters explains the critical factors that influence seniors' attitudes and behavioral intentions when using technology. The authors define and evaluate these factors considering existing models of technology acceptance, such as TAM (Davis, 1989) or UTAUT (Venkatesh *et al.*, 2003), or newer models such as STAM (Chan and Chen, 2014) and UTAUT2 (Macedo, 2017), which incorporate age-related health and ability characteristics of older people. Interestingly, certain determinants (e.g., the user-driven approach) of technology adoption and intention to use are piquing researchers' interest by raising new questions about the new role of seniors and their entire environment (i.e., active vs. passive recipients of technology), even in well-established topics, such as those related to telecare. Bjørkquist *et al.* (2015), Horton (2008), and Wilson *et al.* (2017) recognized the importance for service providers to view telecare as a complex system, where adaptability to the needs, expectations, knowledge, and skills of seniors and other users of the care system (i.e., professional caregivers, family, friends, etc.) has implications for its functioning. This highlights the importance of involving users in the process of designing, selecting, and implementing technological solutions (Gòmez, 2015; Leonardi *et al.*, 2009; Neven, 2015) to improve their usability (i.e., ease of use) and acceptance among older people. Recognizing the active role of older people requires a new, socially inclusive mindset to overcome ageist stereotypes. To this end, the changing role of the older technology user as a resource integrator should be considered (Edvardsson *et al.*, 2014; Vargo and Lusch, 2008). Technology for older users should be considered an actor in the service ecosystem (Storbacka *et al.*, 2016; Storbacka 2019), which can act on potential resources to co-create and/or destroy value (Caridà *et al.*, 2019a).

A similar approach is found in clusters #service innovation for elder care (gray) and #silver economy and gerontechnology (ocher). Some recent studies (Compagna and Kohlbacher, 2015) in these clusters go beyond the traditional view of technology as an instrumental and passive object; they emphasize the new role of technological solutions (e.g., social robots) as service innovators and catalysts for service innovation in elder care (Khaksar *et al.*, 2016) and as enablers of new practices and roles in the lives of seniors (Khaksar *et al.*, 2017).

In short, technological solutions must interact and evolve with the social and cultural context of older people (Gòmez, 2015) to accurately reflect their life experiences and enable them to actively participate in their own care. This approach reflects the general perspective of welfare technologies (Östlund *et al.*, 2015) and the emerging pillars of transformative social innovation (Pel *et al.*, 2020). It addresses the use of technologies for social purposes (Caridà *et al.*, 2019b) and leads to the development of new practices, patterns of aging that meet the needs of a more inclusive society, and new market opportunities, particularly in the area of active aging.

To harness the transformative power of technology in terms of social interaction, independence, social inclusion, and improved well-being, older people must become empowered users who control technology. Although older people actively use technology in many ways and for many

purposes (e.g., active aging, aging in place, etc.), this is not a given. As many scholars have noted, the digital divide and its associated consequences (social exclusion of older people) are high on policy-makers' agendas. To avoid this issue, policy initiatives (e-Inclusion Strategy) should align technologies with the values, needs, expectations and skills of older society as a whole and promote digital literacy at both national and European levels. They must include tailored support and education programs (Bechtold *et al.* 2017; De Paoli *et al.*, 2010) that enable seniors to handle everyday services that move online, such as e-government, e-banking, e-commerce, and e-health services. The success of the e-Inclusion strategy requires a shift in perspective from the aging individual (i.e., the micro level) to the aging society (i.e., the macro level). Thus, the question of how to provide new, meaningful opportunities for people in their third age is not a matter for a single organization or service provider but implies the responsibility (Caridà *et al.*, 2019b) of the entire society. Governments and other organizations must promote a social inclusion (dominant) logic to inspire and drive the development of new economic, social, and cultural contexts aimed at the well-being of society.

5. Further research

These findings have shown the lack of a comprehensive theoretical framework that combines the expectations of policy makers, businesses, and silver people in a win-win logic. This is likely due to the recent and highly fragmented debate on the role and impact of technological innovation on the silver economy in the business and management literature. In this regard, further studies should adopt a broad and transdisciplinary perspective to better inform research, policy, and practice and improve their coherence with current trends of aging populations in the real world.

To this end, scholars should combine the perspectives of social innovation (Caulier-Grice *et al.*, 2012; Rubalcaba, 2016; van Wijk *et al.*, 2019) and service ecosystem innovation (Storbacka *et al.*, 2016; Storbacka, 2019).

The service ecosystem innovation perspective (Storbacka *et al.*, 2016; Storbacka 2019) fosters interactions and resource integration among silver market network actors and facilitates the co-creation of technological solutions for social innovation purposes.

On one hand, this research perspective challenges many conventional foundations regarding older people's abilities, expectations, and behaviors, and the social context, where they seek to live longer and healthier. Moreover, it catalyzes several patterns of aging that stem from the emerging theme #service innovation for aged care (gray) and intersects established research strands of the silver economy (i.e., motor and basic themes).

Thus, to view the silver economy through the lens of social innovation and the service ecosystem, scholars should examine the following in depth:

- The role of local and central governments (i.e., policy makers) in orchestrating resource integration processes to holistically address aging opportunities and promote the silver economy at the national

and European levels. To truly transform the silver economy into a golden opportunity for society as a whole, governments must take on the novel role of service orchestrators (Breidbach *et al.*, 2016) to integrate technological innovation, business opportunities, and the social dimension of sustainable development. Accordingly, they must define, develop, and share common institutional arrangements (principles, rules, and social norms) that provide normative guidance for a social innovation culture (Bechtold *et al.*, 2017) at each level of the ecosystem (Edvardsson *et al.*, 2014) and incorporate the role of business in driving the next wave of innovation by focusing on social domains (Caulier-Grice *et al.*, 2012), such as demographic change and aging populations. Therefore, this line of research can make an important contribution to policy-relevant issues (e.g., the development of ICT solutions for the social inclusion of older people, (Butt *et al.* 2021; Flick *et al.*, 2020)), which are included in several clusters such as #ICTs for an aging society (brown) and #wearable technologies for active aging (green).

- The role of both silver people and technology in the broader context of aging society As we discussed, older people become resource integrators (Edvardsson *et al.*, 2014; Vargo and Lusch, 2008), especially when they are empowered to act in social and participatory ways through ad hoc training programs and activities that enhance their digital literacy. This finding is consistent with the United Nations Roadmap for Digital Cooperation (2020), which emphasizes the importance of linking digital inclusion and capacity building to human rights. In addition, technology is no longer just an instrumental and passive object but has become autonomy-enabling innovations for later life, which interact with the social and cultural context of older people (Gòmez, 2015; Khaksar *et al.*, 2016). Future studies in this research area can contribute to clusters such as #Service innovation for aged care (gray), #Wereable technologies for active aging (green), and #Human-Machine interaction in long-term care (salmon), which focus on the active role of older people and technology (e.g., Flick *et al.*, 2020).
- The models, processes (i.e., resource integration: Caridà *et al.*, 2019a; Kleinaltenkamp *et al.*, 2012) and activities to co-create social value and long-term and sustainable value for all ecosystem actors. In this context, researchers should focus on how seniors can be involved in the entire technology design process (Iancu and Iancu 2020). In this context, one should examine how seniors can be involved in all stages of the process, from needs assessment to testing, implementation, and adoption of technological solutions (Gòmez, 2015; Leonardi *et al.*, 2009; Neven, 2015). Therefore, further research in this area will significantly contribute to several clusters such as #Age-friendly design for mobile devices (turquoise) or #Telecare implementation process (blue), #ICTs for aging society (brown), and #Seniors' acceptance and use of technology (red).
- The different beneficiaries and types of value (i.e., economic, cultural, social) that result from the digital inclusion of older people. This direction will allow one to better harness the opportunities of the

silver economy and address the social challenges to transform the silver economy into a golden society.

This approach is not new but still challenging when the heterogeneous characteristics and demands of an aging society are considered. Moreover, as mentioned above, this perspective in the business and management literature provides a basis for further research and development in this area.

6. Theoretical contribution and managerial and policy implications

Discussions about the role and impact of technological innovation for older people have a common denominator based on the social impact of technological innovation and improving the well-being of older people. Although social issues are an important theme in research on the silver economy, different theoretical and practical perspectives of the studies show the lack of a comprehensive theoretical framework that links both social and business logics. Accordingly, this study opens up new research directions by calling for a broad and transdisciplinary paradigm that combines service ecosystem innovation and social innovation perspectives. It identifies several cornerstones (i.e., actors' roles, models of co-creation, processes and activities, codesign of technology for social purposes, and value) that require joint analysis to make the shift from the "silver economy," which is mainly about businesses and older individuals, to a golden opportunity for society of all ages. In summary, orchestrating and developing a meaningful service ecosystem for social innovation can address the challenges of current aging population trends and capitalize on opportunities.

From a managerial perspective, the study provides comprehensive insight into the opportunities and challenges of technology for the silver market. Identifying key problem groups through the systematic literature enables managers to better understand how to respond to stakeholder expectations and reap the benefits of technological innovation. In this sense, the analysis captures the economic opportunities of the silver market and social challenges that managers should consider when formulating business strategies and designing products for older people. Indeed, the current study shows how the interactions between technological innovation and older people can help companies achieve economic benefits. For example, when discussing the level of acceptance of technology by older people from different theoretical and practical perspectives, the analysis shows how innovation can increase the level of usability of technology by older people. This can help managers undertake product development initiatives that stimulate seniors' interest in purchasing products and services. In addition, our findings discuss the advantages and disadvantages that different types of technology design and applications have for older people. From this perspective, the current study enables product developers and managers to better understand which product features satisfy the needs of older people. In addition, our study provides insights for managers on integrating social aspects into business strategies and new product offerings.

From a policy perspective, our study recommends that policy-makers rethink their role and promote effective public policies for aging (i.e., social learning, senior entrepreneurship, etc.) to harness the potential of digital technologies and improve the social relationships and independence of older people in their living environment to enable active and healthy aging. Although the European Commission's program to promote the development of a fully inclusive digital society (European Commission, 2021) partially recognizes this goal, a general strategy is needed to drive changes in the social and cultural context beyond stereotypes and rethink the valuable role of older people in society.

7. Limitations of the study

This study has some limitations typical of most studies of a similar nature, such as the possible exclusion of research papers in the gray literature or the subjectivity bias of the researcher. Indeed, the classification and discussion of the study directions identified by the systematic literature review are inevitably influenced by the researcher's subjectivity bias (Boell and Cecez-Kecmanovic, 2015). To mitigate this problem, the discussion of the topic groups and associated relationships results from the coordinated analysis of four researchers. In particular, the initial and independent examination of various study strands, which was performed by each researcher, was jointly discussed to reach common agreements and increase the degree of objectivity.

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Appendix 1: Cluster themes and author's keywords

	Custer label	Keywords
Motor themes	#Elderly and Social Media (purple)	aging in place; connectedness; digital games; elderly; extended technology acceptance model; game narrative; gameplay intention; hierarchical regression analysis; hotel industry; internet addiction behavior; internet of things; interpretive structural modelling; isolation; sensors; service failure type; service recovery type; smart buildings; smart homes; smart technology; social media; systems design; technology; technology acceptance model; word-of-mouth behaviors
	#Assistive technology for aging in place (pink)	active aging; aging and design; aging population; aging in place; alarm pendant; assisted living technology; assistive technology; baby boomers; care robotics; consumer information; dehumanization; domestication; later life; mcdonaldization; older consumers; older people; older users; participatory; echnology development; scenario-based design; social shaping of technology; sts-driven design; telecare; user-driven design; welfare technology
	#Telecare implementation process (blue)	Care; case study; chronic obstructive pulmonary disease; community care; coordination; focus group interviews; health; information infrastructure; local health and care services; social care; socio-technical systems; systems design; tele-accompany; telecare; telecare and telehealth technology; total social organization of labour; work
Basic themes	#Seniors' acceptance and use of technology (red)	active aging; aging society; digital development; digital divide; digital learning; digital exclusion; households of elderly people; ict; influenced factors; information society; internet; internet use; mobile applications; mobile design; mobile devices; mobile internet; mobility narratives; new technologies; older people; online shopping; senior citizens; service quality; servqual method; smart environment; smartphones; social inspiration; sustainable development; technology acceptance model; transport innovation; transport service; transportation alternatives; use; user behavioral intention; utaut; virtual assistant - avatar
	#Silver economy and gerontechnology (ocher)	Aging; autonomy; care; configurational technology; consumers; continued use; cultural probes; design of domestic technology; elderly; france; gazelles; generification; gerontechnology; geront'innovation; health technology; innovation; morality; personal health systems; population aging; sectoral system; senior; silver economy; silver market; socio-technical arrangements; systemic approach; technological innovations; technology; telecare; use intention; user representation; wearable health technology
	#ICTs for aging society (brown)	aging society; ambient assistive technologies; digital competency; e-inclusion; foresight; forward-looking methods; health; horizon scanning; ict; ict services; knowledge map; ontology; participatory ta; responsible research and innovation; rri; silver economy; smart specialization strategy; smes; socio-technical imaginaries
	#Wearable technologies for active aging (green)	50+ consumers; active aging; alignment; biomedicine; birth cohort; elderly; entrepreneurial opportunities; ethnography; everyday technology; garment system; gerontechnology; health technologies; practice theory; silver economy; smart textiles; social innovations; user-driven innovation; wearable technologies; well-being
Emerging themes	#Service innovation for aged care (gray)	aged care; consumer vulnerability; dynamic capabilities; healthcare; implementation; older people; service innovation; social assistive technologies; social robots; social vulnerability; telecare; telemedicine
Niche themes	#'Trust and senior online consumption (gray-blue)	baby boomers; banks; behavioral insight; customer experience; e-health; elderly consumers; financial institutions; health information; health literacy; knowledge acquisition; mobile phone; quality of life; relationship marketing; structural equation modeling; trust; user characteristics
	#Human-Machine interaction in long-term care (salmon)	aging society; autonomous system; ethics; gerontechnology; heuristics ergonomics; long-term care; long-term care; risk; robotics; smartphones; social robot; systematic review; telecare; usability
	#Age-friendly design for mobile devices (turquoise)	bargain hunting; convenience seeking; demographics; design; ease of use; elders; enjoyment seeking; innovativeness; mobile shopping; mobile shopping intensity; perceived usefulness; technology; user-centered

Source: Authors' elaboration

sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s119.2022.02
pp. 19-49

Seniors and technology: can cognitive age and life events explain the gaps?[1]

Received
23rd June 2022
Revised
21st October 2022
Accepted
30th November 2022

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Abstract

Purpose of the paper: *this paper aims to identify good descriptors of the differences among the elderly, particularly suitable for technology use. Specifically, cognitive age and life events are compared to demographic age.*

Methodology*: a survey was conducted, and three cluster analyses were performed to reach three different segmentations: cohort, cognitive-age and life-event-based segmentations.*

Findings*: the conducted cluster analysis highlights multifaceted consumption trends also in relation to technology, both in the case of using cognitive age as a segmentation criterion and in the case of appealing to events actually lived.*

Research limits: *although alternative segmentation parameters to the chronological age were examined to test their validity, these criteria were used separately, while the analysis of a complex group like Seniors would require a multidimensional approach.*

Practical implications*: our study provides important operational indications to managers who need to understand the different consumption trends and dynamics of the use of technology by elderly consumers in order to define tailor-made offers of products and/or services. Facilitating the use of technology by the elderly has interesting implications in terms of social and economic impact, too.*

Originality of the paper: *although many have highlighted the need to identify effective criteria for the segmentation of such a heterogeneous target in terms of expressed needs, there are currently few studies in this field, especially concerning the use of technology.*

Key words: aging population; elderly consumers; life-event; cognitive age; technology; cluster analysis

1. Introduction

Seniors and technology now appear even closer, or at least less distant, than a few years ago. Also because of the pandemic, elderlies nowadays show an increasing interest in new technologies and are more and more connected. Recent research reveals that in Europe 88% of those over the age of 60 own a PC, 81% a smartphone, 15% a device for monitoring their physical condition/health, and 8% have a home device usable as a virtual assistant (Euromonitor, 2019).

[1] Aknowledgements: "The Authors would like to thank the Editors and anonymous reviewers for their constructive and helpful comments on earlier version of this article. A special thanks to Lisa Scarpini for supporting data collection and elaboration".

Although these data are encouraging about the growing degree of diffusion of technology in the elderly segment, it is nevertheless evident that, compared to what happens in the younger segments, there are still many hindrances to overcome in order to favor its wider diffusion in this market (Lee and Coughlin, 2015). Not being digital natives, these consumers are certainly not as tech-friendly as the younger segments. There are several reasons for this occurrence, such as physical or health problems, the need for support and assistance, general skepticism towards technologies, and poor accessibility, even in terms of price (Euromonitor, 2015). Additionally, in relation to specific technologies, other drawbacks come to light. Regarding digital communication platforms - such as blogging, social media, and other technologies supporting communication with one's family - recent studies (Hope *et al.*, 2014) show how merging digital and physical spaces is more appealing to some older adults than exclusively acting digitally. At the same time, in relation to the adoption of social robots by older adults, concerns about deception, infantilization, and privacy are often stressed in the literature (Sharkey and Sharkey, 2012; Watchsmuth, 2018).

On the other hand, researchers from different disciplines provided extended analysis on how to use technology to support personal, community and societal engagement in later life (Waycotte *et al.*, 2019). Technologies, indeed, offer huge opportunities to the elderly who, thanks to technology, may satisfy one of the main needs that characterize this segment, namely autonomy (Kohlbacher and Herstatt, 2016). Technology today allows us not only to improve the elderlies' health by offering online services (telemedicine), but also to ensure the possibility of continuing to live in the place they have chosen - their own home, in their community - in a safe, independent, and comfortable way regardless of age, and income, thanks to assisted living technologies and integrated care services. Similarly, technologies, such as social robots, have proven to reduce loneliness for older adults (Pradhan *et al.*, 2019), as supporting functions like safeguarding, social contact, and cognitive support (Čaić *et al.*, 2018).

In order to grasp all the opportunities deriving from aging, as expected to impact future society hugely, companies need to analyze and fully understand the needs of an aging population, to develop adaptations or new strategies to align with these changes (Kohlbacher and Hang, 2011; Kohlbacher *et al.*, 2011). Even though seniority is recognized as being the combined effect of various factors and events, according to the "life course paradigm" (Moschis, 2019), elderly consumers are usually defined as those who are at least 60 years old (Jacoby, 2011). As a result, serving the entire elderly market seems to be a difficult task since people considered to fall within this target include workers and pensioners who are very different in terms of expressed needs and spending habits. The elderly market should not be considered as a single entity, but as an agglomeration of heterogeneous submarkets that require *ad hoc* approaches (Kohlbacher and Chéron, 2012; Moschis, 2012). The segment is too broad as a target and the choice of such a path would result in undifferentiated offerings, unable to meet the specific demand, thus doomed to failure.

However, the use of age as a parameter to identify an older target

audience may not be the best way to approach this problem, as people can feel more or less old than they really are, through a personal evaluation that differs from individual to individual and that can result in different perceptions and purchasing decisions, despite the same age (Barak and Schiffman, 1981). Thus, cognitive age, according to which people "see, feel, act and have interests of younger people than those of their chronological age" (Reisenwitz and Iyer, 2007) is expected to impact on elderly consumer behavior especially in relation to technology use. This is also a consequence of anti-ageism (Vincent, 2006), which leads elderlies to reject misleading stereotypes (Ng and Feldman, 2012) and thus to decline elderly' products (Bae *et al.*, 2020).

Furthermore, since the literature on elderly consumers segmentation identified life events as strongly impacting on overall consumption behaviors (Mathur *et al.*, 2006), we might suppose that said events could impact on elderlies' technology use, too. Since technology use in the aging population is almost always affected by social factors (Wang *et al.*, 2011; Heinz *et al.*, 2013; Lee and Coughlin, 2015), we might expect that life-event, as impacting on elderlies' lifestyles and social relationships, could be an effective descriptor of elderly technology use.

So, based on this consideration, this paper strives to identify good descriptors of the differences across the elderly segment referring, in particular, to technology use. Specifically, cognitive age and life-event will be compared to demographic age as alternative segmentation criteria.

To this end, the paper reports a detailed literature review about elderlies' segmentation criteria used in the studies concerning elderly consumers, and discusses how said criteria may be extended to explain the gaps emerging in elderlies' technology use.

Thereafter, the results of three clusters analysis based on three different segmentation criteria (cohort, cognitive age, life-event segmentations) performed on a sample of elderly consumers are reported and discussed. The managerial implication, limitations of the study, and future research directions are reported in the conclusion section.

2. Segmenting elderly consumers: a literature review

Since the aging of the world population has become a consistent phenomenon that can no longer be ignored, different approaches have been followed to analyze the characteristics and behaviors of elderly consumers. At first, the most relevant data concerned the chronological age (Moschis, 1994; Hettich *et al.*, 2018; Moschis, 2019; Kuppelwieser and Klaus, 2021), considered as "a process induced by the simple passaging of time after birth" (Hettich *et al.*, 2018) or as "a linear count between the moment in which a person is born and the current date" (Kuppelwieser and Klaus, 2021). Nonetheless, nowadays the range of options and visions for the study of this segment is constantly growing. Therefore, considering that chronological age is not sufficient to explain and understand the behavior of the elderly (Moschis, 2012), it is appropriate to recall the various variables that may lead to a better understanding of the behavior

of the elderly, which must be properly selected according to the purpose of the study. These methodologies are not mutually exclusive, but according to the analyzed topic, it is mandatory to select the most suitable ones. Table 1 provides a summary of the different approaches, models, and theories used in the study concerning the elderly consumer: they may be useful to understand the development of the different segmentation criteria for the elderly consumer, which are detailed below.

The fact that the elderlies make up a separate group with their peculiarities does not imply that the elderly market is homogeneous. On the contrary, this segment appears highly diversified, regardless of the criterion used (Barawitzka *et al.*, 2020). This heterogeneity is the result of several factors: considering the over-sixties, it is inevitable to face different people (Barawitzka *et al.*, 2020). Consequently, marketing professionals deploy various segmentation criteria in order to cluster elderly consumers. The most popular criteria initially referred to both age groups and generations. However, they were not very useful in understanding the consumption behaviors of the elderly. According to the existing literature on the subject, no univocal criterion comes to light for the study of the segment, but an adequate mix of criteria is necessary to understand the elderly consumer fully (Moschis, 1994). Hence, it is appropriate to point out different segmentation criteria used in the literature.

Segmentation by age group is the simplest type of socio-demographic segmentation to use but, at the same time, the most lacking from the point of view of the information provided (Neugarten, 1974; Mathur *et al.*, 2006). The chronological age says indeed little about consumer behavior. Mathur *et al.* (2006), echoing Neugarten (1974), point out that "age has become a bad predictor of the timing of life events, as well as a poor predictor of a person's health, employment status and, therefore, also of a person's interests, concerns and needs".

The cohort-based segmentation relates to socio-demographical criteria and it is expounded through the subdivision of consumers according to the generation they belong to. The term "cohorts" refers to proposed groups of individuals who were born during the same time period and who experienced similar external events during their formative or coming-of-age years (i.e., late adolescence and early adulthood) (Schewe and Meredith, 1994; Ryder, 1985). External events, such as economic changes, wars, political ideologies, technological innovations, and social upheavals, are thought to define consumers' values, attitudes, and preferences. However, the results of Noble and Schewe (2003) suggest the need to reassess the theory of cohorts. As Reisenwitz and Iyer (2007) underline, cohort segmentation is certainly important for evaluating different aspects of individuals (not only elderly), but it must be placed within a broader context, which includes other types of segmentation.

Tab. 1: Models in Studies concerning Elderly Consumers

Model	Methodology	Description	Derived Research Streams	Marketing Implications	Weaknesses	Sources
Chronological age		Linear count between the moment in which a person is born and the current date		Senior needs and consumer behaviors	Age as a self-standing factor does not provide any explanation	Moschis, 1994; Hettich *et al.,* 2018; Moschis, 2019; Kuppelwieser and Klaus, 2021
Aging Models	Biological Aging	Decline of biological system due to natural changes and/or illnesses	Programmed Theories and Damage or Error Theories	New product development, promotion, customer preferences	Defined as a perspective, replaced by multi-theoretical frameworks and by studies on overall life course	Moschis, 1994; Grossman and Lange, 2006; Moschis, 2012; Jin, 2010; Goldmsith, 2014; Da Costa *et al.,* 2016; Diebel and Rockwood, 2021
	Psychological Aging	Cognitive changes, personality and identity changes	Processing-resource Framework, Phase and process models, Stage theories and cognitive age	Product positioning, advertising, reasons for rejecting products for aging people		Stephens, 1991; Moschis, 1994; Van Auken and Barry, 1995; Gwinner and Stephens, 2001; Moschis, 2012; Zniva and Weitzl, 2016; Hettich *et al.,* 2018; Bae *et al.,* 2020; Kuppelwieser and Klaus, 2021
	Social Aging	Changes in social and power relations as in the roles taken over along the person's various lifecycles	Structural functionalism, Symbolic interactionism, Exchange theory, Marxism, Social phenomenology	Segmentation, product positioning, support in role adaptation		Moschis, 1994; Grossman and Lange, 2006; Moschis, 2012; Hettich *et al*., 2018
Life Events		Events (classified as accidental and planned) lived by the person		Senior consumers' behavior, brand preferences	Replaced by multi-theoretical frameworks and by studies on overall life course	Moschis, 2012; Zniva and Weitzl, 2016
Life Circumstances		Life circumstances a person lives or has lived (period effects and cohort effects)		Needs, consumption behaviors, purchasing habits	No methods suitable for distinguishing cohort effects, from aging effects and period effects	Moschis 2012; Zniva and Weitzl, 2016

Source: Authors' elaboration

Segmentation by cognitive age is a psychographic segmentation. Resienwitz and Iyer (2007), referring to Barak and Schiffman (1981), underline how chronological age has little relevance when compared with cognitive age in those elderly individuals who feel younger than their age. This feeling involves their behaviors and leads them to "see, feel, act and have interests of younger people than those of their chronological age" (Reisenwitz and Iyer, 2007). As Stephens (1991) points out, feeling more or less elderly has both a social and psychological impact in various ways. Some research quoted by the author highlights how those elderly consumers who feel young depart from the typical behaviors of their segment. In this perspective, the study by Stephens (1991) underlines how the adoption of the cognitive age in the analysis of the elderly consumer is fundamental, also and not only as an integration of the segmentation based on the age group.

Event-based segmentation builds upon the life-course paradigm and requires consumers to be divided according to the events they have experienced (including those anticipated) (Moschis, 2019). Based on these assumptions, Mathur *et al.* (2006) conducted a study aimed precisely at understanding the validity of this type of segmentation. In a survey,

866 respondents between the ages of 21 and 84 were asked to indicate whether they had lived certain specific experiences and equally specific consumption behaviors, indicating the moment of their occurrence ("in the last 6 months", "between the last 6-12 months" or "more than 12 months ago"). The study revealed the existence of 4 types of segments:

- the *Unruffled*: it represents 42% of the respondents. It is made up of participants with the fewest events experienced or anticipated (Mathur *et al.*, 2005);
- the *Free Birds*: it represents 16% of the participants and includes mostly elderly people who had recently experienced events such as retirement or becoming grandparents;
- the *Chronic Strugglers* (chronic latecomers): it represents 9% of the participants, those who had experienced more events than others;
- the *Full Nesters*: it represents 33% of the respondents. They are mostly Baby Boomers, married and with children. The conclusions of this study show how life events can have a certain impact on consumption behaviors and, subsequently, how effective this segmentation is to be considered.

Afterwards, Moschis (2007) identified a criterion that he defined as "gerontographics" aimed at considering the elderly consumer in a broader perspective, simultaneously taking into account "needs, attitudes, lifestyles, and behaviors". This kind of multidisciplinary approach looks at both the biological and the social, experiential, and psychological aspects of aging. Four groups of people over the age of 55 have therefore been identified (Moschis, 2007):

- the *Healthy Hermits*: despite their good health and participation in the labor market, they are not very active, are solitary, with few consumption needs and not very reactive about any marketing campaigns leveraging on age;
- the *Ailing Outgoers*: their compromised, but self-aware health conditions, and their retirement status do not stop this group from being very active. They are very interested in homecare products and services;
- the *Frail Recluses*: withdrawn from society, inactive and in poor health, they do not like to seek information, even if they hardly know how to admit it;
- the *Healthy Indulgers*: probably the elective segment of marketing professionals for their positive attitude towards technologies, but also shop windows and displays. They are healthy, physically and socially active but, above all, independent.

3. Segmenting elderly consumers for technology use: research questions development

While the segmentation criteria mentioned above highlight some differences in the various clusters that might affect the technology use, no studies hitherto specifically tried to apply these segmentation criteria in this field.

According to studies on technology adoption, age has been found to be a considerable barrier to the adoption of technology. Given the occurrence of problems related, for example, to hearing or eyesight that worsen with age or slower learning abilities, which modify the way older people interact with technology or acquire new information on it, age surely has a negative impact on physical abilities and, therefore, on technology use in elderly targets (Charness and Boot, 2009). Of course, the fact that younger generations will move to more advanced age groups will lead to an increase in the use of technological tools in the elderly segment, but this will not necessarily translate into a narrowing of the technological gap, as technology is always developing while cognitive and physical abilities will continue to manifest. As a result, due to his/her age, the older adult has always appeared as a problematic person to treat (Peine *et al.*, 2014), characterized by a series of handicaps that differentiate him/her from the rest of the population.

On the other hand, portraying the elderly as fragile or reluctant to change recreates misleading stereotypes contradicting the trends that nowadays characterize the elderly market. First of all, the entry into the elderly segment of the Baby Boomers' generation, the first to experience constant exposure to technology since World War II. Secondly, the improvement of living conditions compared to the past and positively impacting on physical conditions and life expectancy at the same age. Last but not least, the phenomenon of anti-ageism (Vincent, 2006; Vincent *et al.*, 2008; Vincent, 2013) as the cultural movement leading the elderly to reject misleading stereotypes (Ng and Feldman, 2012) and false convictions as the sources of social discriminations ("ageism") (Henrard, 2006). According to these prejudices, due to their physical and mental decline, the elderlies are considered "weak, lonely and stubborn" (Bae *et al.*, 2020). Thus, Seniors start feeling disengaged and rolessness and closer to younger generations departing from Seniors' stereotypes, showing as if they were younger, and rejecting Seniors' products (Bae *et al.*, 2020). Moreover, as under the generic label of "technology" manifold types of technological tools are included, it was recently highlighted how some technologies are more appealing than others to elderly consumers as in the case of social networks adoption (Hootsuite, 2022), voice assistants (Pradhan *et al.*, 2019), and social robots (Čaić *et al.*, 2018).

These new trends and the studies revealing how the elderlies are today well prepared to use technology (Peine *et al.*, 2014), support the idea that age cannot always be a good predictor of technology use. Furthermore, the anti-ageism movement, like recent studies investigating the impact of cognitive age on technology adoption (Keng-Chieh and Po-Hong, 2020), point out how cognitive age, on the other hand, may be a good proxy.

RQ1: Is cognitive age a good predictor of technology use in elderly consumers?

At the same, the literature identified various variables affecting technology use and adoption by elderly consumers that might be useful to identify other segmentation criteria suitable for this aim.

Kampmeijer *et al.* (2016) have identified inadequate skills for the use of new technologies, insufficient support and feedback, lack of motivation and cost as the main obstacles to technology adoption among older adults. On the other hand, the main facilitators in the use of these tools were motivation and the ability of self-regulation through goal setting, together with the support and feedback provided by professionals, especially the remote help at home (Kampmeijer *et al.*, 2016). By extending the TAM model, the Unified Theory of Acceptance and Use of Technology (UTAUT) incorporated, in addition to performance and ease of use, two new elements, namely social influences, the degree to which an individual considers the pressures by important others towards the use of the system and facilitating conditions, or the degree to which an individual perceives to be supported by infrastructures and organizations in the use of the system (Venkatesh *et al.*, 2003). Regardless of problems that come to the fore as people age and the presence of facilitators and barriers to adoption, it is estimated that more than 50% of older people's problems with technology can be solved either through a more appropriate design or through education (Hermann *et al.*, 2012). Training and familiar interaction may overcome the anxiety and the lack of comfort in using technology, typically associated with older people (Nikou, 2015).

Recent studies on the older adults' use of voice assistants (Pradhan *et al.*, 2019), while supporting benefits as controversial aspects related to the use of these tools by the elderly, shed light on the role that one person's life might play in this context. The study by Pradhan *et al.* (2019), indeed, points out how the experiences that a person has built up over a lifetime, such as the specific living conditions, lead him/her to have more or less a desire for social contact.

Despite some Authors' attempts in the field of Gerontechnology to connect technology to the existing theories of life-span development (Schulz *et al.*, 2014), no explicit reference is made to life-events in the studies on technology adoption by aging adults. At any rate, life-events are commonly recognized to affect consumer behavior (Mathur *et al.*, 2006). Specifically, according to life-course research, behaviour at a given point in time modifies according to changing life conditions (Mayer *et al.*, 1990) owing to various reasons. First of all, as behaviors are influenced by personal resources, we might expect that people exposed to different events over the course of their life are likely to access different personal resources and, consequently, to act differently (John and Cole, 1998). Secondly, based on stress theory and research, major life events act as "stressors" that create a generalized demand for readjustment to restore balance and remove frustrations and tensions thus resulting in initiation, intensification or changes in consumption habits (Andreasen, 1984; O'Guinn and Faber, 1989). Lastly, according to the normative perspective, certain life events surely favor the transitions into new roles (i.e., the birth of a firstborn into "parenthood" or death of spouse into "widowhood"). As a result, as people acquire new roles and relinquish old ones, their behaviours change accordingly (Adreasen, 1984; Hagestad and Neugarten, 1985).

As all the reasons supporting life-course research behavior refer to factors that are widely recognized as affecting elderly technology adoption,

too - especially, psychological, sociological, and age-specific factors (Nikou, 2015) - we might expect that life-events could be an effective descriptor of Senior use of technology.

RQ2: Is Life-event a good predictor of technology use in elderly consumers?

4. Methodology

A survey was conducted to provide an answer to the identified research questions - that is, whether life events and cognitive age are good predictors of the consumption behavior of the elderly segment with particular reference to the use of technology. Consistent with the definition of elderly consumers provided by Jacoby (2011), the target was a population aged 60 and over, using a universally recognized threshold for the definition of the elderly segment to include both young old (60-74 years old), middle old (75-84 years old) and oldest old (over 85) age segments (Forman *et al.*, 1992). A non-probabilistic sample was drawn from this population (Table 2).

Tab. 2: Socio-demographic characteristics of the sample

Variables		Percentage of respondents
Age	GI Generation	2,46%
	Depression Generation	17,21%
	War Generation	11,48%
	Baby Boomers	68,85%
Gender	Males	39,34%
	Females	60,66%
Marital status	Married	58,20%
	Widows/Widowers	29,51%
	Unmarried	6,56%
	Divorced	5,74%
Work status	Retired	65,57%
	Homemakers	21,31%
	Full-time employees	6,56%
	Part-time employees	2,46%
	Other (unemployed, disabled)	4,10%
Living conditions	Alone, at home	23,77%
	With other people, at home	67,21%
	In a nursing home	9,02%

Source: Authors' elaboration

Therefore, among the survey participants, we find both people belonging to all the three groups identified in the literature - that is to say, young old, middle old and oldest old. Due to the unbalanced distribution of respondents, we can say that our analysis focused mainly on the young old category (68,85% of the sample). The questionnaire was provided anonymously both online, through a link to Google Form, and in paper form. The surveys were carried out between October and November 2021. An amount of 89 paper questionnaires were collected (11 acquired via

direct interview and the remainder via self-compilation) and 112 online. Of the questionnaires in paper form, 72 (80,9%) were found to be usable, while 17 (19,1%) were discarded due to missing answers. Of the 112 online questionnaires, only 50 (44,6%) were found to be usable. In total, 122 questionnaires were used (60,7% of the total number of questionnaires received). The respondents were all Italian (60,66% women). Most of them were married (58,20%), followed by widows/widowers (29,51%), unmarried (6,56%), and divorced (5,74%). 65,57% were retired, 21,31% were homemakers, and the remaining full-time (6.,6%), part-time employees (2,46%), and others (4,1% unemployed or disabled). Regarding living conditions, 67,21% of the sample said they were living with other people at home, 23,77% alone at home, and 9,02% in a nursing home.

The questionnaire consisted in 18 questions, divided into 4 main blocks. The first block concerns 5 multiple choice questions about habits and adopted lifestyles mainly aimed at understanding the degree of autonomy and activism of the respondent, as well as the main barriers, which limit this autonomy. For these questions, surveys recently conducted on the elderly segment (Pivotal Research, 2019) worked as a reference.

The second block of questions referred to the events experienced by Seniors, drawing inspiration from the life-course paradigm and event-based segmentation (Mathur *et al.*, 2006). With a single question we asked participants to say if they ever experienced the listed events (answering "yes" or "no"): moved to a different place, marriage, birth or adoption of a child, divorce or separation, the last child moved out of household, death of a parent or close family member, birth of first grandchild, major conflict with family member, retirement (of one's own will), lost job/business or forced to retire, started work for the first time or after not working for a long time, reduction in working hours or giving up employment (of one's own will), significant success at work or personal life, change jobs, same or different type, major improvement in financial status, financial status a lot worse than usual, family member's health a lot worse, more responsibility for an aged relative, gained a lot of weight, chronic illness or condition diagnosed, serious injury, illness or major surgery, community crisis or disaster (hurricane crime, fire, flood, earthquake, etc. …), death or loss of a pet (dog or cat), stopped smoking.

The third block contained one question aimed at reconstructing the actual consumption behaviors of the interviewed segment, and three questions about the use of technology as digital devices, also connected to the Internet. Questions of this block were phrased by referring to various sources (Mathur *et al.*, 2006 for the question on consumer behaviour; Pivotal Research, 2019, and Consumer Market Monitoring Survey, 2021 for the questions on technology). Specifically, we first asked respondents to indicate the connected products/services bought or used in the last year, selecting from a list which included: connecting devices controlling energy consumption in the household, connected devices for house safety, connected household appliances, wearable connected devices, connected devices for health monitoring, connected entertainment devices, and connected car. Afterwards, with explicit reference to the usage of "digital devices" identified as a smartphone, or a personal computer, or a tablet, or a

smartwatch or an e-reader tool, we asked respondents to say how frequently they use digital devices during a week (multiple choice question), and the main reasons why they use them, specifying the time related to each reason (last year, in the past, never). The various reasons listed in the question were the following: for generic/entertainment purposes (news, driving, reading), to keep in touch with family, friends, community, for professional scopes (work-related activities), for health reasons (telemedicine services), to search for information, for e-mail checking and transmission, for financial transactions, to play, shopping, to access social media.

In conclusion, the last section reported three questions aimed at investigating the cognitive age (Van Auken and Barry, 1995; Barawitzka *et al.*, 2020). In this context, one question was included to analyze the Ageism phenomenon (Pivotal Research, 2019). The study carried out by Van Auken and Barry (1995) was a reference point especially regarding the reasons behind the choice of a semantic differential scale for cognitive age. Among the scales used for the measurement of cognitive age adopting a direct approach, the semantic differential scale was therefore considered one of the most valid compared to ratio scale and Likert scale (Van Auken and Barry, 1995). In comparison with other widely recognized multiple items scales measuring cognitive age (see for instance Barak and Schiffman, 1981 scale), Van Hauken and Barry semantic scale was preferred in our study for its simplicity in relation to the target. As a result, to investigate cognitive age, respondents were asked to assign a score from 1 to 5 to the question asking them how young (score 1) or old (score 5) they felt. In order to enrich the collected information, two additional questions were included: one asking people assigning at least 3 to the previous question to detail when they started feeling old (retirement, reaching the age of 60, physical troubles, becoming a grandpa/ma, one's spouse's demise, a parent's death), and one asking to what extent the others see them as old (not at all, a little, quite, so much).

Then, the end of the questionnaire reported some questions to identify different demographic data of the elderly, as well as gender, year of birth, marital and employment status.

The data collected through the questionnaires were entered into an Excel spreadsheet. Three cluster analyses were then conducted to reach three different segmentations:
- cohort segmentation;
- cognitive segmentation based on age;
- life-events-based segmentation.

The first two belong to the category of descriptive a priori segmentation because the segments were predetermined according to the research conducted through the questionnaires. Specifically, in cohort segmentation, respondents were clustered into four groups according to their date of birth: GI Generation (born in 1929 or before); Depression Generation (born between 1930 and 1939); War Generation (born between 1940 and 1945), and Baby Boomers (born between 1946 and 1964). In the cognitive-based segmentation, respondents were instead clustered according to their answers to the cognitive age scale (5 clusters according to the score ranging from 1 "I feel young" to 5 "I feel old"). For these two segmentations,

analyzing the answers to the questions about demographics, habits, adopted lifestyles, and the degree of autonomy and activism of the respondent in each cluster allowed us to identify similarities and assign different labels.

As regards the segmentation referred to life events, this is a descriptive a posteriori segmentation. In particular, cluster analysis was the approach, through the Two-step method using SPSS.

Therefore, in the segmentation based on life-events, since the events are qualitative variables, in particular dichotomous (the answers were "Yes" or "No"), it was not possible to use cluster analysis techniques, such as the k-mean algorithm or hierarchical methods, for which the use of the Two-step cluster analysis was selected. The dataset contained in Excel was therefore transferred to SPSS and clustering was performed, using the 21 events experienced by the Seniors as variables. The information criterion used is the AIC, while the distance measurement is the Logarithm of the likelihood (all being categorical variables). Although Twostep allows for the automatic identification of the number of clusters (in this case the solution would have been two clusters), it was deemed necessary to specify the number of clusters to compare different options.

The analysis was initially launched with two clusters. However, since the Silhouette had two clusters equal to 0.2 (therefore scarce), the use of three clusters was decided. In this case, the Silhouette worsened (0.1) and out of the three clusters obtained two were very similar, especially for the first four most important predictors. Therefore, four clusters were analyzed: the Silhouette returned equal to 0.2, but in the first four predictors the situation was varied for the four obtained segments. Despite a reduced Silhouette, however, the condition of these clusters seemed satisfactory. Afterward, a Twostep cluster analysis based on four segments was conducted. The main events that led to the determination of the segments were four in order of importance: "the last child left home", "birth of the first grandchild", "death of the spouse" and "birth or adoption of a child".

Crossing the differences in life-events with demographics, habits, adopted lifestyles, and degree of autonomy and activism of the respondents in each cluster, we were then able to assign labels to the clusters.

5. Results

This section will report the main results from the analysis of the collected data. For every segmentation depicted, the leading trends in the use of technology will be subsequently described to understand whether the segmentation criteria used can be considered effective in identifying homogeneity among elderly consumers.

5.1 Cohort segmentation

Cohort segmentation allowed for the identification of four segments (Table 3):

- *GI Generation* (GI stands for "General Issue", known as the Greatest Generation shaped by the Great Depression and including the primary

participants in World War II born in 1929 or before) 2,46% of the sample;
- *Depression Generation* (often included in the previous category as devoted to recovery, including people born between 1930 and 1939) 17,21% of the sample;
- *War Generation* (including those born at the time of the Second World War between 1940 and 1945) 11,48% of the sample;
- *Baby Boomers* (born in the demographic and economic boom between 1946 and 1964) 68,85% of the sample.

Tab. 3: Cohort-based clusters' profiles

Variables		GI Generation	Depression Generation	War Generation	Baby Boomers
Gender	Males	66.67%	23.81%	21.43%	45.24%
	Females	33.33%	76.19%	78.57%	54.76%
Marital status	Married	0.00%	23.81%	42.86%	71.43%
	Widows/Widowers	100.00%	71.43%	50.00%	13.10%
	Unmarried	0.00%	4.76%	7.14%	7.14%
	Divorced	0.00%	0.00%	0.00%	8.33%
Work status	Retired	66.67%	80.95%	85.71%	58.33%
	Homemakers	33.33%	19.05%	14.29%	22.62%
	Full-time employees	0.00%	0.00%	0.00%	9.52%
	Part-time employees	0.00%	0.00%	0.00%	3.57%
	Other (unemployed, disabled)	0.00%	0.00%	0.00%	5.95%
Living conditions	Alone, at home	33.33%	38.10%	42.86%	79.76%
	With other people, at home	0.00%	33.33%	42.86%	19.05%
	In a nursing home	66.,67%	28.57%	14.29%	1.19%

Source: Authors' elaboration

In order to better depict the characteristics of the clusters identified on the basis of the cohort the respondents belonged to, the socio-demographic data collected during the administration of the questionnaire were analyzed.

Most Baby Boomers live alone, while 2 out of 3 people part of the GI Generation are in a care facility, and one lives alone at home. The (numerical) gender gap intensifies in the median generations, while the situation is more balanced for Baby Boomers. As regards marital status, widowers and widows prevail clearly in the first two generations, while the situation changes for the War Generation and the Baby Boomers, in which married couples re-emerge. Speaking of the level of activity, recreational and spiritual ones are outnumbering. Hence, it is evident that daily activities, probably practiced by children, relatives, or acquaintances, take a back seat, such as expenses. For the Depression Generation, on the podium, two types of activities mentioned above are found, in addition to daily activities. In the War Generation, spiritual activities are the most popular, followed by daily activities. Of great significance is the cohort of Baby Boomers, very active from the point of view of daily tasks. Being the youngest cohort, it is probably also the most active from this point of view. More than 40% also love exercising and delving into recreational and leisure activities.

As far as the difficulties encountered are concerned, it is useful to point out how in the passage from one generation to another the percentage of people who have faced obstacles is lower and the number of people who have never encountered any increases. If, however, the age obstacle arises as the main reason leading the GI Generation to inactivity, this does not apply to subsequent cohorts. For Baby Boomers, a crucial reason for inactivity is given by the lack of motivation/laziness. With reference to the difficulties encountered, it is evident that the GI Generation does not seem to show any kind of difficulty.

Regarding technologies, it is the Baby Boomer segment that once again stands out both in the use of digital devices (80 out of 84 subjects use them) and various appliances connected to the Internet (42 out of 84). Rates fall when passing to the "older" generations. More than half of the younger cohort uses social media. Regarding the use of digital devices, excluding GI Generation, all the other generations use digital devices. The rate of non-users decreases as they move from one cohort to another, while the percentage of users increases. Regarding how frequently Seniors in the three cohorts, excluding the GI generation, use digital devices, the most intense use of these devices is by Baby Boomers. In addition, in respect of the methods of use that Seniors make of digital devices, some differences come to light between generations. As for the Depression Generation, the main underlying reason for the use of digital devices is the ability to stay in touch with family/friends/communities and to send and receive e-mails. People belonging to the War Generation, on the other hand, use these tools mainly to contact family members, but also for general and entertainment purposes and to find information. The reasons behind the use of these devices are instead multifaceted for Baby Boomers. For these latter, the desire to stay in touch with both family members and acquaintances prevails and, besides general purposes and the ability to search for information, the use of e-mail and social media emerges. As regards the devices connected to the Internet, the prevalent use is by Baby Boomers, while both the Depression Generation and the War Generation make little use of them. In particular, the Baby Boomers show an extensive use of entertainment devices, such as smart TVs, smart speakers, and game consoles. Other tools are appliances connected to the Internet, those for monitoring health, and wearable devices.

At the conclusion of this focus on technologies, it appears quite clearly that the cohort most accustomed to the use of technologies, be they digital devices or other devices connected to the Internet, is certainly that of Baby Boomers. Within this cohort, however, the varied behaviors that come to light cannot be easily explained, revealing some typical shortcomings of segmentation by cohorts.

5.2 Cognitive-age segmentation

According to cognitive age, the following groups were identified (Table 4):

- the *Peter Pan* (individuals who rated 1 on the cognitive age scale) represent 8,20% of the sample;

- the *Young but not too young* (those who rated 2 on the cognitive age scale) represent 16,39% of the sample;
- the *No longer young, but not old yet* (those who rated 3 on the cognitive age scale) represent 44,26% of the sample;
- the *Old but not too old* (those who rated 4 on the cognitive age scale) represent 20,49% of the sample;
- the *Old in word and deed* (those who rated 5 on the cognitive age scale) represent 10,66% of the sample.

Tab. 4: Cognitive-age-based clusters' profiles

Variables		Peter Pan	Young but not too young	No longer young, but not old yet	Old but not too old	Old in word and deed
Gender	Males	40.00%	50.00%	48.15%	20.00%	23.08%
	Females	60.00%	50.00%	51.85%	80.00%	76.92%
Marital status	Married	80.00%	75.00%	55.56%	56.00%	30.77%
	Widows/Widowers	0.00%	10.00%	27.78%	44.00%	61.54%
	Unmarried	10.00%	10.00%	9.26%	0.00%	0.00%
	Divorced	10.00%	5.00%	7.41%	0.00%	7.69%
Work status	Retired	40.00%	45.00%	66.67%	76.00%	92.31%
	Homemakers	50.00%	30.00%	18.52%	16.00%	7,.69%
	Full-time employees	0.00%	15.00%	5.56%	8.00%	0.00%
	Part-time employees	0.00%	5.00%	3.70%	0.00%	0.00%
	Other (unemployed, disabled)	10.00%	5.55%	0.00%	5.95%	0.00%
Living conditions	Alone, at home	10.00%	15.00%	20.37%	28.00%	53.85%
	With other people, at home	80.00%	85.00%	66.67%	60.00%	46.15%
	In a nursing home	10.00%	0.00%	12.96%	12.00%	0.00%

Source: Authors' elaboration

With regard to the segmentation based on cognitive age, it should be recalled that respondents were asked to first indicate how young or old they felt and, thereafter, to clarify the reasons for that perception. As for the people who assigned a score of 3 to the first question on cognitive age, the prevailing reasons were: the onset of physical problems (29,63%), reaching the age of 60 (25,93%), and retirement (16,67%). For the individuals who assigned a score of 4: the main reason (44%) was once again related to physical issues. The same can be said for the people who assigned a score of 5 to the first question: almost half of them (46,15%) indicated the onset of physical problems as their reason.

A further question investigated, instead, how other people saw them. The emerging data allow us to state that a person's cognitive age influences the way they feel they are seen from the outside. Those who gave a score of 1 in the question on cognitive age, think indeed that others do not see them as elderly at all or slightly old, in line with their perception; therefore, as the perceived cognitive age increases, the perception of the age assigned by others increases, too.

Regarding technology, the use of digital devices decreases in the transition from reduced cognitive age segments to cognitively older segments (Table 5). The "Peter Pan" people qualify as one of the six most "technological" segments as well as the most "social" one. The older

categories who use these devices, as well as for reasons shared with other segments, such as searching for information or keeping in touch with family and friends, often also employ them to find information about their health, also making use of telemedicine. Online shopping is a matter for the "Young but not too young" category. Even in the use of devices connected to the Internet, individuals who feel cognitively younger prevail. Therefore, the comparison between cognitive age and the use of technology shows how the mental obstacle of feeling "elderly" often represents a barrier. As regards the segmentation based on cognitive age, data highlight a marked use of digital devices in all segments, in particular for the "Young but not too young" group. However, the observable trend emerging from the second segment is a progressive reduction in the number of digital devices users from one segment to another. This is consistent with the cognitive age referred to the different segments. Indeed, people who consider themselves older use to a lesser extent these types of devices. The reasons behind the use of digital devices are also interesting. As for the "Peter Pans", they use these tools for general purposes, to communicate with their family, to search for information, and to access social media. In particular, regarding the use of social media, a greater inclination is evident in the "Peter Pan" segment. The "Young but not too young" people use digital devices mostly for general purposes, to stay in touch with family and friends, to search for information, to send and receive e-mails. The same goes for the last three segments. Regarding telemedicine services, the highest percentages concern "Old but not too old" and "Old in name and deed" individuals. This tool is mainly used to find health information. The use of devices for financial transactions is also notable. A high percentage of "Young but not too young" individuals shop online. This percentage is lower in the "Old in name and deed" people. Moving from one segment to another, the rate of digital devices users who check and send e-mails grows, as does the use of games available in the app stores of smartphones. Concerning devices other than just smartphones, tablets, etcetera, taking into consideration all the devices connected to the Internet, it is evident how the "Peter Pan", "Young but not too much" and "Not young but not yet elderly" groups are inclined to use various devices. The data collected, therefore, hold on a good level in the use of different devices and subsequently of technologies. Feeling young certainly affects this trend. This also concerns the use of social media.

Tab. 5: Cognitive-age-based clusters' use of technology

	Peter Pan	Young but not too young	No longer young, but not old yet	Old but not too old	Old in word and deed
Digital Devices users	80%	85%	74%	60%	54%
Digital Devices types (prevailing in the last year)	1. Connected household appliances (57%); Connected entertainment devices (57%) 2. Wearable connected devices (43%)	1. Connected entertainment devices (64%) 2. Connected devices for health monitoring (36%) 3. Wearable connected devices (27%)	1. Connected entertainment devices (56%) 2. Connected devices for health monitoring (33%); Connected household appliances (33%)	1. Connected household appliances (40%) 2. Connected entertainment devices (20%); Connected devices for health monitoring (20%); Wearable connected devices (20%); Connecting devices controlling energy consumption in households (20%)	1. Connected entertainment devices (100%) 2. Connected household appliances (67%) 3. Connected devices for health monitoring (33%)
Digital Devices reasons to use (prevailing in the last year)	1. For generic/ entertainment purposes (news, driving, reading) 2. To keep in touch with family, friends, community 3. To search for information	1. For generic/ entertainment purposes (news, driving, reading) 2. To search for information 3. To keep in touch with family, friends, community	1. To keep in touch with family, friends, community 2. To search for information 3. For generic/ entertainment purposes (news, driving, reading)	1. For generic/ entertainment purposes (news, driving, reading) 2. To search for information 3. To keep in touch with family, friends, community	1. To keep in touch with family, friends, community 2. For generic/ entertainment purposes (news, driving, reading) 3. To search for information

Source: Authors' elaboration

5.3. Life-events-based segmentation

The following segments were identified according to life events (Tables 6-7). In order to provide a better description of the clusters, profiling information about lived events was combined with data collected on socio-demographic features, habits, and adopted lifestyles as impacting on the autonomy and activism of the clusters:

- *Proactive people* (persons who lived more events compared to other people, with an average of experienced events of 12,9. They are married, with grown-up children who left home), 30,33% of the sample;
- *Shy Seniors* (persons with a low average of experienced events in comparison with other clusters. They are mainly unmarried), 34,43% of the sample;
- *Old-fashioned widows/widowers* (persons once married and now widows/widowers with children, who lived the standard events expected by the society of the past, without special features), 16,39% of the sample;

- *Footloose Seniors* (married persons with children with the highest rate of divorces or breakups compared to other clusters), 18,85% of the sample.

Tab. 6: Life-events-based clusters' profiles

		Proactive People	Shy Seniors	Old fashion Widows/ Widowers	Footloose Seniors
Moved to a different place	Yes	40.54%	30.95%	45.00%	47.83%
	No	59.46%	69.05%	55.00%	52.17%
Marriage	Yes	100.00%	80.95%	100.00%	100.00%
	No	0.00%	19.05%	0.00%	100.00%
Birth or adoption of a child	Yes	100.00%	57.14%	100.00%	100.00%
	No	0.00%	42.86%	0.00%	0.00%
Divorce or separation	Yes	5.41%	2.38%	0.00%	26.09%
	No	94.59%	97.62%	100.00%	73.91%
The last child moved out of the family household	Yes	89.19%	11.90%	95.00%	82.61%
	No	10.81%	88.10%	5.00%	17.39%
Death of spouse	Yes	24.32%	9.52%	100.00%	21.74%
	No	75.68%	90.48%	0.00%	78.68%
Death of a parent or close family member	Yes	100.00%	78.57%	100.00%	95.65%
	No	0.00%	21.43%	0.00%	4.53%
Birth of first grandchild	Yes	91.89%	19.05%	100.00%	100.00%
	No	8.11%	80.95%	0.00%	0.00%
Retirement (out of one's will)	Yes	70.27%	66.67%	70.00%	60.87%
	No	29.73%	33.33%	30.00%	39.13%
Lost job/business or forced to retire	Yes	8.11%	11.90%	10.00%	13.04%
	No	91.89%	88.10%	90.00%	86.96%
Significant success at work or personal life	Yes	86.49%	59.52%	50.00%	60.87%
	No	13.51%	40.48%	50.00%	39.13%
Change jobs, same or different type	Yes	59.46%	40.48%	20.00%	21.74%
	No	40.54%	59.52%	80.00%	78.26%
Major improvement in financial status	Yes	48.65%	38.10%	50.00%	39.13%
	No	51.35%	61.90%	50.00%	60.87%
Financial status a lot worse than usual	Yes	45.95%	11.90%	0.00%	17.39%
	No	54.05%	88.10%	100.00%	82.61%
Family member's health a lot worse	Yes	86.49%	76.19%	100.00%	30.43%
	No	13.51%	23.81%	0.00%	69.57%
More responsibility for aged relative	Yes	72.97%	73.81%	45.00%	78.26%
	No	27.03%	26.19%	55.00%	21.74%
Gained a lot of weight	Yes	37.84%	38.10%	15.00%	17.39%
	No	37.84%	38.10%	15.00%	17.39%
Chronic illness or condition diagnosed	Yes	72.97%	33.33%	25.00%	34.78%
	No	27.03%	66.67%	75.00%	65.22%
Serious injury, illness or major surgery	Yes	75.68%	38.10%	75.00%	13.04%
	No	24.32%	61.90%	25.00%	86.96%
Death or loss of a pet (dog or cat)	Yes	35.14%	47.26%	45.00%	39.13%
	No	64.86%	52.38%	55.00%	60.87%
Stopped smoking	Yes	43.24%	38.10%	5.00%	0.00%
	No	56.76%	61.90%	95.00%	100.00%
Average number of lived events		12.9	8.6	11.5	10

Source: Authors' elaboration

Cluster 1 was called "Proactive Seniors", considering that they are the individuals who have experienced more life events than the others, with a number of experienced events averaging 12,9. This cluster consists of 100% happily married individuals (only 2 individuals are divorced and 9 are widows or widowers, out of 37 subjects belonging to the cluster) and with children, who are now adults and left home. Of all 4 segments, Cluster 2 has the lowest average of experienced events. They are mostly married, but in this group unmarried single men and women of the sample (8 individuals) can be found; this is not to be underestimated, as well as the data relating to children's birth or adoption. Unlike the other segments, which show a 100% positive answer in relation to this event, in this case the situation changes for this cluster: 24 Yes and 18 No are collected as answers, which shows that celibates and even some married people have no children. As regards the event "The last child left home", the data show that only 5 out of 37 individuals experienced this step. As there are 24 persons with children in this cluster, it can be said that only 5 Seniors out of 24 no longer have children at home: a high percentage of them still have so-called "dependent children", who are teenagers or adults currently living in the parental home. Given a low average of experienced events compared to the other clusters, these subjects were called "Shy Seniors", specifying that this label only refers to the low propensity of these individuals to experience numerous events compared to the other segments. Cluster 3 has been called "Traditionalist widows/widowers": they were all once married and are now widows or widowers, with children, who have experienced the classic events that society once expected, without peculiarities. None of them is divorced and has experienced any worsening of their financial condition. Cluster 4 consists of individuals who experienced marriage and children, but this segment shows the highest percentage of divorced or separated people considering all 4 clusters. In addition, almost 83% have experienced the last child leaving home. Given these peculiarities, it was decided to call this cluster "No longer constrained Seniors".

In the field of technologies, the least technological segment is represented by the "Old fashioned widows/widowers". Mostly, they do not use any digital devices, but if they do, the main reason is to stay in touch with loved ones. The most technological is, instead, the "Shy Seniors" category. High percentages of "Proactive", "Shy Seniors" and "Footloose Seniors" use these tools, while the data change for the "Old fashioned widows/widowers": most of them do not use any digital devices, indeed. In the use of technologies, on the other hand, the "Shy Seniors" dominate: the reason may be traced back to their still cohabiting with young models or to the fact that they are unmarried, which, therefore, leads these Seniors to become familiar with technological devices. In the case of digital device use, this is generally frequent. Regarding the reasons for the use of these types of devices, there is a strong dualism between users and non-users. Speaking of "Proactive" subjects, the main reason for using general devices is to keep in touch with family and friends, followed by general purposes and the search for information. As for the "Shy Seniors" and the "Footloose Seniors", the reasons behind the use of these devices are very comparable to those of the first segment. In this case, however, a good percentage also use

them for e-mails. The "Old fashioned widows/widowers" who use digital devices all agree in indicating as the main reason of use the possibility of keeping in touch with their family, friends, and the community to which they belong. Regarding the data on the use of devices connected to the Internet by the different segments identified based on life-events, non-use dominates, especially in "Old fashioned widows/widowers". As regards "Proactive" people, different types of devices connected to the Internet are used. In the "Shy Seniors" group, the use of entertainment devices prevails clearly.

In conclusion, it is therefore possible to state that "Old fashioned widows/widowers" are the "least technological" segment while "Shy Seniors" are the most accustomed to technologies. This is because this segment tends to be inspired and influenced by youth models (both for having children who live with them and for feeling young based on their condition).

Tab. 7: Life event-based clusters' use of technology

	Proactive People	Shy Seniors	Old fashion Widows/ Widowers	Footloose Seniors
Digital devices users	73%	90%	20%	86%
Digital devices types (prevailing in the last year)	1. Connected entertainment devices (64%) 2. Connected devices for health monitoring (50%) 3. Connected household appliances (36%); Wearable connected devices (36%)	1. Connected entertainment devices (61%) 2. Wearable connected devices (33%) 3. Connected household appliances (28%)	1. Connected devices for house safety (100%)	1. Connected household appliances (54%) 2. Connected entertainment devices (45%) 3. Connected devices for health monitoring (27%)
Digital devices reasons to use (prevailing in the last year)	1. To keep in touch with family, friends, community 2. For generic/ entertainment purposes (news, driving, reading) 3. To search for information	1. To search for information 2. For generic/ entertainment purposes (news, driving, reading) 3. To keep in touch with family, friends, community	1. To keep in touch with family, friends, community 2. For generic/ entertainment purposes (news, driving, reading) 3. To search for information	1. For generic/ entertainment purposes (news, driving, reading) 2. To keep in touch with family, friends, community 3. To search for information

Source: Authors' elaboration

6. Discussion

This study aimed to compare different segmentation criteria in order to identify the most suitable ones for describing the elderly market, particularly referring to technology use. The cluster analysis we performed confirmed the existence of various facets in this market in terms of needs, and, as a result, in terms of consumer behavior. This asks for effective segmentation criteria.

The first cluster analysis, based on chronological age, highlighted some relevant diversities in elderly consumer behavior, also in technology use. As expected, chronological age leads to specific consumer trends related to aging. Likewise, regarding technology use, as ageing increases, technological devices use decreases. These pieces of evidence are consistent with the contributions identifying age as a key factor impacting on technology adoption because of the consequent progressive worsening of physical and cognitive abilities (Charness and Boot, 2009). Despite this, chronological age appears lacking when it comes to studying in-depth the reasons behind specific behaviors.

To this end, cognitive age seems to represent a good criterion to segment the elderly market. Our analysis shows how, in conjunction with the different clusters of consumers identified according to cognitive age, different uses of technology come to light. Similarly, as regards chronological age, the perception of being younger than one's true age (low cognitive age) goes with more active behaviors and this, inevitably, goes with more intense technology use. This, indeed, is in line with the anti-ageism phenomenon (Vincent, 2006) that, leading Seniors to reject the ageing stereotypes, pushed them to disregard elderly *ad hoc* products (Bae *et al.*, 2020), and to prefer products, such as those technology-based, conceived for a younger target. As stated in the literature, a low cognitive age positively affects innovative consumer behavior (Szmigin and Carrigan, 2000). Similarly, a high cognitive age creates a barrier to technology use. This is consistent with the well-known concept of technophobia, which can emerge if the person, through a self-evaluation, does not feel able to use such tools (Dogruel *et al.*, 2015).

Cognitive age-based segmentation also provides interesting insights for technology developers. Based on the results of the cluster analysis we performed, "Peter Pan" and "Young but not too young" clusters do not require an *ad hoc* investment in order to encourage the use of technology. These are the clusters that already use digital devices and are technology friendly, even though for different scopes - more "social network" users the Peter Pan and more "online shopper" the "Young but not too young". Because of their attitude to feeling younger, these categories probably would reject technologies developed for elderly users. This is the reason why, for these categories, universal design approaches (Gassmann and Reepmeyer, 2011) - as the development of solutions that may be desired by any consumer, regardless of their differences, integrating customer groups and offering larger target markets - may be more suitable than *ad hoc* approaches. The opposite goes for the clusters feeling older that tend to use digital devices less frequently. For these categories, probably investing in developing more user-friendly technologies could be a viable solution. As these categories show a higher propensity to use specific devices for health monitoring and to use technology also to find health information, promoting *ad hoc* technology solutions may represent a good strategy to reach this target. As these consumers do not feel the need to distance themselves from their actual age, they are probably more willing to accept technologies developed according to their values, ideas and aspirations (Boerema *et al.*, 2016). So, technologies addressing the physical and psychological needs of the elderly

could be suitable for this target as welfare technologies helping older people to perform tasks they used to pursue in their previous daily living, such as exercises, housekeeping and medication and reduce healthcare costs (Hofmann, 2012).

Lastly, using lived events for segmenting the elderly market seems to be truly intriguing. Our analysis shows how life events are very good descriptors of elderly consumer behavior also in relation to technology use. Similarly, as for the previous segmentation, in addition to the reasons to use digital devices in the four live-event-based clusters, also types of digital devices differ, suggesting interesting insights. Usually, on the basis of lived events, Seniors tend to adopt different consumer behaviors, also in relation to technology. Regarding technology use, some inspiring insights come to the fore, supporting the pieces of evidence of some studies, and opening up new interesting avenues for future research. Lived events in the elderly target not only discriminate between more or less technology-friendly targets, but also provide additional insights into the reasons that lie behind these behaviors. The results of our cluster analysis indicate that life-events contribute to shaping the social groups Seniors belong to, thus supporting their technology use. This is in line with the literature stressing social factors as essential for training elderly target to technology use (Wang *et al.*, 2011; Heinz *et al.*, 2013; Lee and Coughlin, 2015).

Moreover, regarding this cluster analysis, inspiring suggestions could be provided to technology developers. It is evident that, for many elderly consumers, lived events impacted on the social group they belonged to, and this favored or hampered technology adoption. As a result, "Shy Seniors", as the most technological category among the life event-based clusters, do not need any specific support in the use of technology, as the group they belong to acts as a trainer. Advanced technological solutions, maybe developed by co-creation procedures (Östlund *et al.*, 2014) may therefore suit this category. On the contrary, the least technological "Old fashion widows/widowers" surely need user friendly technologies. The simpler the technology with which the person has to interact, the less physical and mental energy is spent (Bong *et al.*, 2018). This certainly stimulates purchases also among people with no previous knowledge and narrows the digital divide for the elderly (Spreicer, 2011). Furthermore, due to the role that social influences play in technology acceptance (Venkatesh *et al.*, 2003), technical support is essential when it comes to developing technologies addressed to "Shy Seniors". Lastly, as by nature older people are used to maintaining previous behaviours and lifestyles (Deng *et al.*, 2014), product adaptations rather than completely new products could be recommended for this target (Zhang *et al.*, 2016). On the other hand, "Footloose Seniors" and "Proactive people", despite their stronger attitude to using technology, might be attracted by different solutions according to their backgrounds. "Footloose Seniors", mostly living alone and feeling no more constraints, are likely to be more sensitive to "social" technologies supporting them in developing new social relationships. Technologies designed to be easily usable, and able to emotionally engage the user (Harte *et al.*, 2017) may be fitting for this target. On the other hand, this doesn't does not seem to be a specific need for "Proactive people".

7. Conclusion

This research, albeit of an exploratory nature, contributes to the enrichment of the studies about the consumption behavior of the elderly segment, with specific reference to technology use. Although many have highlighted the need to identify effective criteria for the segmentation of such a heterogeneous target in terms of expressed needs, there are currently few studies in this field, especially in relation to the use of technology.

Therefore, by analyzing the elderly target, cognitive age and lived events are good predictors of the consumption behavior of these subjects, as an alternative to age. The conducted cluster analysis highlights multifaceted consumption trends, both in the case of using cognitive age as a segmentation criterion and in the case of appealing to lived events.

As far as technology is concerned, our study states that segmentation based on age is not very effective, especially when certain dynamics of the use of the technology need explanation. On the one hand, it is evident that the use of technologies changes according to the age group (greater use for the youngest and lower use for the oldest). On the other hand, cognitive age and lived events provide additional information regarding the reasons for such discrepancies in the use of technological tools.

This provides important operational indications to managers who need to understand the different dynamics of the use of technology by elderly consumers in order to define offers of products and/or services suited to the several needs of the different segments into which this target is divided. The gaps emerging in our clusters show that some digital devices are perceived as more user-friendly than others by elderly consumers. Others, on the contrary, are less familiar to the elderly, but probably in the different reasons to use technologies as well as in the different cluster profiles, the producers of technological devices and services can find the basis for designing or redesigning their offerings to better fit elderly's needs.

Producing and selling their products or providing services allows companies to leverage the purchasing power of the elderly, triggering economic growth. Seniors' innovations to boost autonomy offer opportunities that are not restricted to medical devices, but include various products and services, such as transportation, housing and communications.

Promoting and facilitating the use of technology by the elderly segment has interesting implications in terms of social and economic impact, too. This is because the use of technology by this segment would lead to its greater autonomy with relevant effects on several fronts. Technology adoption might help older people to live independently in their comfort zone, improving their life quality and satisfaction, reducing pressure on the healthcare system and society as a whole.

Despite its theoretical and practical contribution, the present work is not exempt from limitations.

The first certainly deals with the method used for the segmentation of the elderly. Although alternative segmentation parameters to the chronological age were examined, to test their validity, these criteria were used separately. Homogeneity in terms of number of lived events seems to

affect cognitive age in our analysis, stressing the importance of adopting multicriteria approaches, capable of integrating the different perspectives for segmenting the elderly market.

The second limitation concerns the sample, which is surely limited and therefore expandable to be more representative of all age groups included in the elderly segment.

The third and final limitation concerns the moment of detection. The data were gathered during the period of the pandemic and, especially for those concerning the use of technology, they certainly appear to be influenced by this phenomenon. Therefore, although the information collected does not allow for a comparison with the period prior to the pandemic, it is also true that the pandemic has certainly contributed to accelerating the process of adoption of technology by the elderly and to making this process irreversible.

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Appendix 1

Tab. 1a: Reasons to adopt technologies in the different cohort-based clusters

		Cluster 2 Depression Generation	***Cluster 3 War generation***	***Cluster 4 Baby Boomers***
For generic / entertainment purposes (news, driving, reading)	Yes, in the last year	50,00%	80,00%	85,00%
	Yes, in the past	25,00%	0,00%	2,50%
	Never	25,00%	20,00%	12,50%
To keep in touch with family, friends, community	Yes, in the last year	100,00%	100,00%	86,25%
	Yes, in the past	0,00%	0,00%	3,75%
	Never	0,00%	0,00%	10,00%
For professional scopes (work related activities)	Yes, in the last year	25,00%	0,00%	23,75%
	Yes, in the past	25,00%	20,00%	16,25%
	Never	50,00%	80,00%	60,00%
For health reasons (telemedicine services)	Yes, in the last year	50,00%	0,00%	33,75%
	Yes, in the past	0,00%	0,00%	3,75%
	Never	50,00%	100,00%	62,50%
To search for information	Yes, in the last year	75,00%	80,00%	82,50%
	Yes, in the past	0,00%	0,00%	3,75%
	Never	25,00%	20,00%	13,75%
For email checking and sending	Yes, in the last year	100,00%	20,00%	55,00%
	Yes, in the past	0,00%	0,00%	1,25%
	Never	0,00%	80,00%	43,75%
For financial transactions	Yes, in the last year	25,00%	0,00%	30,00%
	Yes, in the past	0,00%	0,00%	0,00%
	Never	75,00%	100,00%	70,00%
To play	Yes, in the last year	25,00%	0,00%	26,25%
	Yes, in the past	0,00%	20,00%	2,50%
	Never	75,00%	80,00%	71,25%
To do shopping	Yes, in the last year	50,00%	0,00%	31,25%
	Yes, in the past	0,00%	0,00%	1,25%
	Never	50,00%	100,00%	67,50%
To access social media	Yes, in the last year	50,00%	40,00%	53,75%
	Yes, in the past	0,00%	0,00%	2,50%
	Never	50,00%	60,00%	43,75%

Tab. 2a: Reasons to adopt technologies in the different cognitive age-based clusters

		Cluster 1 Peter Pan	*Cluster 2 Young but not too young*	*Cluster 3 No longer young, but not old yet*	*Cluster 4 Old but not too old*	*Cluster 5 Old in name and deed*
For generic / entertainment purposes (news, driving, reading)	Yes, in the last year	100,00%	94,47%	80,00%	73,33%	71,43%
	Yes, in the past	0,00%	0,00%	2,50%	6,67%	14,29%
	Never	0,00%	5,53%	17,50%	20,00%	14,28%
To keep in touch with family, friends, community	Yes, in the last year	100,00%	84,21%	92,50%	66,67%	100,00%
	Yes, in the past	0,00%	0,00%	5,00%	6,67%	0,00%
	Never	0,00%	15,79%	2,50%	26,66%	0,00%
For professional scopes (work related activities)	Yes, in the last year	12,50%	21,05%	25,00%	26,67%	14,29%
	Yes, in the past	12,50%	21,05%	15,00%	20,00%	14,29%
	Never	75,00%	57,90%	60,00%	53,33%	71,42%
For health reasons (telemedicine services)	Yes, in the last year	37,50%	31,58%	27,50%	40,00%	42,86%
	Yes, in the past	12,50%	5,26%	0,00%	6,67%	0,00%
	Never	50,00%	63,16%	72,50%	53,33%	57,14%
To search for information	Yes, in the last year	100,00%	89,47%	80,00%	73,33%	71,43%
	Yes, in the past	0,00%	0,00%	2,50%	13,33%	0,00%
	Never	0,00%	10,53%	17,50%	13,34%	28,57%
For email checking and sending	Yes, in the last year	37,50%	68,42%	52,50%	46,67%	71,43%
	Yes, in the past	0,00%	0,00%	0,00%	6,67%	0,00%
	Never	62,50%	31,58%	47,50%	46,66%	28,57%
For financial transactions	Yes, in the last year	12,50%	47,37%	20,00%	33,33%	28,57%
	Yes, in the past	0,00%	0,00%	0,00%	0,00%	0,00%
	Never	87,50%	52,63%	80,00%	66,67%	71,43%
To play	Yes, in the last year	25,00%	10,53%	35,00%	13,33%	28,57%
	Yes, in the past	0,00%	10,53%	0,00%	6,67%	0,00%
	Never	75,00%	78,94%	65,00%	80,00%	71,43%
To do shopping	Yes, in the last year	25,00%	42,11%	30,00%	26,67%	14,29%
	Yes, in the past	0,00%	0,00%	0,00%	6,67%	0,00%
	Never	75,00%	57,89%	70,00%	66,66%	85,71%
To access social media	Yes, in the last year	62,50%	47,37%	57,50%	46,67%	42,86%
	Yes, in the past	0,00%	0,00%	2,50%	6,67%	0,00%
	Never	37,50%	52,63%	40,00%	46,66%	57,14%

Tab. 3a: Reasons to adopt technologies in the different life event-based clusters

		Cluster 1 Proactive people	***Cluster 2 Shy Seniors***	***Cluster 3 Old-fashioned widowers***	***Cluster 4 Footloose Seniors***
For generic / entertainment purposes (news, driving, reading)	Yes, in the last year	77,78%	89,47%	50,00%	85,00%
	Yes, in the past	11,11%	0,00%	0,00%	0,00%
	Never	11,11%	10,53%	50,00%	15,00%
To keep in touch with family, friends, community	Yes, in the last year	88,89%	86,84%	100,00%	85,00%
	Yes, in the past	7,41%	0,00%	0,00%	5,00%
	Never	3,70%	13,16%	0,00%	10,00%
For professional scopes (work related activities)	Yes, in the last year	14,81%	26,32%	25,00%	25,00%
	Yes, in the past	18,52%	18,42%	0,00%	15,00%
	Never	66,67%	55,26%	75,00%	60,00%
For health reasons (telemedicine services)	Yes, in the last year	29,63%	34,21%	25,00%	35,00%
	Yes, in the past	3,70%	2,63%	0,00%	5,00%
	Never	33,33%	63,16%	75,00%	60,00%
To search for information	Yes, in the last year	77,78%	89,47%	50,00%	80,00%
	Yes, in the past	3,70%	2,63%	0,00%	5,00%
	Never	18,52%	7,9%	50,00%	15,00%
For email checking and sending	Yes, in the last year	48,15%	63,16%	50,00%	50,00%
	Yes, in the past	3,70%	0,00%	0,00%	0,00%
	Never	48,15%	36,84%	50,00%	50,00%
For financial transactions	Yes, in the last year	33,33%	31,58%	0,00%	20,00%
	Yes, in the past	0,00%	0,00%	0,00%	0,00%
	Never	66,67%	68,42%	100,00%	80,00%
To play	Yes, in the last year	18,52%	26,32%	0,00%	35,00%
	Yes, in the past	3,70%	5,26%	0,00%	0,00%
	Never	77,78%	31,58%	100,00%	65,00%
To do shopping	Yes, in the last year	22,22%	42,11%	0,00%	25,00%
	Yes, in the past	3,70%	0,00%	0,00%	0,00%
	Never	74,08%	57,89%	100,00%	75,00%
To access social media	Yes, in the last year	55,56%	55,26%	25,00%	50,00%
	Yes, in the past	3,70%	2,63%	0,00%	0,00%
	Never	40,74%	42,11%	75,00%	50,00%

sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s119.2022.03
pp. 51-81

Social network sites and ageing: roles of Facebook in enhancing seniors' well-being

Received
18th July 2022

Revised
7th October 2022

Accepted
22nd November 2022

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Abstract

Purpose of the paper: *Use of social network sites (SNSs) among the elderly is on the rise, providing opportunities to facilitate their connections and restore social interaction. The purpose of this paper is to frame the role of Facebook in enhancing seniors' well-being.*

Methodology*: The authors carry out a netnography to explore the role of Facebook groups in ageing people's well-being. A total of 411 postings in 10 online communities were collected and analysed.*

Results*: Building on an extant framework on psychological well-being, this study highlights three roles that Facebook groups can fulfil to enhance seniors' well-being: information provider, social facilitator, and loneliness reductor.*

Research limitations: *The study has some limitations related to the generalizability of the research results. However, these limitations may represent potential avenues for research.*

Practical implications*: This paper provides practitioners with helpful insights on how Facebook can enhance various well-being dimensions. Service providers can use these results to devise effective communication and services tailored to seniors' needs.*

Originality of the paper: *Research examining SNSs and psychological well-being is still scarce. The proposed integrative framework offers initial evidence of how Facebook groups can improve psychological well-being among older adults.*

Key words: silver economy; social media opportunities; seniors' well-being; psychological well-being; netnography

1. Introduction

In recent decades, Western societies' populations have undergone progressive ageing. According to the World Health Organization, the 2050 population of those aged 60 years and older will be 2 billion people; in other words, one in five people will be elderly. The increased presence of older people and their acquired longevity can be viewed as either a burden for society or a great opportunity for economics and businesses (Vigolo *et al.*, 2017).

As life expectancy increased in the past 30 years, another revolution was concurrently changing society profoundly: the digital revolution (Matarazzo *et al.*, 2020; Mele *et al.*, 2022b). Although the elderly are often viewed as being reluctant to use new technologies (Baisch *et al.*, 2017), the age group between 55 and 74 years has actually consistently increased its usage in recent years, particularly the internet and social networking

sites (SNSs). Worldwide data show that among the elderly, the use of social networks increased especially: As of 2021, 43% of those aged 65 years and older used social networks, and Facebook was the most used (Jung and Sundar, 2021; Cotten *et al.*, 2022; Gil-Clavel *et al.*, 2021). This phenomenon saw its biggest increase during the COVID-19 pandemic, when the elderly increasingly turned to social networks (e.g., Facebook) and online video conferencing apps (e.g., Zoom) to help them stay connected with their family members and friends (Chen *et al.*, 2021; Colurcio *et al.*, 2022). The containment measures to control the spread of COVID-19 starting in March 2020 imposed serious restrictions on face-to-face social contacts, with negative effects on the quality and satisfaction of life of older people (Tuzovic *et al.*, 2021). In this sense, information and communication technologies and social media have been useful tools to help the elderly population maintain and strengthen social ties, especially intergenerational ones (Cugmas *et al.*, 2021; Zerbini *et al.*, 2022). Older adults' use of Facebook continues to grow (Bianchi, 2021), and recently, communities of seniors gathered in Facebook groups have proliferated (Yachin and Nimrod, 2021). (Facebook groups are pages "that any Facebook user can create that others can join, allowing group members to interact based on a common interest, affiliation or association" (Techopedia, 2017).

Scholars from disparate disciplines (i.e., psychology, communication, computer science, and social science) have investigated the association between SNSs and well-being over the past two decades (e.g., Schiffrin *et al.*, 2010; Liu *et al.*, 2019; Simons *et al.*, 2021); these studies produce disparate outcomes (Castellacci and Tveito, 2018; Liu *et al.*, 2019). For example, some provide insights into the associations of social media use (SMU) with cognitive well-being (e.g., life satisfaction) and affective well-being (i.e., the elderly's affective evaluations of their moods and emotions) (e.g., Hsu *et al.*, 2021). Others investigate the impact of social networks on elderly well-being in terms of reduced depression symptoms (Matthes *et al.*, 2020). In business studies, only a few scholars have examined the associations of SNS use and well-being (Luqman *et al.*, 2021) in relation to the elderly (Pera *et al.*, 2020).

We focus on psychological well-being, a multidimensional, dynamic construct composed of a framework of dimensions in which enjoying positive experiences and meeting basic needs are essential (Ryff and Singer, 2008). It involves subjective, social, and psychological dimensions, health-related behaviours, and practices that add meaning to people's lives and allow them to attain their maximum potential (Ryff, 2014). It relates to growth and human fulfilment and has consequences for health (Ryff and Singer, 2008). In addition, recent studies have recognized that psychological well-being can substantially contribute to better health and positive ageing (Bar-Tur, 2021). Building on this reasoning, we state our research question as follows: What roles do SNSs (e.g., Facebook groups) play in fostering seniors' psychological well-being?

To address our question, we carried out a netnography analysis of 10 Facebook groups to obtain empirical insights into the roles of SNSs for the elderly. In particular, we selected online posts and reviews from senior groups on Facebook, the most popular social network used by ageing

people (Auxier and Anderson, Pew Research Center, 2021). The main contribution of this study is that we provide a better understanding of how SNSs (e.g., Facebook groups) can enhance elderly psychological well-being, as sites for social interactions that improve their daily quality of life. We provide an integrative framework of the three roles that Facebook groups play for elderly well-being: information provider, social facilitator, and loneliness reductor. First, Facebook can provide the elderly with information and foster their knowledge. Second, it can function as a social facilitator, by improving seniors' social lives and interactions. Third, it can mitigate a sense of solitude and overcome a lack of intimacy.

The remainder of this paper is organised as follows: We present the theoretical background next, after which we describe the research method and the empirical results. Finally, we discuss the findings and contributions, as well as some limitations of our research.

2. Literature review

2.1 Connectivity and SNS opportunities for seniors

Catering to and caring for older adults is an increasingly multidimensional concern, due to their evolving needs, perceptions, and evaluations (Kabadayi *et al.*, 2020). Some scholars consider the elderly a vulnerable population (Berg, 2015; Amine *et al.*, 2021), such as when they are exposed to psychological disabilities due to loss of social communication and declining interactions (Courtet *et al.*, 2020; Ruggiero *et al.*, 2022). In the early 2020s, not only was this group exposed to the natural decline of physical health, but it also experienced the most extensive social and emotional loneliness exacerbated by, among other things, the COVID-19 pandemic (Odekerken-Schröder *et al.*, 2020). According to Coelho and Duarte (2016), the leading way to fight isolation and loneliness is to meet social needs through participation in SNSs (Vrontis *et al.*, 2015), particularly in later life (Bruine de Bruin *et al.*, 2020). These sites offer potential opportunities to address the elderly's lack of connectivity (Hsu *et al.*, 2021). In contrast with common stereotypes of older adults as tech passive, the elderly are actually increasingly adapting social networks to stay connected with society (Chen *et al.*, 2017, Vigolo, 2017). Online community usage is proliferating, and millions of people aged 60 years and older are logging onto Facebook, the world's largest digital platform (Statista, 2021; Caridà *et al.*, 2022). Technology and recent computer-based communication provide seniors a chance to take part in a wider part of society, making it possible for them to connect with people who have similar experiences (Iancu and Iancu, 2020). Studies show SNSs such as Facebook groups can function as a therapeutic tool, helping the elderly maintain and strengthen social connections, as well as affectional and social relationships, favouring greater integration among individuals (Spineli Silva *et al.*, 2020). Specific activities such as posting, commenting, and sharing with family, friends, and community members provide cognitive and social benefits to older adults (Nimrod, 2014; Pera *et al.*, 2020). For example, older adults who

regularly customise their social network profile and often share personal stories on their Facebook wall feel a greater sense of community and control (Solima, 2011; Hsu *et al.*, 2021). From this perspective, several scholars posit that SMU generates positive effects in terms of combating loneliness, fostering social support, and reducing social pain, especially during the pandemic (Bruine de Bruin *et al.*, 2020; Courtet *et al.*, 2020; Yang *et al.*, 2021). Scholars also have observed that SMU has some positive effects on older adults' well-being that involve their social connections and life satisfaction (Courtet *et al.*, 2020; cotton *et al.*, 2021). However, no studies address which types of well-being SNSs support.

2.2. Well-being: Ryff's model

Well-being is a dynamic concept, closely related to other concepts such as happiness, wellness, and quality of life (Ryan and Deci, 2001; Mele *et al.*, 2021; Boccoli *et al.*, 2022). An integrated conceptualization reflects the multidimensional status of well-being, spanning positive emotion, engagement, relationships, meaning, and accomplishment (Keyes *et al.*, 2002). Mele *et al.* (2022a, p. 7) offer a value-based definition of well-being "as individual positive effects that arise from utilitarian and hedonic value but also from ethical, environmental, and social value, which depend on the current and/or potential uses of resources by individuals and/or other people, within a narrow and/or wider context." In contrast, mainstream literature categorises the concept as eudaimonic or hedonic well-being (Ryan and Deci, 2001).

Researchers have proposed several theoretical models of well-being in agreement with these two philosophical positions. On the one hand, drawing on hedonism, Diener (2000) proposes the construct of subjective well-being (SWB), which refers to affective and cognitive evaluations of an individual's life. Other studies espousing this view posit that the feeling of happiness and satisfaction with life is universal, though what brings happiness and satisfaction may differ across societies and cultures (Diener and Suh, 2000; Diener *et al.*, 2009). On the other hand, eudaimonic theorists argue that it is important for people to have a sense of meaning and fulfilment in life (Deci and Ryan, 2008).

Herein, we adopt Ryff's (1989b) theoretic model of psychological well-being, which falls in the eudaimonic tradition and encompasses six key dimensions: "Autonomy, Environmental Mastery, Personal Growth, Positive Relations with Others, Purpose in Life, Self-Acceptance" (Ryff, 1989b, p. 35). This model serves as the basis of our netnographic investigation, as we depict in the proposed framework. Ryff's model of psychological well-being draws extensively from various theories, such as Aristotle's Nicomachean Ethics; the humanistic conceptions of Maslow, Allport, and Rogers; existential and utilitarian philosophy; and clinical, developmental, and humanistic psychology (Ryff and Keyes, 1995). We integrate all these perspectives to create a multidimensional model of psychological well-being. One of Ryff's criteria, autonomy, is also known as the final stage of ego development (Loevinger, 1976); it pertains to self-determination and independence-that is, the ability to make one's own

decisions without relying on, or waiting for, the approval of others (Ryff and Singer, 2008). Environmental mastery refers to the effective ability to choose or create contexts suitable to psychic conditions, such as personal needs and values (Jahoda *et al.*, 2021). Personal growth is correlated with the constant development of one's own potential and self-expansion as a person, working towards optimising one's full potential (Henn *et al.*, 2016). The concept of positive relations with others refers to warm, satisfying, and trusting interpersonal relations. It involves the welfare of other people and the capability to experience strong empathy, affection, and intimacy. In Ryff's model, the definitions of autonomy and positive relationships with others correspond to the basic needs of autonomy and relationships for any individual (Gao and McLellan, 2018). Ryff (1989a) and Ryff and Keyes (1995) propose that these needs represent a central component in a model that integrates other perspectives. Self-acceptance refers to a positive attitude toward the self and positive feelings about one's past life (i.e., having a realistic perception of oneself, including both good and bad qualities, and still being able to accept oneself). Finally, purpose in life is a high sense of meaning and emotional integration in life. It pertains to having life goals and a sense that one's life has purpose and meaning, while living intentionally and with clear direction (Birren and Renner, 1981; Ryff, 1989a, b).

We'll adopt the Ryff's model on psychological well-being to understand how SNSs (e.g., Facebook) affect the elderly.

3. Method

We adopted netnography, a qualitative research approach, which is appropriate when a deeper description and explanation of a multifaceted phenomenon is needed (Kozinets, 2002; Thanh and Kirova, 2017). Compared with other qualitative research techniques, the distinctive value of netnography is that it excels at telling a story, allowing readers to understand complex social phenomena, and assists the researcher in developing themes from consumers' points of view (Kozinets, 2002; Rageh *et al.*, 2013). Netnographic data are often described as rich and naturalistic, with the ability to represent people's lived realities accurately (Kozinets, 2002; Sandlin, 2007). For this study, we became "insiders" in some senior Facebook groups. We used a participant observation diary to capture key moments among participants in Facebook groups (Kozinets, 2020). The source of the data for the analysis occurred naturally in the expression of the participants in the text, without them being aware of being questioned, as would be the case with a formal interview in traditional ethnography (Kulmala, 2011).

3.1 Data collection

We identified the online communities most relevant to seniors on Facebook, the most popular social network used by ageing people (Pew Research Center, 2021). To this end, we followed Kozinets *et al.*'s (2010)

guidelines when choosing which channels would be relevant to the community under study: those that were active, interactive, substantial, heterogeneous, and data-rich at the time of study. Furthermore, the SNSs had to be written in English and used by ageing people for several purposes (e.g., interacting, sharing news, staying connected with family and friends). The context was international, though the prevailing target in terms of nationality was U.S.-based. We also collected archival data, such as texts or pictures, and copies of pre-existing communication, such as posts shared by the participants. With this observation diary, we identified posts that were most relevant and active for further analysis.

Tab. 1: Facebook communities, self-descriptions, and details

Community	Facebook Description	Members	Foundation
Ageing gratefully	"It's about aging with grace"	529	01/03/2021
Group of Seniors Citizens	"I made this group for senior citizens like me, THIS WILL BE OUR SHOULDER TO LEAN ON We can post what we feels, You are not alone in this journey... Think positive we are just starting our new normal life... May God bless us all!"	5,605	11/04/2021
J.O.Y just older youth	"J.O.Y is a group for adults ages 50 & under that will meet once a month. We will get together for around an hour, eat, play game(s) & fellowship. You do not have to be part of our church to attend. This is a casual, fun get together.. a time we can enjoy getting to know each other & fellowshipping. If you have kids let us know & we will have a babysitter available"	526	06/04/2018
Elderly We Care	"To provide peace of mind to Seniors and to their loved ones, that their Seniors are being taken care of; whether they are in their own home or retirement homes."	1,875	03/05/2021
Elderly Care	"Living & health care tips for elderly parents, aging people, grandparents, senior citizens, old age persons, dementia & Alzheimer patients."	4,294	28/06/2017
Elderly Care Group	"A group where we can share our problems and what concerns us. Probably we could connect better as we can't go out in these tough times. I also intend to come up with some solutions to your problems"	1,457	11/05/2021
Senior Citizens	"The group has been created to help Senior citizens with the latest information on various topics including health... science...welfare"	7,237	01/08/2018
Senior with humor	"A PLACE TO RELAX and have a laugh, chat and tell jokes: N0 PORN, No POLITICS No NEGATIVITY, and NOTHING on Covid-19 !!!!! We are all adults so let's have fun here . ALL, AND I MEAN ALL, ARE WELCOME IN HERE ! NO RACISM OF ANY KIND !!! To SHARE a POST on your own page: GO to top of the post and press "post" or the 3 dots top right and follow directives. We encourage sharing joy with everyone."	16,453	09/12/2012
Aging in Place: Exploring Alternatives in Senior Living	"Aging in Place: Alternatives to Senior Living is a closed Facebook group for people concerned with being able to continue living at home independently as we age. We will look at current models around the country and discuss our experiences and share stories as we go"	1,617	25/10/2018
Seniors Only - Active, Online Group for 50+	"This Group is for SENIORS only. Must Be 50+ to Join. Inside We Share Lots of Great Information About: - Getting the Most Out of Your Retirement - Daily Deals We Find - Discounted Rates on Services and Things We Use - FUN Ideas and Activities We've Come Across - Hilarious Pictures and Stories - Books We're Reading - Places We're Visiting - and MUCH More!"	9,715	28/06/2018

Source: Authors' elaboration

We ultimately selected 10 online Facebook groups from which to collect posts and comments (see Table 1). We selected groups created specifically for elderly users with more than 500 members and that were English speaking. Two researchers searched for groups whose title contained at least one of the keywords elderly, seniors, silver, aging, or ageing and that had a fairly detailed group description. In addition, we excluded groups in which interaction was low, according to the average number of daily posts, and dismissed groups predominantly characterised by product advertisements or various sponsorships. The netnography that informs the current study encompasses online contributions posted between 2019 and 2021. However, the review was limited to contributions in English and those that focused on elderly experiences and thoughts, rather than technical concerns and company promotions (e.g., we excluded suggestions from administrators or people about products and services). Using a filtering process, we analysed these posts initially to determine if each contribution revealed information about one or more of Ryff's well-being dimensions, looking for expressions of joy, sadness, or knowledge acquisition (e.g., asking for help or information). The final selection of online contributions for further review resulted in 411 posts detailing elderly activities, opinions, questions, thoughts, and memories, which we subsequently analysed with the aim of addressing our research question (Heinonen and Medberg, 2018).

3.2 Data analysis

For the data analysis, we employed qualitative content analysis (Altheide and Schneider, 1996; Bryman, 2008; Heinonen and Medberg, 2018). The qualitative content analysis of comments and posts revealed well-being topics through combinations of lexical (signal words in the text) and semantic (content interpretation and meaning) assessments (Heinonen and Medberg, 2018). This method is based on reflexive movements across concept development, data, analysis, and interpretation (Altheide and Schneider, 1996); it requires an orientation toward discovery and constant comparison. The focus was on what users were talking and writing about in their experiences, thoughts, memories, opinions, and questions. As elderly posts and comments revealed well-being facets, including all the six dimensions detailed by Ryff (1989a, b), we first coded a dominant element per post/comment (See Appendix I). Table 2 provides a frequency distribution of dominant codes across Facebook posts and comments. Then, through iterative discussions among the researchers, we realised that the dimensions could be grouped in three clusters because they provided common outcomes. These groupings ultimately resulted in the integrative framework detailed in the next section.

Tab. 2: Frequency distribution of dominant codes across Facebook posts and comments

	Number of Posts	Number of Comments	Total
Environmental mastery	43	24	67
Personal growth	36	16	52
Purpose in life	51	21	72
Autonomy	26	14	40
Self-acceptance	41	13	54
Positive relations with others	75	51	126
Total	272	139	411

Source: elaboration

4. Findings

Our analysis of 411 posts and comments led us to differentiate three roles of social network sites (e.g., Facebook groups) in enhancing the elderly's well-being: information provider, social facilitator, and loneliness reductor. We provide several illustrative coding examples and descriptions in Table 3.

Tab. 3: Facebook groups quotes related to well-being dimension

	Well-Being Dimensions	Illustrative Coding Examples	Description
Loneliness reductor	Self-acceptance	"I have been widowed twice. I am a retired member of the medical community and I live in Florida… I am upbeat and wish everyone here a wonderful life :)" #male, post 312	In the process of telling their stories, including sad events, users open up and overcome difficult moments, accepting themselves and even unpleasant situations
	Positive relations with others	"Hello dear, I'm new to this page, a friend of mine introduced me to this group weeks ago. Your comments are wonderful. If you don't mind sending me a friend request so that we can be best friends and also get to know more about each other!" #female, post 56	Elderly users look for deep and true friendship in communities, beyond just having fun and reading some posts.
Social facilitator	Autonomy	"I'm looking for input from lo-distance caregivers. What are your thoughts and/or experiences with remote monitoring services? Good? Bad? Meh?" #male, post 402	Users find valuable sources in Facebook communities to obtain knowledge and contacts to improve their life and autonomy, avoiding in some cases nursing homes.
	Purpose in life	"I love the holidays and I desire companionship. I also emailed my sister and I asked if we could celebrate together." #female, post 167	Through interactions in Facebook groups, the elderly think about their deep desires and purposes. They are also driven to make decisions that make them feel good and enjoy life.
Information provider	Personal growth	"Any suggestion to fall asleep?" I was so proud of myself, when after several attempts I learned how to write in cursive" #male, post 348	Users experience a digital self-development when they interact in SSNs, contributing to a personal growth that they deeply pursue.
	Environmental mastery	"A good song is not based on how many people like it, but on how many memories you get. That's the true beauty about music." #male, post 298	Users express a sense of mastery in managing environmental factors and activities.

Source: Authors' elaboration

4.1 Information provider

The Facebook groups improved *environmental mastery* and *personal growth*, in this sense serving the role of information provider for elderly users. Some users interact in Facebook communities to counteract their decreased social interactions and mainly perceive functional support (e.g., information, instructions). This group aims to increase their knowledge and digital self-development, as well as take advantage of surroundings and technology for specific and desired personal communication outcomes. These users found a positive environment in Facebook groups, where they can openly express themselves and show "active participation" and willingness to "develop one's potential to grow and expand as a person" (Ryff, 1989b, pp. 44). In addition, seniors demonstrated proficiency in user-friendly platforms such as Facebook and the functions of Facebook groups.

"I was so proud of myself, when after several attempts I learned how to write in cursive." #male, post 56

They ask for tips to improve their physical well-being (e.g., sleeping, eating) (see Plate 1 in Figure 1), or they state an opinion looking for some kind of appreciation or discussion (see Plate 2 in Figure 2).

"A good song is not based on how many people like it, but on how many memories you get. That's the true beauty about music." #female, post 7

Fig. 1: Plates 1 and 2: Illustrations of Facebook posts as information providers

Source: Authors' elaboration

4.2 Social facilitator

The second role of Facebook groups is to affect purpose in life and autonomy. Some users interact in social networks to compensate for their lack of relationships and to contribute to "feelings of meaningfulness and integration about the various parts of one's life" (Ryff, 1989b, pp. 44). They

mainly perform hedonic activities (e.g., having fun, joking, sharing fun videos and posts; see Plate 3 in Figure 2) or express enthusiasm resulting from the type of content shared of and about oneself, involving selfies or focused subject matter. Seniors aim for independence and autonomy (Ryff, 1989a); accordingly, to facilitate their social life, they ask for suggestions about doctors, online services, or reference points, especially when moving to other places (see Plate 4 in Figure 2).

"I'm looking for input from long distance caregivers. What are your thoughts and/or experiences with remote monitoring services? Good? Bad? Meh?" #female, post 298

The open discussions provided some instances in which participants combined thoughts and discloses their opinions about social life:

"I love the holidays and I desire companionship. I also emailed my sister and I asked if we could celebrate together." #male, post 347.

Plates 3 and 4: Illustrations of Facebook posts as social facilitators

Source: Authors' elaboration

4.3 Loneliness reductor

Self-acceptance and *positive relations with others* represent the dimensions that make up the role of loneliness reductor, which mitigates solitude and lack of intimacy. Many users find in Facebook a renewed social life that, due to various circumstances (e.g., living alone, social distancing), they have lost. These seniors want to build new relationships and restore connectivity that has been reduced by infrequent interactions with their existing personal networks or the incapability of peers to meet. Thus, they join social network communities to build warm and trusting interpersonal relations that involve caring, feelings, and more personal ties. In looking for these intimate relationships, this group also seeks an individual sense of self-acceptance (Ryff, 1989a). We frequently observed comments and posts of people looking to meet in person, trying to develop strong attachments and share more about themselves.

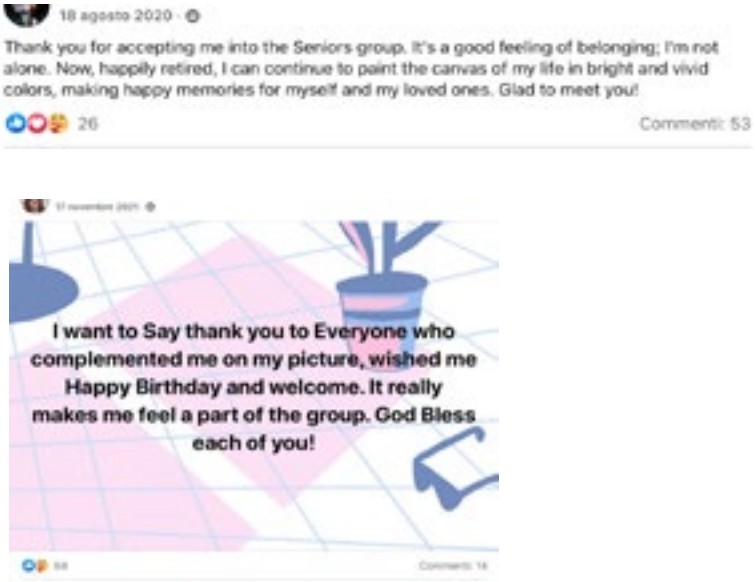
"Hello dear, I'm new, a friend of mine introduced me to this group weeks ago. Your comments are wonderful. If you don't mind sending me a friend request so that we can be best friends and also get to know more about each other." #male, post 411.

"I am happy to be a member of this senior group. I am a 65 year old man from Africa looking forward to meeting people and making new friends." #male, post 48.

In addition, these seniors directly display their state of mind and interests, helping them build new relationships and accept their current state (see Plate 5 in Figure 3). Especially among elderly with mobility limitations that prevent them from socialising physically, the process of talking about themselves reduces their feelings of loneliness (see Plate 6 in Figure 3).

"I have been widowed twice. I am a retired member of the medical community and I live in Florida.… I am upbeat and wish everyone here a wonderful life :)" #female, post 276.

Fig. 3: Plates 5 and 6: Illustrations of Facebook posts serving the role of loneliness redactor



Source: Authors' elaboration

5. Discussion

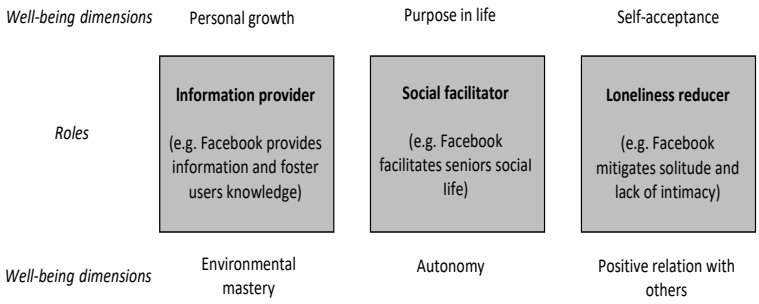
This work centres on a key priority in management research: how to foster elderly well-being through technologies (Kabadayi *et al.*, 2020; Ostrom *et al.*, 2021). It offers contributions for scholars and practitioners, as well as advice for further research.

5.1 Theoretical contributions

Extant research emphasises that, especially during the COVID-19 pandemic, restoring and promoting social connections become fundamental for seniors' well-being (Hsu *et al.*, 2021). As such, the present work aims to

frame the role of SNSs (e.g., Facebook groups) in enhancing the elderly's well-being. The proposed framework offers two main contributions. First, SNSs have the potential to enhance many facets of well-being, such as those identified by Ryff (Ryff, 1989b; Ryff and Singer, 2008). Second, the current study, building on prior studies of well-being (Ryff, 1989a, b; Ryff and Keyes, 1995; Pera *et al.*, 2020; Bianchi, 2021), loneliness (Cacioppo and Patrick, 2008), and social networks and the silver economy (Coelho and Duarte, 2016), proposes an integrative framework (Figure 4) that differentiates three roles of social network sites (e.g., Facebook groups) for enhancing the elderly's well-being: information provider, social facilitator, and loneliness reductor.

Fig. 4: Roles of Facebook groups in enhancing well-being



Source: Authors' elaboration

Each role contributes differently to enhancing well-being, by offering specific, socially supportive relationships. These roles can improve well-being, by providing useful information, bringing joy, and/or enhancing feelings of powerful connections (Adelman *et al.*, 1994; Adelman and Ahuvia, 1995). Seniors use SNSs primarily to create a bridge of social capital, sharing identity and developing a sense of connectedness among group members (Coelho and Duarte, 2016). Facebook groups are a useful tool to help the elderly population maintain generational ties, especially when social distancing limits face-to-face interactions. Interacting in Facebook groups allows seniors to grow personally, and the exchange of information among users in SNSs maximises their potential, fostering improved knowledge (information provider).

In addition to functioning as a place to collect and provide information, Facebook acts like a social facilitator, by helping users communicate with other humans (Sharkey and Sharkey, 2012). Participation in an online community enables the elderly maintain their own goals and a sense that life has purpose and meaning. In this light, SNSs can also enhance a user's social well-being.

Finally, SNSs can fill the highest needs of well-being, such as loneliness and intimate relationships (Odekerken-Schröder *et al.*, 2020). In online communities, older people are not afraid to have a realistic perception of themselves, including both positive and negative qualities. Relationships with others encourage them to accept themselves, despite age-related vulnerabilities. Elderly users often find partners or close friends through

interaction in Facebook communities. Through daily, direct interaction (posts and comments), the elderly establish warm and caring relationships (Pera *et al.*, 2020). As a loneliness reductor, Facebook thus serves as a place to develop intimacy and express empathy. In this sense, contrary to stereotypical views that social networks hinder human contact, we find that Facebook groups foster social interaction for elderly users.

5.2 Managerial implications

This study offers important insights for practitioners on the importance of observing the behaviour and actions of the elderly on social networks. Seniors express themselves among peers in specific Facebook groups, revealing interests, desires, and concerns toward products and services. Considering the key role of technology and SNSs in effective efforts to facilitate active ageing (Klimczuk, 2015), practitioners should devote more attention to the design of new modalities of engagement that support the participation of older adults (Keyes, 2014). Although technology companies have faced some problems in winning over this age group in the past, because some of them may be reluctant to use new technologies (Baisch *et al.*, 2017), recent growth in internet, smartphone, broadband, and tablet adoption among the elderly is evident (Pew Research Center, 2021). Tech firms should be aware that their technology offerings need to be affordable (such that the elderly can buy and maintain them), accessible (such that information and services about the technology are available), and usable (such that this group perceives ease of use, and using the technology does not lead to feelings of stress and confusion) (Iwasaki, 2013). From this perspective, Facebook complies with these requirements; many older people feel comfortable using this platform. Its ease and accessibility have resulted in widespread diffusion among the elderly. Managers should focus on exploiting more accessible interfaces (Conte *et al.*, 2022), like Facebook, for older age groups.

Our study provides evidence that professionals, managers, and marketing specialists can adopt digital advertising to target elderly consumer segments, in contrast with a common and stereotyped view of older adults preferring newspapers and television. In these platforms, companies can carry out social listening to understand ageing and elderly needs, which represent an increasingly attractive business segment (Falk *et al.*, 2007; Grougiou and Pettigrew, 2011; Kuppelwieser and Klaus, 2020; Caridà *et al.*, 2022). Elderly encounters, especially in assisted living and nursing homes, have become a subject of increasing analysis (Bermudez-Gonzalez *et al.*, 2016). Both scholars and practitioners are uncovering the importance of digital places and encounters for elderly (Bar-Tur, 2021), and not only third places (e.g., diners, coffee shops, taverns), to enhance their health and longevity (Rosenbaum, 2006), by satisfying their consumption and health needs, as well as their needs for companionship and emotional support. Thus, the rapid introduction and development of smart technologies has uncovered the promising relation of digital encounters with elderly service provision and well-being (Essén 2009; Čaić *et al.*, 2018; Kabadayi *et al.*, 2020). To address and develop this critical and

demanding segment, it is incumbent on firms not to wait for political and economic reforms, but to design innovative solutions especially tailored to the ageing population (Warner *et al.*, 2020). Managers should keep in mind the importance of matching the features of SNSs and other digital communication technologies with the specific needs and challenges of the elderly (Caridà *et al.*, 2016). Doing so is a first step toward encouraging and helping the elderly use these technologies to their advantage. Ultimately, health care professionals and general physicians (Kenet and Lavi, 2014) can enhance the usage of Facebook groups, which can improve patient care even if their well-being decreases due to psychological sufferings (Boccoli *et al.*, 2022).

5.3 Limitations and further research

This paper has some limitations that could serve to guide further research into the links of the "silver economy," SNSs, and well-being. Because we adopted a netnographic study approach, we do not consider the social and cultural characteristics of Facebook users. Ethnographic studies and in-depth interviews might enrich the understanding of the nuances of seniors' behaviours and desires in SNSs. Quantitative research through surveys and databases could validate our findings. Scholars can expand theoretical and empirical knowledge in Facebook communities to address clusters of seniors (e.g., 50+, 65+, 75+) or cultural and national differences. Alternatively, quantitative research might focus on developing more detailed measurement scales for each of the six dimensions or three roles. In summary, the exponential growth and changes among seniors in today's society provides a promising field of study.

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Vol. 40, Issue 3, 2022

ZERBINI C., AIOLFI S., BELLINI S., LUCERI B., VERGURA D.T. (2022), "Mobile shopping behavior: a bibliometric analysis: Array", *Sinergie Italian Journal of Management*, vol. 40, n. 2, pp. 233-256.

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Appendix 1: Well-being illustrative coding examples

	Well-Being Dimensions	Illustrative Coding Examples
Loneliness reductor	Self-acceptance	 "*How do you stay positive and get momentum when it's so hard to find like minded people? So many people around me don't want change.*"
	Positive relations with others	
Social facilitator	Autonomy	
	Purpose in life	
Information provider	Personal growth	 *There is so much that can be done for us, focusing on nutrition and diet, stress management, sleep quality and quantity, social interactions, exercise, meditation, creativity and learning. Collectively, these can all play a role in the health and wellness of our brains.So please don't think your choices today are not relevant because I can assure you that they really are!*" 
	Environmental mastery	"*Remember these days when we didn't have to wear seat belts as kids. It was a different world then*" 

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ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s119.2022.04
pp. 83-103

Promoting innovation in the fashion industry to support active ageing: can independent European centres take the leadership?[1]

Received
23rd June 2022
Revised
17th October 2022
Accepted
22nd November 2022

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Abstract

Purpose of the paper: *The aim of the paper is to identify how many independent innovation centres are working in the fashion field at European level, their contribution to innovation in the sector and how they consider the needs of the elderly.*

Methodology*: The empirical analysis uses a mixed method that combines a desk analysis of the websites of European independent innovation centres with a qualitative survey with open-ended questions and in-depth interviews with experts.*

Findings*: On the one hand the analysis highlights that independent centres in the fashion and textile field are involved in multiple activities targeting social inclusion-oriented innovation but on the other hand only a few consider the over-65 population as a specific target. The findings highlight the potential of applying skills and innovations in this segment that have already been tested in other social areas and for other creative industries.*

Research limits: *The research only investigates independent innovation centres. Future research developments could usefully examine and complete the panorama with the large fashion companies and the businesses that operate in market segments whose products have technical features that could be easily transferred to the silver market.*

Practical implications: *The study highlights the potential of the silver market for fashion and suggests practical implications for independent innovation centres as regards encouraging greater attention to and the development of activities and products that are specifically dedicated to this target.*

Originality of the paper*: Despite the relevance for the fashion industry of the European over-65 market, so far the literature has shown little interest in the fashion silver economy as regards analysing both demand needs and product innovation processes aimed at satisfying these needs, with reference to the places where such innovation processes can more easily take place.*

Key words: fashion; textile; active ageing; independent innovation; silver market

[1] Acknowledgements; the paper presents some preliminary results of a study conducted as part of the international partnership project, funded by Creative Europe, FUSION, organized by Limerick School of Art & Design (Ireland), Crafts Council (United Kingdom), Polytechnic Institute of Cavado do Ave (Portugal) and Santagata Foundation for the Economy of Culture (Italy). The Authors are grateful to the project partners for making their data available.

1. Introduction

There are important creative and innovative trends in fashion today which offer unprecedented opportunities in terms of product innovation and mass customization (Behr, 2018). These trends come not only from research within companies but, more and more, also from independent innovation hubs which are more easily in contact with the social needs expressed by demand (Lushan and Li, 2018), and that are able to integrate current technological advances in the fashion system (Manenti, 2016).

The relationship between fashion and technology has become stronger and stronger in recent years also thanks to the experiments carried out in many of these independent centres, contributing to the transformation of many fashion goods into technological products. The functions of clothing have thus evolved from the protection of the body and from aesthetics to advanced functions such as delivering information, releasing therapies, supporting movements, producing energy, and many others (Bertola and Teunissen, 2018). These functions play an increasingly important role in the well-being and safety of more and more customers: athletes, the ill, workers, seniors and many others (Tomico *et al.*, 2017). In this context it is particularly interesting to look at the seniors market look, also due to its growing size.

This because, if on the one hand the fashion industry can offer new answers on how not only to live longer but also in a healthier way, on the other hand studies highlight both the enormous potential for the European fashion industry of older consumers, and the risks for the sector in neglecting this segment (CBI, 2019).

Surveys of the demographic picture in the EU indicate a continuous and sustained trend towards an aging population. The most recent statistics (2019, Eurostat 2021) show that more than one fifth of the population in EU-27 member countries is aged 65 or more, while young people up to 14 make up around 15%. With life expectancy increasing at a similar pace in all European countries, a further significant factor to consider is the progressive aging of the elderly population: the 80-plus age group is growing faster than any other age group in the European population.

Population aging will therefore have a growing impact on many sectors of the EU economy (Guido, Ugolini and Sestino, 2022), and technological innovations will play a fundamental role in defining the prospects for the "silver market" phenomenon (Kohlbacher and Herstatt, 2011).

With specific reference to the fashion market, research in the UK from the International Longevity Centre (ILCa, 2019) shows that spending by seniors on clothing and footwear will increase by 11 billion pounds (60%) from 2019 to 2040; also in other countries, such as Italy for example, the over 65s are driving the growing expenditure in the fashion and cosmetics sectors (Assolombarda, 2017).

However, while many sectors have invested heavily in research and development in order to find innovative solutions to meet the new needs of an aging society - as in the case of e-health (Kampmeijer *et al.*, 2016), of the automotive sector (Faber and van Lierop, 2020), home automation (Pal *et al.*, 2018), tourism (Vigolo, 2017 *et al.*), communications and many

others (Technopolis group, 2018) - the fashion industry has fallen seriously behind on this front (ILCb, 2019).

Therefore, considering that an important part of innovation in the fashion industry today comes from independent centres and from the co-creation processes that take place here (Mizuno, 2014b; Townsend et. al, 2019), and that the senior market represents an increasingly relevant target in terms both of size and needs, this study aims to contribute to existing innovation management studies by investigating if and how European independent innovation centres are contributing to filling the gap in responding to the needs of the silver market.

Looking at activities carried out in more than 350 independent innovation centres in thirteen European countries, the paper analyses (i) where and how the main innovations in the field of textiles and fashion take place; and (ii) to what extent and how these innovations are also aimed at users over 65.

The paper is structured as follows. The theoretical background of this study is presented in section two, highlighting the research questions that will be addressed in the empirical analysis. The methodology used to conduct the analysis is described in section three, while the results are presented in section four. Finally, the theoretical and managerial implications are discussed in the last paragraph which also looks at the limitations of this study.

2. Theoretical background

The field of fashion is full of creative and innovative trends, involving changes in business models, new communication strategies, emerging patterns of consumption and new production techniques and materials that offer unprecedented opportunities in terms of mass customization (Akram *et al.*, 2022; Braglia *et al.*, 2020; Behr, 2018). These new trends are mainly the result of integration between the fashion system and current technological advances: fashion is a sector that is profoundly transformed from the inside out by technology (Manenti, 2016). Technology and fashion have become an indissoluble couple.

On the one hand, as widely reported in the literature, technology has a high influence on textile production and packaging, communication, and distribution, transforming the entire production and distribution process (Mizuno, 2014a; *et al.*). For example, AI is used today in the collection and analysis of consumer and market data to predict fashion trends (Banica and Hagiu, 2016; Zhu *et al.*, 2018), 3D rendering is becoming a tool used in the presentation and pre-sale of products (Arribas *et al.* 2018), while blockchain technology is used for increasing sustainability in supply chain management (Oguntegbe, *et al.*, 2021).

Technological research is also increasingly focusing on innovative materials and production processes (e.g. sustainable raw materials, zero waste, wearable technology, etc.) to pursue the lower environmental impact of the fashion industry (e.g. upcycling, recycling, "vegan"; CSR and vertical integration, fair trade, local procurement, collaborative consumption,

second hand, etc.), and to improve the wellbeing of customers through so-called "smart clothing" (Bertola and Teunissen, 2018; Akram *et al.*, 2022). Important innovations in fashion have been achieved thanks to 3D printing too (Sun and Zhao, 2017; Vanderploeg *et al.*, 2017).

Research shows that in many cases it is the MSEs that break the rules of the traditional business model that leads to fast-fashion, instead pursuing multi-stakeholder collaborations that enable and promote innovation (Todeschini *et al.*, 2017): the fashion sector is in fact a highly fragmented and globalized one (Choi, 2018), with the 10 largest brands and retailers detaining a global market share of 10% (Statista, 2019), and a myriad of small and medium-sized enterprises involved along the entire chain of value.

Furthermore, in fashion as well as in other sectors, a number of new actors with a strong potential for innovation have emerged: these actors - innovation centres, fablabs and creative spaces - are increasingly taking the lead in open innovation processes and in reshaping the traditional production flow (Buchel *et al.*, 2018; Lushan and Li, 2018; Buchel *et al.* 2022). This is also because of their ability to sustain a much more intimate relationship with demand and to engage future users directly in design and production processes (Mortara and Parisot, 2016; Giusti *et al.*, 2020).

In the European fashion and textile sector, therefore, innovation is increasingly generated not only by the traditional training and production places but also by multiple and different structures that can support the transformations in the sector through the promotion of new entrepreneurial actors and production modes (Lin, 2018; Brydges at al., 2014; Lavanga, 2019; Friel and Borrione, 2020).

The synergies that these actors can activate between new technologies and textiles/clothing design and production offer unprecedented opportunities for increasing the level of product customization, and for responding to trends in consumer roles and expectations (Buchel *et al.*, 2018), also with regard to specific psycho-physical needs.

However, despite the growing attention in academic literature both to the technological innovation processes underway in the fashion industry and to the contribution given by independent innovation centres to these innovative processes, no studies have specifically addressed the issue of fashion innovation for the silver market. This despite the fact that today seniors make up one of the most interesting markets for the new fashion technologies to address, both because of the dimension of this market, and of the kind of needs it expresses and that make it an ideal laboratory for experimenting and co-creating new products (McCann, 2016).

Scholars have analysed the clothing preferences of the elderly (Rocha, Hammond and Hawkins, 2005) and their shopping behaviours (Thomas and Peters, 2009; Yu and Rahman, 2018; Ghal and Lee, 2016). On the supply side, research has focused on fashion brand communication strategies targeted at seniors (Bøilerehauge and Jørgensen, 2019; Farinosi, 2022). However, little attention has been paid in the literature to analysing how innovation paths in the fashion industry can lead to new and suitable products and processes for the elderly, and to collaboration actions with users at the basis of such processes (Townsend *et al.*, 2019).

Moreover, McCann has observed how "the requirements of the so-called new old can be addressed by involving all the stakeholders in a relatively slower and more responsible collaborative process", to "interrupt" business as usual, "perpetuated mainly through feedback from youth-oriented fashion trends" (McCann, 2016, p.235).

In activating this collaborative process, independent innovation centres can play a particularly important role because by vocation they are able to sustain a much more direct relationship with demand, and to activate participatory design and production processes (Ghala and Lee, 2016).

However, how much of the innovation taking place in independent research centres concerns the production of technological innovation for the benefit of the elderly still remains an aspect that is largely neglected by management literature.

This study therefore intends to contribute to the academic debate by analysing (i) how many and which independent innovation centres in Europe are active in the field of fashion; and (ii) to what extent and how these independent innovation centres also take care of the elderly.

Identifying and studying how innovation paths in the fashion sector can lead to new products and processes suitable for the elderly and analysing where these innovation paths take place is in fact of capital importance if we are to support these innovative processes with adequate strategies and policies.

3. Methodology

To try and give an answer to the research questions, the empirical analysis used a mixed method combining a desk analysis of the websites of European independent innovation centres with a qualitative survey with open-ended questions, and in-depth interviews with experts.

A first phase of the research aimed at mapping the main independent innovation centres in Europe that are active in the cultural and creative industries (CCIs), and then at understanding how many of them are dealing with innovation in fashion.

The goal of the second phase of the research was investigating how many of the centres that deal with innovation in the fashion field also operate with specific reference to the needs of the elderly.

A desk analysis was first carried out to map the independent innovation centres in order to build a database of makerspaces and incubators dedicated to technological innovation and digital manufacturing for the cultural and creative sectors, with a particular focus on those active in fashion and textiles.

The starting point for the mapping process was the FabLab Global Network database with the addition then of European makerspaces, including university incubators that had CCIs and fashion as their focus.

The cultural and creative sectors considered for the mapping were the following:

- Cultural Heritage and Entertainment: Museums, Monuments, Archives and Libraries, Contemporary Art and Architecture, Music and Live Entertainment;

- Content Industry: Publishing, TV and Radio, Cinema, Software and Advertising;
- Material Culture: Fashion, Design, Crafts and the Taste industry;
- Cultural tourism.

The data collected covered the following European countries: Austria, Belgium, France, Germany, Ireland, Italy, Poland, Romania, Switzerland, The Netherlands, Portugal, Spain, the United Kingdom. These countries were selected given their high production of textiles and fashion goods according to Eurostat (2018 data).

A desk analysis of the websites of the mapped centres was then carried out to identify and to include in the database the activities implemented by the centres in the previous three years. The activities were categorized by type, number, sector of reference, target, and frequency.

The questions on which the database was built were the following. Questions 13-17 were specifically intended to find out how creative innovation centres address the senior target, an aspect that in general has been a particularly hard to discover.

- Question 1: European country in which the centre is located;
- Question 2 and 3: municipality where the centre is located and postcode of the municipality;
- Question 4 and 5: name of the incubator / centre and website;
- Question 6: network to which the centre belongs;
- Question 7: Does the incubator offer activities or events related to one of the creative and cultural sectors?
- Question 8: Is there any digital manufacturing machinery available?
- Question 9: If production machinery is available, who can use it?
- Question 10: For which creative and cultural sectors has the incubator offered training courses over the last year (January-December 2019)?
- Question 11: If in the months of January-December 2019 the centre offered training courses in the fashion and textile sectors, how many were there?
- Question 12: Does the centre provide support for business development?
- Question 13: What kind of support for business development does the centre offer?
- Question 14: Does the centre host activities for the elderly population?
- Question 15: If the centre hosts activities for the elderly population, which activities are they?
- Question 16: Does the centre promote initiatives for the design and production of products for the elderly?
- Question 17: If the centre promotes the design and production of products for the elderly in the fashion and textile sector, what type are they?
- Question 18: Does the centre promote activities, productions or events that link design with social impact?
- Question 19: What activities, productions or events that link design with social impact are promoted by the centre?

This analysis was conducted in 2020 and was accompanied by a questionnaire sent to the directors of those centres for which information available online was missing, incomplete or outdated. The questions

addressed to directors in the questionnaire were identical to those used for the desk analysis.

As a result, a total of 357 active independent centres - active across different sectors - were mapped. Almost half of the mapped centres are geographically located in large cities, but a fair number of centres were also established and are currently active in smaller towns and villages (Table 1).

After the desk analysis, in-depths interviews were then conducted with 12 fashion experts and managers/entrepreneurs of innovative makerspaces that work on active ageing. The interviews were carried out from October 2020 to February 2021.

Tab. 1: Distribution of mapped centres in relation to city dimension[2], total number of centres per country and % of centres active in fashion and textile fields for each country

Country	Capital	Large	Medium	Small	Village	Total Centres per Country	% Over total
Austria	7	5	2	5	2	21	5.9%
Belgium	7	9	7	2	1	26	7.3%
France	4	16	2	4	11	37	10.4%
Germany	9	36	9	4	2	60	16.8%
Ireland	1	0	1	1	3	6	1.7%
Italy	3	28	12	12	9	64	17.9%
Netherlands	4	13	2	2	3	24	6.7%
Poland	4	5	0	0	0	9	2.5%
Portugal	4	3	1	5	2	15	4.2%
Romania	1	3	0	0	0	4	1.1%
Spain	6	23	0	1	0	30	8.4%
Switzerland	1	4	1	7	5	18	5.0%
United Kingdom	8	29	4	0	2	43	12.0%
TOTAL	59	174	41	43	40	357	100%
%TOTAL	16.5%	48.7%	11.5%	12.0%	11.2%	100%	

Source: our elaboration

4. Findings

4.1 European independent innovation hubs for fashion and textiles

Of the 357 independent innovation hubs, 132 are currently active in the fashion and textile field (around 37% of the total). Table 2 summarizes the number of fashion and textile centres per country and their weight on the total amount of mapped centres in the European area of reference, as well as the percentage of the total centres active in that country.

[2] The distribution among cities and urban centres was assessed considering large cities with a minimum of 100,000 residents; medium cities between 50,000 and 100,000 residents; small cities between 20,000 and 50,000 residents; villages under 20.000 residents.

The countries with the highest number of active centres in fashion and textiles are Germany (55% of the total centres mapped in the country), Italy (nearly 30% of the total centres mapped in the country), France (11%), and the UK (26% of the centres mapped in the country). Romania (75%), Poland (67%), Germany (55%), Switzerland (45%) and Portugal (40%) are the countries with the highest concentration of total centres active in fashion.

Two geographies therefore emerge. On the one hand we can see that the most important producer countries in the sector show higher absolute numbers of independent centres with a specific interest in the fashion and textile sector (and located in most cases in territories historically associated with this kind of production). On the other hand, we see new emerging countries driven by those to which production has been delocalised (Romania and Portugal) and some countries that have no tradition/ weight in terms of production, but which clearly support innovation in a transversal manner (Poland 67%, Switzerland 44%, Belgium 35%, and Austria and Ireland both 33%).

Tab. 2: Active centres in fashion and textiles: distribution of mapped centres in relation to city dimension; percentage of centres active in fashion out of total fashion centres per country; percentage of fashion and textile centres out of total centres

Country	Capital	Large	Medium	Small	Village	Total Centres per Country	% Over total
Austria	3	2	0	0	2	7	33
Belgium	4	3	2	0	0	9	35
France	3	7	1	1	2	14	38
Germany	6	20	3	3	1	33	55
Ireland	0	0	1	0	1	2	33
Italy	1	10	2	4	2	19	30
Netherlands	2	2	1	0	1	6	25
Poland	3	3	0	0	0	6	67
Portugal	1	2	1	1	1	6	40
Romania	0	3	0	0	0	3	75
Spain	2	6	0	0	0	8	27
Switzerland	1	2	1	4	0	8	44
United Kingdom	2	9	0	0	0	11	26
TOTAL	28	69	12	13	10	132	
%TOTAL	21%	52%	9%	10%	8%	100%	

Source: our elaboration

Regarding the location of innovation centres dealing with fashion and textiles, most of centres are in large cities (52%) or capital cities (21%), and almost a third of the centres are located in small or medium-sized towns or villages.

Design (69%) and crafts (64%) are the most frequent sectors of activity of the centre that host fashion and textile facilities, as well as software (64%). This is a good indicator of the level of use of digital tools in

makerspaces and fablabs that are active in fashion and textiles and pursue innovation in this field. Other relevant sectors of activity related to fashion and textiles are contemporary art (25%), and related sectors (architecture and performing arts, both around 13%).

Almost one third of the centres active in fashion and textiles are totally independent, while a strong concentration of hubs belonging to the Fab Lab network emerges (41%, including local Fab Lab networks, such as Fab Lab Lazio in Italy, Swiss Fab Labs, etc.), as well as part of a university department devoted, for example, to design, fashion, or architecture.

With regard to activities offered by these centres, around 82% of those active in fashion and textiles offer training, courses, and workshops in the fashion and textile field (Table 3).

Tab. 3: Counted trainings in fashion and textile per country

Country	Total Counted Trainings in 2019	Ratio Trainings active in fashion/Centres active in fashion	Centres offering Training	% Fashion centres offering trainings
Austria	33	4.7	5	71
Belgium	35	3.9	6	67
France	25	1.8	12	86
Germany	239	7.2	27	82
Ireland	10	5.0	2	100
Italy	60	3.2	16	84
Netherlands	13	2.2	6	100
Poland	23	3.8	6	100
Portugal	5	0.8	5	83
Romania	0	0.0	1	33
Spain	20	2.5	7	88
Switzerland	8	1.0	8	100
United Kingdom	26	2.4	7	64
TOTAL	497		108	82

Source: our elaboration

The mapped makerspaces and fablabs active in the fashion and textile field offer support for business development, especially for mentoring (70%), contacts with potential clients (31.35), and seed funds (9%).

Unlike the case with training activities, the data on business development support show wide differences between countries. Independent innovation centres in Belgium, France, Ireland, the Netherlands and Spain provide it in almost all cases. In other countries, such as Germany and Italy, business support initiatives are present in 27% and 38% of cases respectively, despite having potentially a very developed B2B market in the country that is capable of absorbing the innovations produced (Tab. 4).

Tab. 4: Support for business development per country

Country	No	Yes	Total	% No	% Yes
Austria	10	11	21	48	52
Belgium	1	25	26	4	96
France	3	34	37	8	92
Germany	44	16	60	73	27
Ireland	1	5	6	17	83
Italy	40	24	64	63	37
Netherlands	4	20	24	17	83
Poland	8	1	9	89	11
Portugal	11	4	15	73	27
Romania	2	2	4	50	50
Spain	5	25	30	17	83
Switzerland	12	6	18	67	33
United Kingdom	27	16	43	63	37
TOTAL	168	189	357	47	53

Source: our elaboration

4.2 Innovation practices in European independent centres for supporting active ageing and silver fashion

Coming to the propensity for independent innovation centres to consider the population over 65 as one of the target markets of their innovation processes, this was assessed both on the basis of the habit for co-creation - one of the ways in which design is used to define needs, and the expectations of specific targets - and, more directly, by identifying if and how the centres promote initiatives for the design and production of products for the elderly.

The centres active in the fashion and textile fields are usually involved in multiple parallel and complementary activities aimed at social inclusion, linking design with social impact. The hosted activities are in the fields of healthcare and disabilities (37%), the environment, sustainable and eco production (34%), community and social resilience (22%), and young communities and children.

As shown in Table 5, there is a relatively low involvement (6%) in active ageing and in considering the over-65 population as a target.

In the whole database, only 12 activities have been detected aimed at seniors, 4 of them in the centres active in fashion and textiles; while 8 centres develop products for elderlies, and only 2 of them include textiles and fashion products.

Tab. 5: Active ageing and over-65 population as a target, activities offered

Focus Elderlies	Activities	Products	Including textile products
All Centres	12	8	2
Centres active in fashion and textile	4	6	2

Source: our elaboration

Among the most significant experiences - also because of the co-creation process implemented - is the one developed in Slovenia by RogLab, a production space focused on the creative use of 3D technologies.

In 2019, RogLab decided to launch a survey among the elderly of the city of Ljubljana to assess their interests and needs for the development of innovative solutions for active ageing.

The positive feedback collected led the makerspace to launch an international call for designers - "RogLab Open: Active Aging" - with the aim of developing socially conscious solutions to enable over-70s to lead active and independent lives in their homes or in public spaces, be they indoors or outdoors.

The call was promoted with the support of 35 FabLabs and workshops from 27 countries. Out of the thirty project ideas developed by the selected designers, four were selected for prototyping, one of which applies technical innovations for fashion and clothing for active ageing.

The garments designed - for men and women - were classically tailored clothes with adaptations for non-standardised body shapes and for easier use by the elderly thanks to the application of magnetic zippers and buttons.

The elderly participants in "RogLab Open: Active Aging" commented that the most satisfactory factor was feeling dignified in their clothes, without having to choose comfort over beauty.

All the creations prototyped within the project were exhibited at the MAO Museum of Architecture and Design in Ljubljana and made available by the designers with a Creative Commons 4.0 license for digital fabrication.

5. Discussion and conclusions

The evidence that emerges from the analysis relates both to the role that independent centres in Europe play today in the innovation of the cultural and creative sectors - and of fashion in particular - and to their potential for effecting a change of perspective towards an overlooked market: the over-65s. In general, one first element that emerges concerns the geographical distribution of the centres and their activities: the countries that stand out for their ability to promote independent innovation are not always the leading countries in the production of fashion and textile products. The countries with the highest absolute number of centres that are active in fashion and textiles are in fact Germany (55% of the total centres mapped in the country), Italy (nearly 30% of the total centres mapped in the country), France (11%), and the UK (26% of the centres mapped in the country); while Romania (75%), Poland (67%), Germany (55%), Switzerland (45%) and Portugal (40%) are the countries with the highest concentration of centres that are active in fashion compared with the total number of centres.

Two geographical pictures therefore appear: that of the most important fashion producer countries - such as Italy or France - that reveal higher absolute numbers of independent centres with a specific interest in the fashion and textile sector; and that of countries that do not have a specific tradition in the fashion industry but which clearly support innovation with respect to all the creative production sectors in a transversal manner.

A second element shows that while the number and variety of the projects in European independent innovation centres proves to be significant for innovation in the fashion industry, the over-65 target is rarely identified as one of specific interest despite the large proportion of the European population in this age group and its significant purchasing power.

Considering that the European population is ageing in ways that increasingly allow people to extend their healthy, youthful lifestyles for much longer, and that many of the "new" elderlies or "perennials" want to stay active, are aware of what is happening in the world, and desire to keep abreast with technology, this target should not be overlooked.

As discussed in the previous sections of this paper, the development of assistive technologies for self-care and self-healthcare and the adoption of garments and accessories that allow active security functions such as monitoring vital signs or physical activities will be progressively more strategic for the growth of the fashion industry, as also confirmed also by the experts interviewed. Ergonomic textiles, materials with drug-releasing properties or ones that are able to mitigate the effects of a fall, and antibacterial or antimicrobial textiles were cited by experts as promising fields for research and product development. Moreover, while responding to health and wellbeing needs, the fashion industry also needs to ensure that its products continue to be aesthetically attractive in order to gain relevance. Nonetheless, very few independent centres organise activities specifically targeting the application and experimentation of technological innovation for the benefit of the elderly and for active ageing, and older people have hardly been identified by our research among the users or guests of fablabs or digital fabrication spaces.

This seems to be connected in particular to the location of these spaces and to the approach they adopt. As regards the former, the figures reveal that a considerable number of maker spaces and fablabs are in post-industrial areas of cities, while their establishment has often been associated with major urban regeneration programmes. Such areas are frequently non-residential and therefore less attractive to older people and harder for them to reach. Greater involvement of the elderly could therefore be achieved through a greater presence of independent centres in residential districts or through offsite activities in collaboration with commercial and cultural spaces visited by over 65s.

Moreover, according to the experts interviewed, another reason why the role of the elderly often remains marginal to co-designing innovation processes is also because of a diffuse absence of a common language and understanding when it comes to the nature and potential application of technologies. As regards the latter, the issues of the digital literacy of older people and of technological and scientific dissemination (Francis *et al.*, 2019) are fundamental. From this perspective, if we want to include seniors in participatory innovation processes, it is also essential for independent innovation centres in fashion to be able to support digital literacy activities and develop targeted communication strategies towards this audience in order to promote a better knowledge of technological innovation in the fashion industry.

In other words, in order to bring about innovation, designers and makers need to find the way to actively involve ageing people in the design processes, with the development of suitable, ad hoc participative methodologies for the conception, prototyping and trial of products (Schmidt-Ruhland and Knigge, 2008).

Finally, an interesting idea that emerges from the analysis - also confirmed by the panel of experts interviewed - regards the opportunities for innovation centres to effect the transfer to the niche silver market of relevant innovations (e.g. new materials, ergonomic models, etc) that have been developed both in segments of the fashion industry where more investments are currently made - the sportswear sector for instance (Piccinini *et al.,* 2020)- and by lead users of other target markets (Helminen, 2008); this requires the implementation of new business support activities for fashion companies and fashion designers.

If these results therefore provide some interesting strategic indications, a number of aspects should be detailed for a better understanding of how to incentivize knowledge and technological transfer both between sectors and between actors operating in the same sector.

This first explorative study has two main limitations. On the one hand it only investigates independent innovation centres. Future research developments could usefully examine and integrate the perspective of large companies to understand if and how they are responding to the growing demand for fashion from the elderly. Such an investigation should be carried out not only for textile and fashion manufacturers, but also for companies that operate in market segments whose products have technical features that could be transferred more easily to a market segment that demands products that could meet health needs and not just aesthetic ones.

The research should also be enriched by exploring the policies in favour of the fashion industry that could incentivize research and development targeted at finding new solutions for the over-65 market. There are specific policies both at the European and at the national level in other sectors, such as health, housing and transport (European Commission 2015), that have established the appropriate framework and incentives for responding to this demand.

Active and healthy aging is in fact a challenge that is shared by all European countries and provides a huge opportunity for Europe to establish itself as a global leader, one that is also able to provide innovative solutions by redefining the potential role of those industries, such as fashion, that might seem irrelevant with regard to the question. It can also act as an aggregator by bringing together all the innovative actors who are already committed to similar challenges in sectors other than fashion.

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sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s119.2022.05
pp. 105-121

Silver entrepreneurship: a new trend in startups

Received
20th July 2022

Revised
10th October 2022

Accepted
23rd November 2022

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Abstract

Purpose of the paper: *This study is framed in the debate on entrepreneurial education and entrepreneurial behaviour. It aims to investigate the motivations behind the choice of people over the age of 50 to become entrepreneurs through the founding of startups and the background of so-called silver entrepreneurs.*

Methodology*: The study adopts a qualitative approach. A matrix is built according to two key topics from the literature review and used to report case studies to describe the dynamics of silver entrepreneurs and so clarify the reasons behind their rather unique choice. The case studies are classified according to the technical skills and entrepreneurial experiences of 29 founders of startups.*

Findings*: The results attempt to highlight the ways in which mature entrepreneurs seek the benefits of starting new careers through their startups. The results also show the interplay between the entrepreneurial and technical skills that the silver entrepreneurs possess. The proposed scatter plot depicts the predominance of three combinations of technical skills and entrepreneurial competences.*

Research limits: *The study will require further information on the resources and skills available to, and needed by, entrepreneurs over 50 who are forming new startups.*

Practical implications*: This research deepens the understanding of the potential local economic impact of entrepreneurs over 50 who have founded startups. We also identify that entrepreneurial training programmes enable the proliferation of new business ventures in the startup ecosystem. While this might be self-evident, it is found that such initiatives are most relevant for silver entrepreneurs with backgrounds other than being businesspeople, managers, or business owners.*

Originality of the paper: *Through this study, the authors propose a new combination of interrelated variables such as skills, business background, and motivations to start new businesses for people over the age of 50, shaping the dynamics of silver startups and startuppers; this also supports a conceptual clarification in an intricate scholarly debate.*

Key words: silver entrepreneurship; startup; entrepreneurial education; entrepreneurial behaviour

1. Introduction

"Silver economy" is more than just a buzzword; it has led to the provision of new services, attracted investment from businesses and governments, and provoked interest among academic scholars. The silver economy shapes a valuable market for the needs and demands of

the elderly, recently calculated to account for approximately one-third of the world GDP (European Commission, 2018), and is progressing as an important component of the entrepreneurial fabric of European countries (European Commission, 2018; Westberk and Reid, 2020). The silver economy phenomenon has assumed even wider dimensions (Thompson and Thompson, 2009) with consequences for the job market (Eager *et al.*, 2022). Today, it refers to a group of latent businesspeople with unleashed potential. Thus, business dynamics are related not only to businesses (and related services) created "for people with white hair", but also to businesses founded and owned "by people with white hair".

Indeed, on an international scale, evidence shows that successful new ventures have been created by adult entrepreneurs in the past-mostly referring to entrepreneurs over 50-, even before the silver economy became such a noticeable phenomenon. The United States has seen many exemplary cases of this kind of entrepreneurship. Indeed, in 1954, at the age of 52, Ray Kroc launched McDonald's. At that time, Kroc was a salesman and often ate at the restaurant owned by brothers Dick and Mac McDonald in San Bernardino, California. The American pharmacist John Stith Pemberton, at the age of 56, formulated the recipe for Coca-Cola and shortly thereafter founded the Coca-Cola Company in 1892. In 1911, when he was 61, Charles Ranlett Flint founded the Computing-Tabulating-Recording Company, which later became IBM. Therefore, it is never too late to found a new company. Silver businesspeople provide relevant evidence of that. They might pursue such an endeavour due to early retirement, a willingness to continue working, or because it is stimulating.

When dealing with startups, one might automatically think of creative and energetic young people at the beginning of their professional careers. Actually, the reality is different. More and more mature workers are finding the benefits of starting new careers as entrepreneurs. Available data show that this is the predominant scenario; worldwide, so-called "silver people" are very active as businesspeople with newly founded startups (Forbes, 2020). In Italy, too, the trend is quite similar, as seen in the ISTAT (Italian Institute for Statistics) Italia Startup 2018 Report, which helped to profile the "made in Italy startupper". In Italy, 15% of startuppers are under 30, while two out of three startuppers (66%) are aged between 30 and 49, and almost 20% of "new generation entrepreneurs" are over 50 (ISTAT, 2018). Founders' age is similarly high for those startups that successfully exit through an IPO (initial public offering) or acquisition. In other words, when one looks at the most successful firms, the average founder age "goes up, not down" (Azulay *et al.*, 2018, p. 1). Policymakers are aware of the ageing population scenario, especially in Europe; thus, they are encouraging the development of the silver economy to fill gaps from a technological point of view (Oget, 2021). Drawing on this significant scenario, scholars have shaped a debate in management studies that focuses on this countertrend, although the complexity of this phenomenon has not yet been exhaustively researched. Indeed, both the newness of the phenomenon and the relative paucity of empirical evidence have encouraged further research due to a multitude of variables and their moderating effect on silver startuppers (Walmsley and Nabi, 2020), with special reference to personal traits

affecting the intention to create a new venture (Fernández-López *et al.*, 2022), as well as the interactions with the local context (Canestrino *et al.*, 2018).

This paper adopts the following structure: A review of the literature, which led to the categorization of studies into three commonly mentioned dimensions in silver entrepreneurship research (Weber and Schaper, 2004; Cahill *et al.*, 2013; Martin and Omrami, 2019). There is subsequently a gap analysis regarding the lack of studies that have focused on the phenomenon of people over 50s who challenge themselves by creating new innovative businesses and, therefore, startup companies, followed by a methodology that presents the analysis of representative case studies through which we obtain findings capable of providing both theoretical and managerial implications.

2. Literature review

Increased length and quality of life have enhanced the potential for older people to become entrepreneurs. This provides the opportunity to consider demographic changes in terms of a counter-ageing society. This potential has been discussed in several recent studies (e.g., Leporati *et al.*, 2021; Maritz *et al.*, 2021) and has led supranational - as well as national - institutions to fund new initiatives led by people aged 50+ (Zhu *et al.*, 2022) or provide suitable solutions to fill the gaps related to knowledge, competence, and other resources required when one is starting a new venture (e.g., AGE Platform Europe, 2021).

Many studies have focused on innovative solutions to the manufacturing, distribution, and consumption of goods and services aimed at utilizing the purchasing potential of older people (Djellal and Gallouj, 2006; Mostaghel, 2016; Yang *et al.*, 2016). Studies have investigated organizations that provide services "for" the silver economy, but there is not enough literature about startups founded "by" the silver economy owing to the newness of the topic. This phenomenon has caught the attention of policymakers and economic operators alike: the ageing population promises more economic growth and jobs (European Commission, 2021). On average, successful entrepreneurs are middle-aged (Azoulay *et al.*, 2018); when one looks at the fastest growing startups in the economy, the median age of the founder at the time of founding has risen to 45. The correlation between age and successful exit is positive and linear, i.e., the probability of having a successful exit increases as the age of the founder increases up to at least 60 (Azoulay *et al.*, 2018). The willingness to become an entrepreneur at a later age might also depend on not feeling ready for retirement, thus stimulating people to use their experience and knowledge to develop a business opportunity (Green and Binsardi, 2015). Indeed, it is statistically verified that the business of a 50-year-old founder has twice the chance of being acquired or achieving a winning IPO compared to one with a founder aged 30. The chances of founding a company that is among those that will grow more than the other 99.9% are also double (Cullen and Perez-Truglia, 2019). Through this contribution, the authors would like to strengthen and

characterize the reference framework of senior entrepreneurship (Isele *et al.*, 2014; Matos *et al.*, 2018; Soto *et al.*, 2021), sometimes also referred to as silver entrepreneurship (Cannon, 2008; Nasurdin, 2012; Conway *et al.*, 2022), as well as offer insights from empirical observations.

The existing literature defines "senior entrepreneurs" as people over the age of 50 who start a business (Curran and Blackburn, 2001; Hart *et al.*, 2004; Kautonen *et al.*, 2013). However, the term "silver entrepreneur", which refers to the same concept, began to spread later, together with the term "silver economy" (Merkel, 2016; Zsarnoczky, 2016).

Scholars have used use various terms to refer to entrepreneurs at a later stage of life. An initial attempt to categorize these entrepreneurs was performed by Seymour (2002), but over time new definitions arose, leading to the following alternatives: senior entrepreneurs, silver entrepreneurs, grey entrepreneurs, seniorpreneurs, later-life or older or elderly entrepreneurs, mature or mature-age or third-age entrepreneurs, and second career entrepreneurs. Regardless of the terms used, the perspective is similar. It is useful to recall some of the definitions to highlight the key issues shaping this debate.

Table 1 reports some of the studies that discussed the various definitions and key issues scholars focused on in describing this category of entrepreneurs. The definition of "senior entrepreneur" used by Rossi (2009) was chosen to define the growing phenomenon of entrepreneurship among people aged 55+. Cannon (2008) highlighted how one could speak of the "silver entrepreneur" as someone extremely successful, reporting various cases. Watkins-Mathys (2012) referred to the term "grey entrepreneurship" as underlining the socio-economic aspect of the European working environment, where retirement age is increasing and life expectancy is lengthening. Neutschel *et al.* (2012) underlined how young entrepreneurs can profit in terms of knowledge of the market and networks from the skills of what they define as "seniorpreneurs". The terms "later-life or older entrepreneurs" are used in study contexts related to the social sciences. In the managerial field, the terms were used by Kerr (2017) to emphasize the motivations of these entrepreneurs, such as seeking not a successful career, but, rather, personal satisfaction and work-life balance. The term "third-age entrepreneurs" was used by Lewis (2013) to highlight how these entrepreneurs relied heavily on trusting relationships built over time. The term "second career entrepreneurs" instead highlights the experiential aspect of the entrepreneur, as well as the reasons for changing one's life (Kemelgor *et al.*, 2011).

Tab. 1: Overview of the definitions of adult entrepreneurs

Definition	Source	Definition	Key issues
Senior entrepreneur	Martin and Omrani, 2019, p. 259	"Personal skills, acquaintances' entrepreneurial experiences, media relaying information about successful new businesses, and the senior employment rate are important factors of seniors' starting new businesses"	Skills, experience
Senior entrepreneur	Linardi and Costa, 2021, p. 6	"A commonly observed resource in the senior entrepreneur is the theoretical and practical experience accumulated throughout life. However, this experience is sometimes made up of technical knowledge"	Experience, technical knowledge
Silver entrepreneur	Cannon, 2008, p. 32	"Silver entrepreneurs have wider ranges of experience than all entrepreneurs and greater access to resources and networks - as might be expected. More surprisingly, they tend to be better qualified, especially in sciences, technologies and commerce"	Experience, qualification in a field of study/work
Silver entrepreneur	Ahmad et al., 2014, p. 307	"For silver entrepreneurs, it is expected that there would be other intriguing factors that drive them to pursue entrepreneurship [...] some encouraging factors are related to entrepreneurial capital which include possessing vast experience due to former employment, knowledge, and strong financial position"	Entrepreneurial capital, knowledge, finance
Grey entrepreneur	Weber and Schaper, 2004, p. 155	"One resource that most grey entrepreneurs would appear to possess in greater quantities than their younger counterparts is experience - the cumulative body of knowledge, skill, practice and learning [...] One factor portrayed as having an impact on entrepreneurial success is technical knowledge about a particular product or service"	Experience, knowledge, skills, technical knowledge
Grey entrepreneur	Matricano, 2018, p. 82	"This means that intellectual agility, knowledge and personal capabilities - which are expected to be more developed in grey entrepreneurs - have a significant effect on entrepreneurial intentions"	Knowledge, capabilities
Seniorpreneur	Maâlaoui et al., 2013, p. 161	"Through their competencies, experiences, know-how and networks, seniors may be able to demonstrate a true understanding of entrepreneurial activities"	Competencies, experience, know-how
Seniorpreneur	Maritz, 2019, p. 352	"There is a growing population of healthy older people with skills, financial resources and time available to contribute to economic activity through extending their working lives [...] There is also the opportunity to enhance entrepreneurial activity in older people who do not necessarily hold entrepreneurial skills and attitudes"	Skills, attitudes
Later-life or Older entrepreneur	Kautonen, 2008, pp. 4-5	"Prior studies have suggested that older entrepreneurs are more capable of starting and running a business than their younger counterparts due to the financial, human and social capital accumulated over a lifetime career [...] Another characteristic considered in this study relates to the previous entrepreneurial experiences of older (potential) entrepreneurs"	Finance, human and social capital, experience
Later-life or Older entrepreneur	Kautonen et al., 2008, p. 87	"Older entrepreneurs are likely to have accumulated a good deal of such social capital during their career employment, which can in turn be employed in their own business. The technical and managerial skills as well as industry knowledge gathered during career employment can assist older entrepreneurs in establishing a new venture successfully"	Social capital, technical skills, managerial skills
Mature or Mature-age or Third-age entrepreneur	Clarke and Holt, 2018, p. 77	"The entrepreneurs' goals were infused with the motivation to avoid 'cowardice and laziness' and 'keep going and show no fear,' to embrace uncertainty and expand the landscapes of possibility; [...] or the motivation to move forward and a determination not to return to an unenlightened condition despite the personal and financial risks"	Motivation, possibility, financial risk
Mature or Mature-age or Third-age entrepreneur	Viljamaa et al., 2021, p. 20	"When the stability of the financial situation is controlled for, attitudes to entrepreneurship and self-realization as a motive explain well-being among [the] third-age group"	Finance, self-realization, attitudes
Second-career entrepreneur	Minarcine and Shaw, 2016, p. C1	"The term 'second career' entrepreneur refers to individuals who were previously employed and who chose to leave their jobs and pursue a dream.[...] These are individuals who did not intend to start a business, but found their products or services were in sufficient demand"	Dream, demand
Second-career entrepreneur	Lawal and Adeniran, 2022, p. 5	"Second career entrepreneurship which included individual activities by those individuals after they served their working life. The motive for their participation is mostly to debate the needed inadequacies recorded in the individual's level of income after retirement or just as [a] hobby for the silver entrepreneurs to reduce idle time"	Income, time

Source: Authors' elaboration

With reference to the focus of this research and the authors' attempt to broaden the theoretical reference framework of senior entrepreneurship, we separate the literature review into three main strands, which summarize and synthesize the key issues expressed by the authors mentioned previously: (a) the first concerns studies that deal with entrepreneurial education, i.e., those considering entrepreneurial skills that can be acquired through training and support for entrepreneurship (Cannon, 2008; Ahmad *et al.*, 2014; Matricano, 2018); (b) the second focuses on the technical and managerial skills of entrepreneurs who, in some cases, also perform operational/managerial tasks (Kautonen *et al.*, 2008; Maritz, 2019; Linardi and Costa, 2021); and, finally, (c) the third group of studies deals with the motivations behind the choices of senior entrepreneurs (Minarcine and Shaw, 2016; Clarke and Holt, 2018; Viljamaa *et al.*, 2021).

Education is a fundamental characteristic of entrepreneurial development (Honig and Martin, 2014). In a context where it is necessary to interface with a more dynamic and complex market, entrepreneurship education has become an extremely interesting subject of study as a fundamental element of doing modern business (Vanevenhoven, 2013). Education often makes the difference because it is linked to access to resources and networks (Cannon, 2008). Some studies show that it not only concerns the creation of a business, but also affects managerial skills (Albornoz Pardo, 2013). In the context of the silver economy, it has been emphasized that the absence of education is considered one of the primary impediments to entrepreneurial development, much more so than age (Csoba and Ladancsik, 2022). As with the traditional view on entrepreneurs (Matricano, 2018), equally relevant for entrepreneurs of the silver economy are competences, such as technological knowledge, often accumulated throughout a lifetime (Linardi and Costa, 2021), entrepreneurial know-how (Albornoz Pardo, 2013), personal skills, experience, and the social and human capital they bring to their business, all of which represent strengths of seniors when starting a new business (Martin and Omrani, 2019) and demonstrate a true understanding of business activities (Maâlaoui *et al.*, 2013). Furthermore, given that the elderly represent a rapidly growing population with a wealth of important experiences (Maritz, 2019), they provide an important boost to the economy in general (Grosu and Drăgușin, 2020). Finally, motivation is a characteristic aspect of the birth of a company started by a silver entrepreneur and differentiates it from a company started by a younger person (Perez-Encinas *et al.*, 2021). The reasons behind the choice of the senior entrepreneur are often also related to their skills (Ahmad *et al.*, 2014). While some studies have found the motivations of senior entrepreneurs to be relevant in choosing entrepreneurial paths in silver economy (Csoba and Ladancsik, 2022), other studies have analysed what is behind the choice to leave an entrepreneurial reality and start a second career by deciding to become a silver entrepreneur (Minarcine and Shaw, 2016). Motivational drivers are fundamental, with high ambition and openness to technological developments being among the most important (Harms *et al.*, 2014). Strong motivations can make entrepreneurs overcome fears, laziness, and even economic risks (Clarke and Holt, 2018). However, control of the financial situation of the firm also

seems to be an important factor in the entrepreneurial and self-realization attitude (Viljamaa, 2021). Silver entrepreneurship shares some previously analysed traits of classic entrepreneurship, and additionally includes the relevant experience of the founders (from 50 years old), and the knowledge and techniques acquired over the years. To sum up, there is still a paucity of studies in this domain and it seems that scholars have paid more attention to defining the phenomenon in a general fashion than to highlighting the features shaping the entrepreneurial behaviour of startuppers aged over 50.

2.1 Silver entrepreneurship education

With reference to the core issue of this study, the theoretical contributions that have examined the reasons behind the choices of senior entrepreneurs should be partnered with studies that have addressed the issue of entrepreneurship learning, especially of people over 50. The question of whether entrepreneurs are made or born has long been debated (Notarstefano, 2013). According to some scholars, the gift of entrepreneurship is written in one's DNA (Nicolaou *et al.*, 2016). So, the tendency to identify new business opportunities is in the genes and "the tendency to have personality traits such as extroversion, openness, etc., has a genetic component. This suggests that your genes could affect your tendency to be an entrepreneur by influencing the type of personality you develop" (Shane, 2010). According to Baird (2015), it could be a combination of genes that makes a person a leader or risk taker or that gives them other entrepreneurial traits inherited from parents.

According to other studies, entrepreneurship is an approach to work that can be learned over time (Shekhar *et al.*, 2018) and that should be taught in schools at any age, even in advanced stages of life (Franks and Johns, 2015). Additionally, other scholars think that the skills of a true CEO and founder are innate (Ossola, 2014), while others believe that with the right training they can be acquired, though not necessarily in earlier stages of life (Ferrante & Supino, 2014; Greco and Tregua, 2022). Robust empirical evidence suggests that entrepreneurial education is an important determinant of performance throughout the entrepreneurial career for both young and old (Bates, 1990; De Bruin, 2011; Thomassen *et al.*, 2019). Furthermore, according to some studies, the poor economic performance of the Italian economy over the last 15 years or so may be partly the consequence of poor entrepreneurial education (Ferrante, 2005).

Entrepreneurial initiatives and programmes run by universities in the United States were born through a "bottom-up" process involving individual, both young and old, and collective initiatives, in contrast to what has happened in Europe, where entrepreneurship in higher education is a more recent phenomenon that has taken hold through "top-down" processes (Etzkowitz, 2014).

As can be seen from the contributions discussed above, there have been many studies on senior entrepreneurship and, therefore, on the choices of senior entrepreneurs who decide to become entrepreneurs at a later age. There are also many studies on entrepreneurship education, but these are not exhaustive regarding individuals who choose to become entrepreneurs

after turning 50, and nor do they shed light on the reasons that push them to launch a new innovative startup. Therefore, there are still open questions about how to develop specific programmes to stimulate people aged over 50 to acquire the entrepreneurial skills and knowledge needed to start a new venture, and that complement those personal features that, according to some scholars, depend on genetics.

2.2 Know-how and technical competence of silver entrepreneurs

Prior studies have suggested that older entrepreneurs are more capable of starting and running a business than their younger competitors due to the financial, human, and social capital accumulated over a lifetime (Singh and DeNoble, 2003; Weber and Schaper, 2004).

The studies that we have systematized in this second grouping contemplate entrepreneurs having sufficient competences and managerial skills for developing their services and products (Aisha *et al.*, 2016). When talking about competence and "technical skills", scholars usually refer to those skills that go beyond entrepreneurial attitudes and concern specialized skills suitable for a certain job. Owing to the variety of terms used to refer to this topic, in this study we use the term "entrepreneurial competence" to differentiate it from "entrepreneur capabilities"; that is to say, an "entrepreneur's energy, creativity, and motivation that trigger the production of superior product & services" (Kaur and Bains, 2013, p. 31). This study, in classifying the different types of entrepreneurial skills, refers mostly to "technical capabilities", a concept frequently mentioned in the literature as "entrepreneur competences"; thus, this is the main reference for this study. In addition, Kaur and Bains (2013) referred to "technical competence" and included the ability to use and adopt technical skills including techniques and tools that are relevant to a company, as well as machines or search procedures, such as the mastery of tasks or work content.

One should also highlight those studies dealing with the topic of professionals over 50 who, after long careers and the acquisition of many skills and capabilities, decide to found their own businesses, exploiting their wealth of experience (Cannon, 2008). According to Cahill *et al.* (2013), many seniors embark on new entrepreneurial adventures by combining their earnings, retirement benefits, and acquired work experience, thereby creating a suitable mix of resources to start a business.

Other studies have dealt with and investigated startups with high technological content thanks to the soft skills of their founders, who in these cases have been defined several times in management literature as "technopreneurs" (Wardhana, 2013; Paramasivan and Selladurai, 2016; Permana *et al.*, 2020). According to Seli *et al.* (2021), a technopreneur (which comes from the words technology and entrepreneur) is a businessperson who uses technology as their business model. One of the professions that is expected to continue to exist and develop is technopreneurship, which is supported primarily by the increasing number of forms of technology-based entrepreneurship (Seli *et al.*, 2021).

Within this dimension, reference to the theories of the entrepreneur/manager is also essential because some literature indicates a trend in Italy that sees individuals who have had careers as managers for many years turning towards entrepreneurial careers after the age of 50 (Goeta and Ferrè, 2017). Many startups have the entrepreneur at the head of the work organization chart; this person is often the founder and general manager (Colombo *et al.*, 2011; Estay *et al.*, 2013; Bolton and Thomson, 2015). Startup founders who are over 50 years old and who have been managers for many years would be quite inclined to start again and implement digital tools (Goeta and Ferrè, 2017). To sum up, recent studies have highlighted the role of previous technical knowledge in the launch of new business initiatives, but this cannot be considered in isolation; otherwise, silver entrepreneurship would not have become the phenomenon it is.

2.3 Silver entrepreneurship and motivation

A step forward was made with studies of silver entrepreneurship observing that silver entrepreneurs are people over 50 who utilize their experiences to create businesses later in life (Cannon, 2008; Aversa and Ladevaia, 2019; Perić *et al.*, 2020).

According to the European Commission (2006), "Entrepreneurship education seeks to provide students with the knowledge, skills, and motivation to encourage entrepreneurial success in a variety of settings".

Cannon (2008) discussed the challenges senior entrepreneurs face and what governments and organizations might do to lower the barriers for them. Matos *et al.* (2018) carried out a study to analyse what determines the performance of senior entrepreneurs. Motivation refers to the social value placed on entrepreneurship and its desirability and feasibility as a career and employment option (Kautonen, 2013).

Martin and Omrami (2019) offered a narrower focus on what triggers people over 50 to become entrepreneurs, as they aimed to understand the factors encouraging seniors to start new businesses in Europe. There are two categories of factors addressed in the decision-making process leading to the creation of a new venture, namely (a) factors linked to seniors' environment, such as internet and information and communication technologies (ICT) diffusion, the level of status and respect of successful entrepreneurs, and relaying information about successful new businesses in the media; and (b) individual factors such as gender, education, job position, income, and skills (Martin and Omrami, 2019). The categorization of the factors is one of the most recent advances in this literature stream and it advances previous contributions with a view limited to personal features. Indeed, the research results of Amoros and Bosma (2013) highlighted different categories of senior entrepreneurs according to the different motivations that push them to become entrepreneurs at a later age. The first group is composed of those entrepreneurs motivated by necessity, i.e., they must solve a personal matter; the second group shows a stronger motivation, namely, "those people who could obtain employment but choose instead to be entrepreneurs" (Amoros and Bosma, 2013, p. 35). Kautonen (2008) had previously tried to understand the motivations and behaviours of

older entrepreneurs, comparing entrepreneurs of different age in Finland. According to the author, "pull" motivations (inputs coming from the external environment) that lead to entrepreneurship in old age were, in this context, clearly prevalent over "push" motivations (inputs that arise "inside", i.e., from the will of individuals). Kautonen's study, in addition to highlighting that "getting back into the game" is one of the main reasons for individuals over 50 to decide to start a business, revealed that third-age novice entrepreneurs more often start a one-person business.

According to Isele and Rogoff (2014), it is now well known that senior entrepreneurs, with their robust work, life, and networking experiences, as well as their enthusiasm for staying productive, are a huge untapped resource. Indeed, it is time to stop thinking of age as a liability and instead recognize it as an assets, and work across industries to help break down barriers to unleash the potential (Isele and Rogoff, 2014). Similarly, Brooks *et al.* (2019) recently stated that workers' attitudes emerge differently according to the stage of life: while at a young age some qualities, such as reactivity, are predominant in the so-called "fluid intelligence", aptitudes for research and the transmission of knowledge mature at an advancing age and materialize as "crystallized intelligence". The different characteristics of entrepreneurs (Bonnstetter, 2012) of different age groups reveal a greater predisposition for different roles, especially regarding the transmission of knowledge and synthesis of skills at more advanced ages (Brooks *et al.*, 2019). All in all, motivations are driven not just by personal features but also by contextual features; thus, a combination of the so-called push and pull factors emerges and scholars have called for advances about how personal traits and conditions impact the intention to start a new venture (Fernández-López *et al.*, 2022).

3. Research gap and questions

Despite the flourishing literature on the topic, the debate on silver entrepreneurs appears fragmented, with different perspectives stressing either personal or contextual features, while failing to consider the details of such a major decision as starting a new venture at a later stage of life. Owing to the newness of the phenomenon and the paucity of mature evidence on startups from silver entrepreneurs, the combination of variables (Walmsley and Nabi, 2020) and the role of personal traits-including background (Fernández-López *et al.*, 2022)- new research efforts are needed. The questions still unanswered are also related to the interplay among the key features that emerged from the scholarly debate, namely, education, competence, and motivation, as it is evident that there cannot be just one single feature affecting the willingness of people over age 50 to become startuppers.

Despite the numerous activities and programmes (such as acceleration programmes, calls and challenges, competitions, and similar programmes for entrepreneurs over 50) recently launched to support the entrepreneurship of people over 50, and in line with the growing interest in the silver economy, the literature review in the field of entrepreneurship

education has not led to specific contributions referring to entrepreneurial training aimed at senior entrepreneurs. Such a focus is needed to properly understand educational programmes and their intended purpose. Indeed, scholars have highlighted the need for entrepreneurship education at a later age (e.g., Fernández-López *et al.*, 2022), but have also stressed the relevance of shaping educational programmes according to the features of an entrepreneur, including background, working experience, and personal interests. Moreover, educational programmes run at an international level are leading to new opportunities for silver entrepreneurs-to-be, but may benefit from a further adaptation of the content in line with the requirements of the intended recipients of such initiatives. Indeed, supranational institutions, including the European Union, are trying to customize educational programmes according to features such as age and education, but such a customization is still in its infancy, as witnessed by very recent calls for participation (e.g., OECD, 2021)

Therefore, there is a significant gap in the understanding of silver startuppers, especially if one considers one of the most cited definitions of a startup, i.e., as a temporary organization used to search for a repeatable and scalable business model (Blank, 2016 MANCA IN BIBLIOGRAFIA); indeed, the definition is very emblematic and immediately highlights the fact that startups have a series of nonlinear and very complex dynamics for their growth that require institutional support regardless of the age and background skills of their founders. There are no exhaustive contributions in scholarly literature that identify the attributes and determinant variables of startup founders over 50. This study hypothesizes that work experience as both an employer and an employee is an important aspect of senior entrepreneurship. This study aims to answer the following research questions:

- What are the dynamics of investments in startups founded by businesspeople over 50? Do experience and skills affect the decision to found a startup?
- What are the motivations behind the choices of people over 50 to create an innovative startup?

4. Methodology

The study adopts a qualitative approach to research processes occurring deeper in organizations (Dustin *et al.*, 2010) and in the personal sphere of entrepreneurs starting new ventures. The qualitative methodology is commonly associated with the use of case studies (Yin, 2012), and using multiple case studies offers more support for the findings. Additionally, this is in line with some relevant studies in entrepreneurship with a focus on the personal features of entrepreneurs, such as reactivity to market opportunities (Franco *et al.*, 2014), entrepreneurship education (Albornoz Pardo, 2013), and intentions and motivations (Salamzadeh and Kesim, 2017).

According to the goal of ensuring more support for the findings through the selection of multiple case studies, we have chosen to analyse

a series of startups created by founders over 50, with differing features in terms of year of foundation, industry, and operation, i.e., both B2B and B2C. Details of these features are reported in Table 2, which shows a range of years of foundation from 2005 to 2021, and a variety of industries, including healthcare, energy, ICT solutions, and retail.

Based on the similarities that emerged from the literature review, in this study, we used the terms senior entrepreneur, older entrepreneur, and silver entrepreneur interchangeably to refer to individuals aged 50+ who are planning to found a new business, are currently in the process of starting one, or have set up a startup. Furthermore, concerning the age of founders, some scholars theorized "grey entrepreneurship" (Harms *et al.*, 2014); while there is no mutual agreement among scholars on the exact age - or age range - at which an entrepreneur may be considered a silver, grey, or senior entrepreneur, this research focused on startup founders over 50 to analyse this phenomenon in-depth and contrast with the widespread idea that only youngsters or entrepreneurs skilled in IT may turn a promising idea into a startup and become an entrepreneur. Therefore, this study is not focused on older business owners more generally, but on startup founders aged 50+.

We started by collecting evidence from international competitions for people over 50 willing to start a new venture. The websites of such initiatives provided reports and interviews about what businesspeople did. Therefore, we had the chance to consider secondary data combining information offered by silver startuppers themselves and what they reported to the entities leading business competitions. Then we used a snowball technique to consider a wider research context and find a combination of multiple sources to expand our view, geographically, in terms of industry, and with reference to the evolutionary path from the idea to the new business, without limiting any of these aspects. This improved the reliability of the sample and allowed us to consider multiple factors - besides hidden ones - leading to the founding of new ventures (as in Mitra and Basit, 2021), as well as reducing subjectivity by integrating the initial data sources in an unbiased way (Johnston *et al.*, 1999). Data collection occurred through multiple sources, in most cases directly related to businesspeople over 50 through their pages on social media, interviews they released, or on the websites of their own ventures. The combination of sources reduced the risk of bias and favoured the availability of information over time. In more detail, the first, and very useful, source of information was LinkedIn, a social network that is very frequently used and updated by entrepreneurs. Thanks to LinkedIn, it is possible to explore the past and recent experiences of the founders of the startups examined. As in other studies, Barenrji and Remeir (2019) mined startup founders' information from LinkedIn, in particular, data on network size and experience.

In many cases, it was useful to integrate and confirm information on the websites of the initiatives using descriptions the boards and history of the startup, thus giving more reliability to the data collected. As a third type of source, we used interviews from specialized websites and newspapers, and, in some cases, videos, which provided information on the subjects, including why they chose to start a startup, and details of entrepreneurship

education paths they may have undertaken. In this approach, both our research efforts for new cases and the suggestions emerging from other cases proved helpful in providing evidence, leading to a final data set consisting of 29 new ventures.

Regarding the typology of analysis, we collected information individually and shared the whole set of data. Then, each of us analysed the evidence on our own and contributed new sources; in some cases, online interviews were performed, or e-mails were sent to the entrepreneurs to get additional information. At the end of this process, we compared our perspectives to debate mutual views or controversies, then summarized the collected information in a table that included the name of the startup, the business activity, and the year of foundation. In line with the literature review and the research process, we described the skills of the entrepreneurs and the personal motivations underlying the desire to found a startup (Table 2). The search for new cases was stopped when saturation was reached (Pandit, 1996), as no new motivations emerged to describe the combination of technical and entrepreneurial competences. This approach has also been used by scholars studying entrepreneurship and startups (e.g., van Stijn *et al.*, 2018) to investigate the reasons for entrepreneurs' choices.

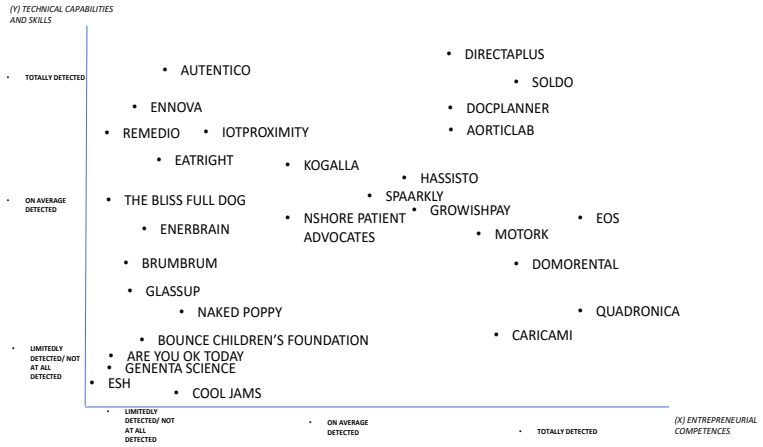
The summarized data were then processed into a dispersion matrix that served to position the entrepreneurs and their startups according to two main variables, namely, technical capabilities and entrepreneurial competences (Figure 1). The content we collected was coded according to the guidelines provided by Bryman and Bell (2011). We took initial notes individually, then reviewed our coding both individually and as a group before moving to more general theoretical assumptions related to the two main variables shaping our research questions, i.e., technical capabilities and skills and entrepreneurial competences. We classified the case studies in the matrix (see Figure 1) according to what the founders stated to be their level regarding each of the two variables and by making a clear distinction between the capabilities related to the industry and the competences related to being an entrepreneur. The insights in the content depended on how the skills and competences were combined with adjectives, levels, acknowledgement of gaps, and the need for partnerships. Examples of such content are related to example 21 ("I developed my idea on holding two degrees and field knowledge in both medicine and ICT, while I totally miss the minimal requirements to start a company") and example 29 ("Few nurses can say they were ICU nurses for 39 years, and when I saw the [technological] changes coming I felt this was a high calling for me … and I started a non-profit to reach people with low income").

Tab. 2: Summary of the data collected

Founder	Firm	Business Activity	Year of Foundation	Formation	Skills	Motivations
1	Remedio	Sempli Farma platform allows you to follow your daily oral therapy in an easier and safer way	2018	Strategic innovator of sector policies, manager of public and private companies	Management, strategic planning	To develop innovative and alternative solutions for consolidated and often obsolete structures, such as the health system
2	Soldo	Management of prepaid cards in order to automate and control company expenses	2015	Founder of Virgilio platform. Strategic roles in banking online and ICT companies	Online platform, ICT management	The need to solve a problem: the control of money owned by one person and managed by others
3	GrowishPay	E-wallet-based social payment solutions for group payments such as gift lists	2011	20 years in the chemical sector before focusing on management and startups	Management	To imitate a successful French service not widespread in his country
4	Domorental	Solutions for operational leasing: hospitality, Ho.Re.Ca and retail business	2017	Years in ICT. He founded companies related to technology and credit recovery	Finance and ICT sector expert	To apply, to leasing, his experience in the ICT
5	EatRight	Supermarkets with sustainable and quality products	2017	Years of experience in the field	Large-scale distribution and management control	To implement previous experiences by getting involved personally
6	AorticLab	Provides medical and technological innovations for medical devices	2020	21 years in clinical research, then he founded several startups in the field of medical devices	Organizational knowledge of the health system sector	To apply previous experience in the sector
7.	Caricami	Provide power on demand through a network of shared power banks	2019	After graduating in law, he worked for IBM for 26 years and became a board member and CEO	Opportunity evaluation, supply chain, and acquisition	Innovator and business mentor for different realities willing to further support new initiatives
8	Ennova	Digital services for telecommunications, finance, and multi-utility sectors	2010	He started in the commercial area and continued in such a position most of his career	Sales and management	Became an entrepreneur because of the opportunity of buying shares based on the return on sales of the company he worked for
9	Brumbrum	First online dealer in Italy of used cars and zero km	2016	Years in McKinsey & Company from consultant to partner	Business analyst	Intuition of a business opportunity since there was demand without an offer
10	Glassup	Develops and manufactures augmented reality viewers	2012	Graduated in business administration, 22 years in FIAT and Ducati	Auditing and process restructuring	Passion is to innovate and simplify the way things are done
11	Directa Plus	Producers and suppliers worldwide of graphene nanoplatelets	2005	Was in this field for years, as CEO, president, board member, and general manager	Managerial and scientific skills	To innovate in an extremely familiar market segment
12	Authentico	Platform that certifies made in Italy: recipes, products, and restaurants around the world	2017	Analysis, design, and consultancy, then customer relationship management for call centre services and quality, training, and coaching manager	Blockchain expert, customer service, digital marketing strategist	To make use of previous experiences
13	DocPlanner	Platform for booking an appointment with doctors; also helps doctors build their online reputations	2015	MBA, strong experience in sales for companies such as IBM, HP, Groupon, and HomeAway	Negotiation, e-commerce, new business development	Intuition of a business opportunity through operating in a rich and not very digitized market segment
14	Genenta Science	Gene therapy research	2014	Renowned scientist and academic	Purely scientific skills	To be consistent with his professional research path
15	MotorK	Software solutions designed for the businesses of car manufacturers, dealers, and after-sales operators	2010	Years in IT from developer to R&D manager. Founder of three startups	Management engineer, IT skills	After Rebooting career in 2007, wanted to change perspective from employee to entrepreneur
16	Enerbrain	Provides energy-saving solutions for large buildings	2015	Specializes in business intelligence architecture	Degree in cybernetic physics	To fight climate change using innovative technologies
17	Spaarkly	Augmented reality	2021	Strategic consultant for public and private sectors. He founded several startups	Innovation consultant and strategic advisor	Intuition of a business opportunity due to a sector being in expansion
18	Quadronica	Digital publishing and online advertising sector; main product is www.fantagazzetta.com	2008	Web designer and computer teacher. Developing platforms since 2005	IT management	The site was initially developed so he could game with his friends; it has evolved into a company
19	Hassisto	E-care platforms for the elderly: remote monitoring of multichronic patients in their homes	2018	Electronic engineering; he collaborates with public and private bodies	Marketing and IT expert	To deal with issues associated with personal experiences with loved ones
20	EOS (Ethical Oncology Science)	Molecule for cancer treatment	2006	Head of R&D of one of the most important pharmaceutical companies in the world	Corporate management for pharmaceutical research	To work independently in a familiar field
21	ESH (Electronic Smart Health)	Reporting system that shares patients' medical histories with specialists in the National Health System and pharmacies	2021	Doctor with a degree in IT; he works as a specialist at Bari Hospital	Master's in IT and strong medical knowledge	To start a business that would express his potential in researching new solutions for healthcare
22	Are You Okay Today?	App to track biosignals and movements of elderly living alone	2019	Master's in IT	IT specialist at IBM	To find a solution because his son continuously called him to check on his health/status
23	The Blissful Dog	Products for dog wellness, including aromatherapy and body lotions	2010	Marketing/clothing and textiles studies	Pet care specialist; not a vet	To continue to work with animals after retiring
24	Bounce Children's Foundation	Events and education for children suffering from chronic illnesses	2015	Studied at University of Michigan, but left without graduating	Marketing executive in IT industry; experience in non-profit domain	To support the community, especially children and their families
25	Cool-jams	Manufacturing of pyjamas and bed linen regulating body temperature to solve sleeplessness	2007	Marketing studies	Manager in textile industry	To find a solution to a personal issue
26	iOTProximity	Use of Artificial Intelligence to create 360-degree virtual safety barriers around job sites	2018	Master's in Economics	Multiple successful companies and strategic exits	To solve a significant problem in the construction industry: the high number of accidents on large-scale projects
27	Kogalla	Travel lighting brand	2014	Design engineer; a BSc in electrical engineering, 17 U.S. patents	30-year electronics industry veteran	To build trust in the renewable energy market
28	NakedPoppy	Customer-curated clean makeup and skincare products	2019	A BA in Arts and an MBA	Executive manager; marketing specialist at Amazon	Inspired by her own passion for clean beauty
29	NShore Patient Advocates	System that provides consultative health services and advocates for clients' needs	2019	Specialist in nursing	Career veteran of Intensive Care Unit nursing	Looking for system change based on her professional experience

Source: Authors' elaboration

Fig. 1: Scatter matrix



Source: Authors' elaboration

5. Findings

The results offer the opportunity to explore the idea that mature entrepreneurs are looking for the benefits of starting new careers through their own startups. As lives are longer due to improvements in living conditions, these people spend more years working than ever and many find themselves making late career transitions to entrepreneurship or continuing their entrepreneurial trajectory in a new way.

Many silver entrepreneurs are former employees or company managers with invaluable experience and know-how in the process of starting new business activities, while others are academics looking for new stimuli who want to create something on their own, making use of the many years of research and reflection they gained within universities.

In all these cases, the main advantage comes from the awareness acquired over the years - often absent in younger entrepreneurs. Furthermore, silver entrepreneurs, in addition to their experiential and professional baggage, appear to be bearers of a company culture and philosophy.

The scatter plot in Figure 1 shows the prevalence of three combinations of technical skills and entrepreneurial competences; in most cases, silver entrepreneurs leveraged relevant technical skills, either with or without entrepreneurial competences, while others started a business with no technical skills or entrepreneurial competences. In a few cases, a startup was founded by someone with entrepreneurial competence but no technical skills in the business.

The four categories are described below, firstly with reference to technical skills and entrepreneurial competences, then with reference to the motivation(s) to start a new venture.

The first category is named "serial starters" and consists of entrepreneurs founding a new venture thanks to the competences they acquired in

previous businesses, mostly as entrepreneurs or managers, and the technical skills they developed throughout their careers, as students and at work. Indeed, in several cases, the new startup focused on a business related to the activity these entrepreneurs were previously involved in. Experience and knowledge of an industry or a service was the key motivation, as these people were aware that there was a good chance of running a business on their own. Two key examples are given to fully describe this category.

The serial starters decided to launch a new business because it was considered a way to gain benefits from potential not fully realized in the industry they were in, or to create a new job for themselves after being fired or having left their previous business due to age limits (retirement).

The second category is named "brand-new starters"; namely, those entrepreneurs with such high-technical competences in a certain field of science that they decided to develop a business using their own solutions and innovations. Indeed, these entrepreneurs had no previous knowledge of what being an entrepreneur would mean, as they had worked as employees, but their passion or knowledge led them to spot a solution that they later transformed into a business. This is reflected in the frequent choice to join a mentoring programme, as they had a great idea but lacked the skills to launch a business. The implementation of their knowledge to develop something new but familiar to them, or the need to launch a business that gave a job to themselves or their families were the main motivations. The following examples confirm this. The founder of EatRight had years of experience in large-scale food distribution before choosing to get involved personally and focus on an entrepreneurial strategy promoting the sustainability and quality of products. Additionally, Quadronica's founder had years of experience in the field before choosing to turn his passion into a successful project.

To sum up, this category consists of businesspeople who decided to invest because they could foresee a solution and combine their passion and previous experience to achieve benefits for themselves or someone else, such as a member of the family, a friend, or an acquaintance.

The third category is named "trouble-shooter starters", namely, entrepreneurs who started a business after looking for a solution to an ordinary issue, either a personal one or someone else's. The cases falling into this category are unrelated to the entrepreneur's previous career; in some cases, people had devoted their time to their families or housekeeping before a perceived need for themselves or someone related to them stimulated their creativity, despite their lack of technical skills or previous experience as an entrepreneur. The two following examples confirm the above description. The founder of Brumbrum had years of experience in consulting but no experience at all in the used car market when he realized the lack of suitable offerings. On the other hand, in the case of Hassisto, the founder was looking for a solution to a personal problem of his parents, but, as in the previous case, he had no experience in that kind of market.

The third category shows how the new venture mirrors the proposal of a new solution, namely, something created for the benefit of someone else or after an event personally affected someone, and was unrelated to the job they previously had.

The fourth category is named "leisure starters" and is the least frequently observed in the analysis. In only a few cases did a person start a business in a domain that was different from the one they were previously part of. This category is also a way to reinforce the results of the first category, as people with entrepreneurial competences mostly prefer to run a new business related to the knowledge they already have. The few cases pertaining to the fourth category describe a mix of passion, knowledge, and other skills without one particularly superseding the others. This is illustrated in the following examples. Domorental was founded by an ICT expert with no experience in the leasing solution market, but he was moved by the desire to apply his experience to this market. As for Glassup, the founder was moved by a passion to innovate, although they came from the auditing field, which has nothing in common with augmented reality.

To sum up, this fourth category is a residual way to describe the competences and motivations of startup founders aged 50+.

6. Research implications

This study has theoretical implications because it contributes to the growing literature on startups, the silver economy, and silver entrepreneurship. Additionally, it offers trajectories for future research that will further contribute to advancing the extant literature and describe the dynamics of investments made by startup founders aged over 50.

Extremely different stories and features emerged from the silver entrepreneurs investigated; the analysis showed that they shared common characteristics, leading to a categorization of the dynamics enabling their becoming entrepreneurs. The first feature is the fact that most of these entrepreneurs already had a background compatible with their new venture, while in a few cases the decision was made to completely change the field of work. It is therefore deduced that the choice to found a startup is supported by strong previous experience rather than creativity in a totally new business. In line with this factor, in most cases, the skills used were consistent with the type of startup founded. As far as motivations are concerned, they appeared to be extremely different, but often played a crucial role: many wanted to be directly involved in a field they were already familiar with, while others identified a gap in the market.

The idea of entrepreneurship as being something innate in a person (Nicolaou *et al.*, 2016) was confirmed in several cases and can be further expanded as a disposition towards innovation; thus, the willingness to create a new venture (Fernández-López *et al.*, 2022) combined with the desire to look for new and improved solutions is a trigger for new ventures. This consideration is strictly linked to the experience businesspeople acquire over time, as in most cases the new ventures were related to the entrepreneur's previous job (Cannon, 2008). However, what is new in this study is the combination with other features of businesspeople, namely, experience in combination with the perception of a personal need or the solution of an issue of someone associated with the silver startupper. This is a phenomenon that may be considered as democratized entrepreneurship

because the new economic scenario and the opportunities offered by technology and mentoring programmes have led to the creation of new ventures, while in the past it would have been hard to transform a simple idea into a new business.

Another novel element emerging from this research is the challenge discussed above, namely, something that pushes a person to launch a business, which is partially in line with preferring entrepreneurship over being employed (as in Amoros and Bosma, 2013); however, in the cases analysed, the challenge was not just being an entrepreneur but doing that in a certain domain to solve a specific problem, either personal or related to a relative or friend. This willingness to do something useful for themselves or someone else expands the debate on silver entrepreneurs that has frequently focused on just defining the phenomenon in a general fashion (Honig and Martin, 2014).

The literature on silver entrepreneurs always considered this trend to consist of one-person businesses (Kautonen, 2008), while, due to the combination of challenges, needs, and creativity, the evidence shows that a new venture may be a family affair, with retired couples or women and their daughters deciding to launch a business. This opens the possibility of involving different skills and competences to manage and develop new management tools (Ahmad *et al.*, 2014; Basset, 2019).

It is particularly interesting to consider the features enabling the creation of new ventures and the motivations of such an investment. Indeed, the analysis of motivations contributes to advancing the studies on this topic, as some motivations are expanded upon while others are brand new. Indeed, the motivation referred to as need considers the creation of a job opportunity instead of retiring (Green and Binsardi, 2015) or the chance to solve a personal issue (Amoros and Bosma, 2013; Martin and Omrami, 2019), while the willingness to create a company to give to the rest of the family in the future, and the chance to solve an issue related to someone else or society in general, must be considered as further reasons. This expands the previous view considering people over 50 willing to start digital again (Goeta and Ferrè, 2017), since this feature is confirmed but it does not act on its own. No scholars stated that just one feature or one motivation may be enough; this research showed the interrelatedness among multiple elements in shaping the dynamics of silver entrepreneurship, in which age and experience are just two of the features of such a process, while creativity, passion, the willingness to solve a need, a personal challenge, an event affecting a silver startupper directly, or a more general disposition towards innovation are additional features to be considered. This discussion answers recent calls for research on the combination of variables (Walmsley and Nabi, 2020) and the role of personal traits including background (Fernández-López *et al.*, 2022), as personal features and background are not enough to describe the dynamics of new ventures founded by people aged 50+. Thus, the role of entrepreneurial skills and technical knowledge must be considered to obtain a full understanding of the process leading to new ventures; this consideration may be widened if personal features of the entrepreneur are combined with local culture (Canestrino *et al.*, 2018), leading to higher

chances of innovative businesses. A combination of variables (Walmsley and Nabi, 2020) affects the entrepreneurial behaviour of people aged over 50. The experiences they accumulate, their willingness to find a solution for themselves or others, and their early-stage career are all significant drivers. These features trigger a debate on silver startuppers in a totally different domain than other studies on entrepreneurial behaviour, as the age of silver businesspeople makes them different from other founders.

From a practical point of view, this research furthers the understanding of the possible positive local economic impact of entrepreneurs over 50 who found a startup. We also identify that entrepreneurial training programmes allow the proliferation of new business ventures in the startup ecosystem, especially for silver entrepreneurs with a background other than businessperson, manager, or company owner. Therefore, it would be favourable to emphasize the democratization of such an entrepreneurial process, as this may lead to the creation of new ventures, stimulating local development, favouring the development of new business opportunities, and offering, to both the silver entrepreneurs and other people, a chance to run a business and work. Therefore, the expected results do not refer only to the economic domain, but also to the social sphere, thus leading policymakers to be interested in such a phenomenon, as entrepreneurial programmes, mentoring plans, and events stimulating creativity - including at a local level - may catalyse these results.

7. Conclusions, limitations, and future research

Until recently, few studies have investigated entrepreneurs over 50 who found startup companies and even fewer have investigated their underlying inspirations. Additionally, through empirical research, we capture a new dimension of the startup phenomenon and the advantages and challenges that still exist. Furthermore, this study offers a new combination of skills, entrepreneurial background, and motivations as the three pillars shaping the process of new venture creation for people aged 50+, thus enriching the flourishing debate on silver (or senior) entrepreneurship. The identification of four categories of startuppers might help the description of the dynamics of investments they activate. Entrepreneurial competence for serial starters, high-technical competences for brand-new starters, the push from concrete issues to be solved for trouble-shooter starters, and the mix of passion, knowledge, and other skills for leisure starters describe four different paths of this phenomenon, besides not mutually excluding. The relevance of such features may drive interventions from government to support this business initiative, as well as efforts from firms to identify the support to be given to such new ventures.

However, this study has some limitations, as further information on the available resources and skills may have enriched the depiction of the process leading to a startup. Similarly, a focus on financial issues could have helped in achieving a more complete overview. Therefore, these limitations reveal avenues for further research in this debate. For example, new analyses may be based on different data collection, since the continuous

emergence of new cases offers the chance to perform a quantitative study, complementing the results achieved in this research and favouring a better understanding of the interplay between different features in such a process. Finally, a focus on the viability and performance of these startups may prove useful in completing the understanding of the phenomenon, with particular reference to the differences between former entrepreneurs and brand-new ones.

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sinergie
italian journal of management

ISSN 0393-5108
ISSN 2785-549X
DOI 10.7433/s119.2022.06
pp. 123-148

Fifty years of research on silver economy: a bibliometric analysis

Received
22nd November 2022
Revised
28th December 2022
Accepted
29th December 2022

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Abstract

Frame of the research: *Population ageing is a global demographic trend that will have tremendous implications for individuals, firms, organizations, policy makers and, in general, for mostly all sectors of society. Specifically, silver economy (SE) encompasses all the activities aimed at providing goods and services that meet the changing needs of this heterogeneous market. While academic interest on SE has greatly increased in the last years, management research on older persons is still fragmented and needs to be systematized.*

Purpose of the paper: *This paper establishes the state of the art and the emerging issues on the SE in the management literature to define and prioritize the future research directions that will support scholars who wish to address the silver market.*

Methodology: *A systematic review of the literature published between 1969 and 2022 was conducted using bibliometric techniques.*

Findings*: Based on bibliographic coupling, 10 clusters emerge, showing the heterogeneity of contributions on the SE in management. Analysis of the thematic map reveals five main research topics on the SE, classified according to the degree of relevance and the level of development. Service quality and service providers are the motor themes (i.e., well-developed and important themes) in the SE management literature.*

Research limits: *Future studies could analyse the single clusters more fully to identify specific features of SE in the various management research fields.*

Practical implications: *This study helps managers to better focus on the design, production and delivery of goods and services in line with the emerging complexity and extension of the population life cycle.*

Originality of the paper: *As far as we are aware, this study is the first to systematize knowledge on the SE in the management literature and to propose a comprehensive research agenda for management scholars.*

Key words: silver economy; research agenda; bibliometric analysis; seniors; management

1. Introduction

Population ageing is a phenomenon that affects almost all industrialized countries, with the number and proportion of older people[1] increasing

[1] There is no consensus about the definition of older persons. Both academics and practitioners use different terms to refer to older people, including for example "seniors", "elder", "elderly", "mature", "grey". Some of these terms may contemporarily be considered having negative connotations or bias associated

all over the world; it is predicted that there will be almost half a million centenarians in 2050 (Eurostat, 2022). The society of the next few years will consist of many older people; that is, people older than 65 years. Such a change in global demographic structures is likely to have a significant impact on most aspects of life and the economy, as well as on countries' macroeconomic and fiscal sustainability.

Thus, institutions, organizations and businesses must fundamentally rethink and redesign their offerings (Kohlbacher *et al.*, 2011). This unified and multi-layered "silver" macro segment poses challenges thus requires consideration (European Union, 2021). First, given the decline in the working-age population and the growing number of older people in society, maintaining the labour force is a main concern of policy makers. Closely related to this is the issue of healthy/unhealthy ageing. Considering life expectancy has increased, the period of old age has become much longer. Within the silver macro segment, different groups can be distinguished, characterised by different levels of independence and health status and therefore different needs at both social and market levels.

The so-called silver economy (SE) was recognised by the World Health Organization (WHO) in 2014 as a system for producing and delivering products and services that aims to shape the environment in which older people lead healthy, active and productive lives. Also, considering the 17 Sustainable Goals of the 2030 Agenda for Sustainable Development, management research needs to address the problems of the ageing population to guide both institutions and companies in developing services and products to fit the changing profile of society. Indeed, fulfilling the 2030 Agenda's primary goal of global human well-being goes beyond social inclusion.

In the management field, the topic of ageing has recently been approached from the perspective of social innovation (Sooraj *et al.*, 2020), which considers the creation of novel, scalable and sustainable ideas, and solutions, to solve systemic societal problems (Aksoy *et al.*, 2019; Mulgan *et al.*, 2007; van Wijk *et al.*, 2019). Contributions focus mainly on "the elderly" -that is, the less active members of the aged population- and address the health and assistance sector (Čaić *et al.*, 2018), especially in relation to technology use (Neven, 2015). Extant studies on the silver market address only specific industries such as tourism, hospitality and financial services (Sudbury-Rilegy *et al.*, 2014; Laperche *et al.*, 2019; Hvozdikova *et al.*, 2015).

Given the extended life prospects of the population and the obvious impact of demographic change on the planning and provision of goods and services, management studies need to approach the SE from a systematic perspective addressing firms and institutions. Such perspective should focus on environments, conditions and activities that enable the

with them. Similarly, different age thresholds are used to refer to older individuals, ranging for example from 50 and older (European Commission, 2018) to 65 and older (United Nations, 2019). To avoid any ambiguity, in this study we use the term "older persons" to refer to individuals older than 65, while recognising that chronological age alone is not sufficient to identify an older person.

well-being of a population that has changed so much in its demographic composition and thus in its needs. We believe that the contribution of management theory is essential to the social and market challenges of the SE, particularly in relation to the issues of service design and innovation.

Therefore, we provide a research agenda to support both academics and managers to redefine priorities in the design, production and delivery of goods and services in line with the emerging complexity and extension of the population life cycle. With the dual aim of filling the gap in the literature and guiding future research, we opted for a systematic review of the literature using bibliometric techniques (Tranfield *et al.*, 2003) to not only establish the state of the art but also, more important, identify emerging issues and thus future research directions.

The remainder of the paper is structured as follows. Section 2 illustrates the methodological path and describes the methodological choice and the dataset building procedure. The main descriptive results of the systematic literature review are then presented in Section 3. Next, Section 4 discusses the results of the bibliometric analysis by illustrating the emerging research clusters on the topic of the SE. Lastly, Section 5 proposes a research agenda for management scholars of the SE and outlines implications for managers and policy makers.

2. Methodology

We combined a systematic literature review with a quantitative bibliometric analysis to illustrate the current state of research on the economy connected to the ageing population (SE) in the management field. This approach is widely used in knowledge management (Gaviria-Marin *et al.*, 2019; Fakhar Manesh *et al.*, 2021) and innovation (Klarin, 2019; van Oorschot *et al.*, 2018). Systematic literature reviews are robust (Ciampi *et al.*, 2021), minimize bias from exhaustive searches of documents in the field and provide a control schedule of the literature review's approach and conclusions (Tranfield *et al.*, 2003).

Figure 1 illustrates the methodological procedure employed, specifying the activities and instruments used.

2.1 Dataset building

On 29 September 2022, we ran a query on Scopus and Web of Science (WOS), using the operators "TITLE-ABS-KEY" and "TS", respectively, and the keywords "service", and ["senior" or "older" or "elder" or "elderly"]. The choice not to include "silver economy" was made on the basis of an exploratory analysis of the WOS and Scopus databases. An initial query launched on 16 September 2022 revealed that: (i) although a term defined by the European Commission (2018) for an economic system, "silver economy" is not widely used in the literature (fewer than 150 articles in all Scopus/WOS categories); (ii) "silver economy" has a terminological meaning used mainly in studies of economics and regional economics (fewer than 30 published papers); (iii) when appearing as a keyword,

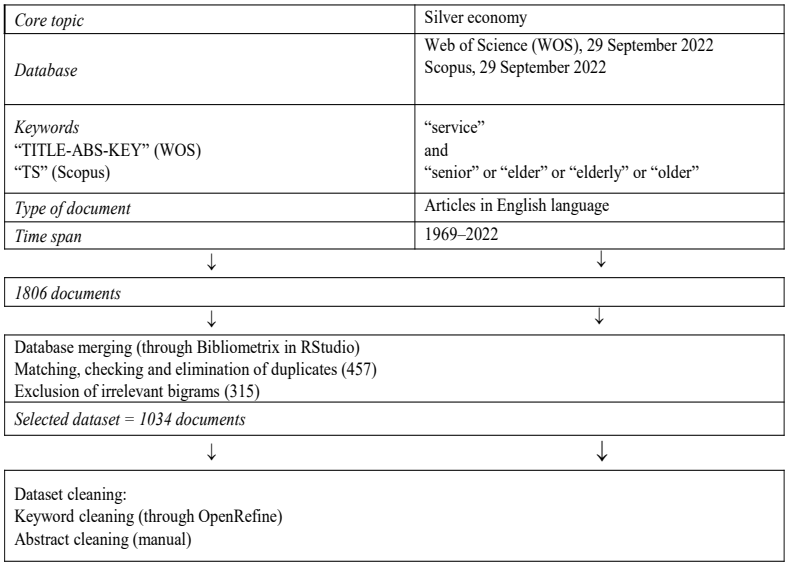
all management articles containing the term include at least one of the keywords identified by the authors for the final query. We limited the search to articles written in English, selected only documents in the field of business and management, and excluded subject areas not pertinent to the scientific domain of our research. We obtained 1045 articles from Scopus and 761 from WOS.

As second step, we merged the two datasets using the Bibliometrix package opensource (Aria and Cuccurullo, 2017) in RStudio (http://www.bibliometrix.org); this process was necessary to ensure a complete and exhaustive bibliometric analysis (Echchakoui, 2020). Duplicates (457) were removed, leaving 1349 articles in the merged dataset. We cleaned keywords using OpenRefine, (https://openrefine.org/) then we manually cleaned abstracts. This was done to homogenise spelling (such as, British and American English, singular and plural, etc.), and to avoid recurrent words in abstracts (such as "purpose", "findings", "limitations"). Moreover, considering the meaning of the bigrams "senior management", "senior manager", and "senior executives", which refer to carrier and organizational issues, we decided to remove documents including these in their abstracts (315). The final dataset consists of 1034 articles.

2.2 Data analysis

We then analysed the data by performing bibliographic coupling using VOSviewer 1.6.18 version (van Eck and Waltman, 2010) and strategic map analysis using the Bibliometrix package in RStudio. Strategic maps are two-dimensional diagrams plotting clusters that are derived from co-word analysis according to their centrality and density ranks (Cobo *et al.*, 2011).

Fig. 1: Methodological procedure

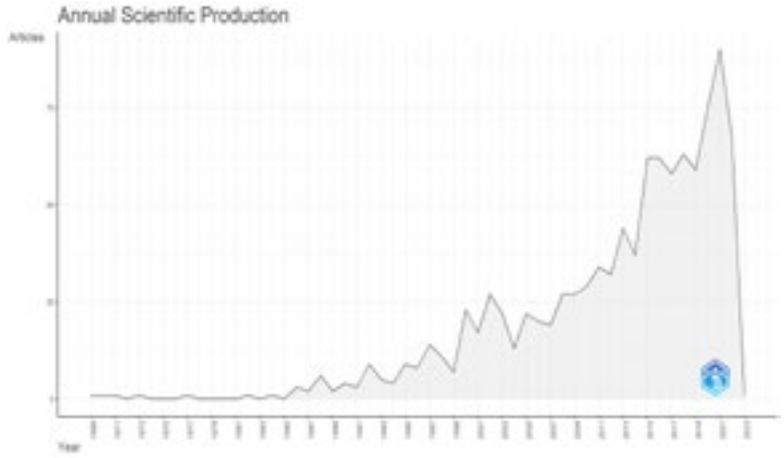


Source: Authors' elaboration

3. Scientific production: descriptive analysis

Over time, the issue of ageing has emerged and gained momentum in the management and business literature (Figure 2). Indeed, although there were several breaks, the average number of articles published annually increased over the study period, 1969-2022, with three subperiods identified (Table 1).

Fig. 2: Scientific production by year



Source: Authors' elaborations

Tab. 1: Scientific production by average number of publications

Years (from - to)	Publications, *N*	Average number of publications
1969 - 1999	94	3
1999 - 2014	393	26
2015 - 2022	537	67

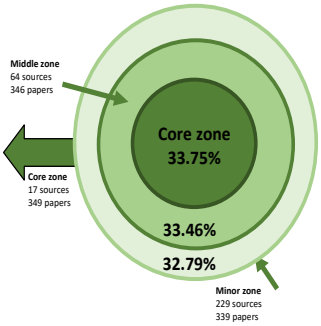
Source: Authors' elaborations

Lacking a reference line for research, the scientific production on the SE appears very heterogeneous in terms of the journals in which papers are published. Bradford's law (Bradford, 1985) was applied to identify a corpus of journals in which significant contributions has appeared and which show some continuity (Figure 3). Bradford's law methodology allows for the distinction of three "zones" that represent a hierarchy of sources for a single topic or subject area. Zone 1 is the top third, the core zone, and includes the journals that are most frequently cited in the literature of the subject area in question and are therefore likely to be of greatest interest to researchers in that subject area. The middle zone (2) comprises the journals that are frequently cited on average, and the bottom zone (3) consists of the long tail of journals that are rarely cited and of little importance to the field (Nash-Stewart, 2012). Figure 3 shows that the analysis found 349 papers belonging to the core area (about one-third of the total production) and

published in 17 major journals, such as the Journal of Services Marketing, Harvard Business Review, The Service Industries Journal and Journal of Business Research.

Fig. 3: Source clustering through Bradford's law

Source	Publications, *N*
Journal of Services Marketing	52
Harvard Business Review	32
International Journal of Contemporary Hospitality Management	27
The Service Industries Journal	27
Journal of Business Research	26
Technological Forecasting and Social Change	25
International Journal of Bank Marketing	23
Journal of Retailing and Consumer Services	23
Journal of Consumer Marketing	18
International Journal of Consumer Studies	17
European Journal of Marketing	12
Managing Service Quality: an International Journal	12
Total Quality Management And Business Excellence	12
Asia Pacific Journal of Marketing and Logistics	11
Journal of Hospitality and Leisure Marketing	11
Public Management Review	11
Managing Service Quality: An International Journal	10



Source: Authors' elaborations

4. The state of the art and emerging trends

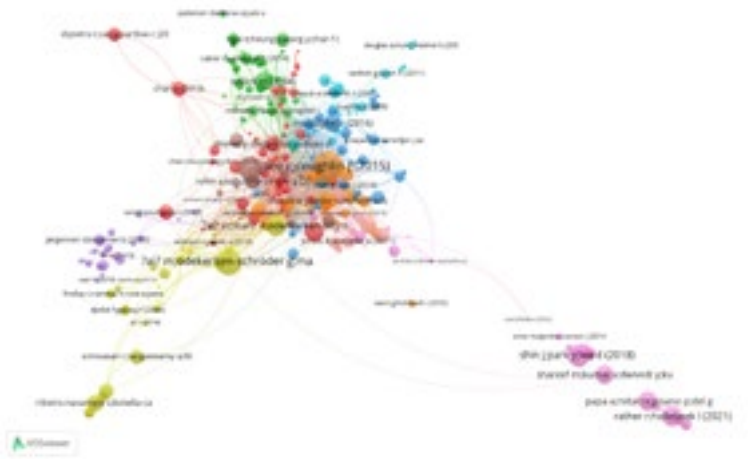
4.1 The results of bibliographic coupling

To verify whether there is a mainstream in the management literature on population ageing, we decided to conduct bibliographic coupling (bibliographic network analysis). Bibliographic coupling pairs two documents that have a third reference in common. The greater the number of shared references, the stronger the bibliographic coupling relation (Van Eck and Waltman, 2014)

Analysis of the map resulting from bibliographic coupling shows a low level of shared linkage in the network: within a dataset of 1034 articles, the largest set of linked elements consists of 359 documents. All documents in the dataset are used as the aim is to identify literature streams that share the same theoretical reference points. The map does not highlight all references, but only those papers that are linked, i.e. only articles that share at least one bibliographic reference in the bibliography. On one hand, this finding is in line with the earlier consideration concerning the heterogeneity of contributions on ageing and the SE in management; on the other hand, it confirms the need for a research agenda on the SE in management. Figure 4 shows the network map of the set of 359 interconnected documents with normalized citations as node size (Marzi *et al.*, 2021). Using the association method, a resolution of 0.50 and a minimum cluster size of 10 (van Eck and Waltman, 2010), we were able to identify 10 clusters. Based on normalized citation, we included over 10% within each cluster (thus, we analysed 10 papers for each cluster) (Turzo *et al.*, 2022).

Table 2 shows the number of documents for each cluster by network-map colour.

Fig. 4: Network map of interconnected documents



Source: Authors' elaborations

Tab. 2: Bibliographic coupling clusters and cluster size

Cluster	Publications, *N*
1 - Red	56
2 - Green	48
3 - Blue	43
4 - Yellow	35
5 - Purple	34
6 - Turquoise	33
7 - Orange	30
8 - Brown	29
9 - Pink	28
10 - Peach	22

Source: Authors' elaborations

The map describes a network in which some clusters are clearly visible (pink, green, blue, purple, yellow), while others overlie (red, orange, peach, brown, turquoise). In this last case, there is a core of literature that has a common reference and probably a common theoretical environment. Following, the clusters that emerged from the bibliographic coupling are discussed, focusing on the connections between them.

The literature in the red cluster focuses on service innovation for older individuals and attempts to provide a better understanding of older consumers' characteristics, behaviour, and lifestyles. Several studies address older individuals in tourism and hospitality context. For example, Tsiotsou and Ratten (2010) highlight the importance of developing specific marketing approaches to market tourism services to an ageing population. Similarly, Hudson (2010) reviews consumer trends among the baby-boomer generation in terms of travel and identifies the relevant

marketing communication strategies needed to effectively connect with this generation of tourists. Concerning restaurants, Lee *et al.* (2012) focus on older individuals' perception of restaurant service and explore the relationship between customer satisfaction and service quality. Differences between older and younger consumers are also investigated. Kim *et al.* (2013) explore the relationships among older individuals' versus younger individuals' lifestyles in terms of health and sustainability, healthy food choices, trust, and emotional loyalty. With regard to lifestyles, Kim *et al.* (2003) examine how older citizens' lifestyles affect their choice of retirement community. Further, Lipowski and Bondos (2018) investigate differences in the perceived media richness of offline, telephone, and online channels among baby boomers, generation X and generation Y. They suggest that for transitioning towards online channels, the pre-purchase phase of the customer journey (e.g., information search) is a good start for customers unfamiliar with the online environment, such as older individuals. Other studies in this cluster address job conditions from workers' perspectives in the health-care services context. For example, Vanderpoolol and Way (2013) investigate the relationship between work–family balance, job anxiety, turnover intentions and voluntary turnover among employees working in health-care and care services for older adults. Their findings show that work–family balance is related to job anxiety, turnover intentions and actual voluntary turnover. Chao *et al.* (2016) find a positive relationship between job satisfaction and service quality in care services for older persons. Specifically, they show that caregivers with higher job satisfaction within a high ethical climate provide better services.

The literature in the orange cluster focuses on older individuals' technology adoption in a variety of consumption contexts, such as restaurants (Cha, 2020; Garg, 2021) or online grocery shopping (Park *et al.*, 2021), rather than in terms of assistive robots or care services. Some studies also address the use of mobile devices in banking and payments. For example, Choudrie *et al.* (2018) develop a conceptual framework that combines the factors that influence the adoption, use and diffusion of mobile banking among older adults. Harris *et al.* (2016) explore consumers' preferences in banking technologies, comparing the importance of mobile, online and physical banking to younger and older customers. Cham *et al.* (2022) consider barriers to the adoption of mobile payment among older consumers, finding functional and risk barriers. Regarding barriers to technology adoption, Shen (2020) also examine physiological and cognitive decline as predictors of perceived ease of use and actual use of technology among older adults.

The literature in the green, purple and brown clusters shares a common focus on ageing from a consumer-behaviour perspective in different services contexts. Specifically, studies in the green cluster attempt to improve understanding of older consumers to provide firms and organizations with the knowledge necessary to serve this market better and improve service quality and customer satisfaction. In this regard, Johnson-Hillery *et al.* (1997) explore the difference between older consumers' self-reported preferences and satisfaction, and retail sales personnel's perceptions, showing a need for improved understanding of

older consumers. Pettigrew *et al.* (2005) address older consumers' shopping experiences in supermarkets and identify three major issues particularly important for older people when shopping: the courtesy and efficiency of supermarket employees, convenient product location, and the functionality of shopping equipment. In addition, older individuals' preferences and behaviour have been explored in research in the tourism and hospitality industry. Chen *et al.* (2013) identify crucial customer service factors for older guests in hot-spring hotels, while Caber and Albarak (2014) focus on a cross-country analysis of the hotel attributes affecting older individuals' customer satisfaction. Other studies focus on segmenting and profiling older customers in different service contexts, such as retail or tourism. For example, Meneely *et al.* (2009) examine consumers' retail food behaviour, showing a change in buying and food-related behaviour as consumers grow older. In the tourism industry, Sellick (2004) segments older tourists based on their psychographic characteristics, including travel motives, risk perceptions and cognitive age. Le Serre and Chevalier (2012) perform cluster analysis using behavioural variables and find the importance of subjective age in tourism consumption. Research conducted in the hospitality industry shows that older individuals tend to complain publicly. For example, Ngai *et al.* (2007) explore differences in consumer complaint behaviour regarding hotel services based on cultural and demographic factors, finding that older individuals tend to complain publicly. Research has also addressed stereotypes in marketing and communications regarding older individuals (e.g., Schewe and Balazs, 1992), suggesting the importance of enhancing the quality of products and services for this market and of educating older consumers about role expectations related to age.

The literature in the purple cluster adopts a different perspective, focusing on public-sector and social services (e.g., Laing and Hogg, 2002; Hansen, 2010) or, more generally, on services dedicated to improving older individuals' well-being. For example, Laing and Hogg (2002) explore patient attitudes to services provision in the National Health Service in Scotland and to the consumer-orientation shift of health-care services. Research has also explored older adults' empowerment, for example through social engagement in third places (Meshram and O'Cass, 2013). Some studies also adopt a stakeholder-engagement approach to design innovative housing and well-being services for ageing individuals (Hennala *et al.*, 2011) or for implementing telecare and telehealth technologies (Bjørkquist *et al.*, 2015). User participation is crucial specifically to favour technology-related innovations in health-care services, as well as to increase older individuals' presence in the online context, for example through purchases via electronic commerce (Leppel and McCloskey, 2011). In services contexts, understanding older consumers' preferences can also help firms to better customize their services. In this regard, Bogicevic *et al.*'s (2018) findings challenge age-related stereotypes regarding hotel-design styles, with the researchers observing that older guests are indifferent to hotel-room design.

Publications in the brown cluster mostly focus on older adults as vulnerable customers (e.g., in terms of health, disabilities or social

conditions) in different service contexts and highlight the importance of improving knowledge on this market to improve older individuals' inclusion, quality of life and eudaimonic well-being (Palumbo *et al.*, 2018). Several studies adopt a transformative service research perspective (Anderson *et al.*, 2013). For example, Rosenbaum *et al.*, 2014 investigate the role of "senior centres" in generating health benefits, such as fatigue relief and overall physical and mental well-being without medications. More recently, Henkel *et al.* (2020) have focused on transformative services and address the role of social robots in improving the well-being of vulnerable consumers. They develop a conceptual approach to integrate social robotics and transformative service research. Vulnerable older adults may need assistance from family members, who have also been included in the SE literature. In this regard, Leino *et al.* (2021) adopt a relational perspective on primary and secondary customers' needs in nursing and suggest that family members' service inclusion is necessary to enhance primary customers' inclusion and well-being. Transformative service research has also been combined with technology adoption research to explore how internet services can improve older consumers' well-being, highlighting the importance of co-creation behaviours (Bianchi, 2021).

The blue, yellow, turquoise and pink clusters comprise papers with a common focus on innovation in ageing, decision-making processes and a marketing perspective. Specifically, some studies in the blue cluster address innovation and technology for services aimed at older individuals. For example, Mostaghel (2016) reviews the extant literature and examines innovative technology adoption among older individuals, identifying the important actors in older people's lives. Arenas-Gaitàn *et al.* (2020) investigate the adoption and use of e-banking by older adults, observing the importance of psychographic characteristics and cognitive age as discriminant segmentation criteria. Bae *et al.* (2020) also explore if older individuals' innovativeness tends to decrease with age and why if so. Interestingly, thier study shows a moderating effect of stereotype threat: in other words, older individuals who think they are negatively viewed as "old" limit their innovativeness to avoid situations that would confirm this negative stereotype. The effect of stereotypes on older people's behaviour is addressed also by Groeppel-Klein *et al.* (2017), who find that negative stereotypes lead to decreased cognitive performance among older adults in a consumption context. Some research also investigates service quality from older individuals' perspective to identify marketing opportunities in different industries, including tourism (e.g., Wang *et al.*, 2013; Hwang and Lee, 2019).

Publications in the yellow cluster particularly explore co-creation in the older market. In this regard, in a conceptual paper, Čaić *et al.* (2019) explore the role of social robots in care services for older persons in terms of their co-creation and co-destruction potential. Further, Čaić *et al.* (2018) adopt older individuals' perspective to investigate the potential roles for service assistive robots in care-base value networks. These roles, identified according to their value co-creating/destroying potential, can be linked to three health-supporting functions by robots: safeguarding, ensuring the patient's social contact and providing cognitive support. Essén (2009)

also investigates the role of technology-based care services and proposes a framework to explain the emergence of new services. Djellal and Gallouj (2006) challenge the stereotype of ageing and innovation and explore the various types of innovation in care services for older persons. Based on their findings, they propose a framework to analyse the diverse types of innovation based on different "targets" (i.e., the forms of assistance and residential provision of older adults, the technologies used, the services offered, the human and institutional environments).

The literature in the turquoise cluster has a strong focus on the analysis of older individuals' decision-making process in different service contexts, such as travel (Faranda and Schmidt, 2000), shopping malls (Kim *et al.*, 2005) and retail banking (Tesfom and Birch, 2011). Research has also investigated the characteristics of customers who have difficulty making buying decisions and found that older, less educated female consumers experience more difficulty (Walsh and Mitchell, 2005). With regard to shopping behaviour, Kim *et al.* (2005) found a significant effect of social interaction and loneliness on mall spending, suggesting that malls should offer more experiential features to attract older customers. A social dimension emerges also in a study conducted among the customers and service providers of a diner in the United States (Rosenbaum, 2009). The findings show that customers and employees engaged in a mutually beneficial exchange of attention and social support. The importance of social relations was also found in an early study on older persons' attitudes and motivations to Internet usage, revealing that users perceived the Internet as a tool to keep in close touch with family and friends (Trocchia and Janda, 2000).

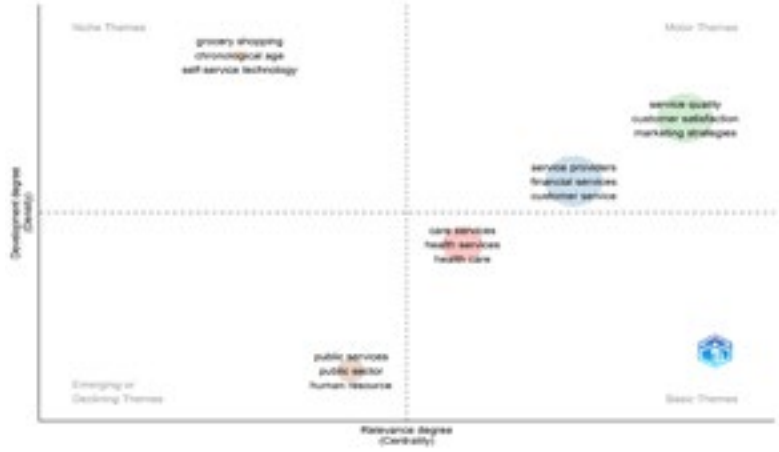
The pink cluster comprises publications on the role of technology for older individuals' well-being in various service contexts, including tourism, homecare and health care. For example, Gomez (2015) researches autonomy-enabling innovations among telecare users. Aceros *et al.* (2015) have undertaken an ethnographic study on the introduction of a telecare system in older individuals' homes consisting of a personal alarm system to obtain assistance at home in case of emergency. The findings reveal that this type of telecare stimulated "good ageing" by requiring, for example, memory and boundary work to align the user with the system. Compagna and Kohlbacher (2015) address service robots in care facilities for older adults and highlight the importance of participatory technology development. To enhance older persons' participation in this process, technology developers should increase usability trials in the middle stages of the innovations process and the use of rapid prototyping by enhancing the direct interaction between users and developers (Compagna and Kohlbacher, 2015). In addition, Shareef *et al.* (2021) investigate the role of trust in older individuals' acceptance of autonomous homecare systems to replace human support. Their study attempts to reveal how trust and personal characteristics can increase intent to adopt an autonomous system. Research also considers the service providers' perspective. For example, Jang *et al.* (2016) adopts the providers' perspective to determine the quality characteristics of ubiquitous health-care services in long-term care hospitals.

Finally, the peach cluster, smaller than the other clusters, includes studies that consider older persons' emotions in consumption behaviours. For example, Chaouali *et al.* (2021) address older customers' reactions to service failure, considering the role of emotions and older individuals' ability to cope with stressful situations. Research has also shown that negative emotions towards usage constraints imposed by service providers can act as a barrier to purchasing intentions-for example, from online trave"l agencies (Talwar *et al.*, 2020). Further, Godefroit-Winkel *et al.* (2019) explore the interplay of emotions and consumption between grandmothers and their grandchildren, providing interesting insights from an intergenerational marketing perspective. Finally, research also address the potential of branding in social marketing services (Gordon *et al.* 2016) and the relationships between older persons' caregivers and family members to understand consumption from a collective perspective (Barnhart *et al.*, 2014).

4.2 Thematic maps

To identify the main topics, we analysed the strategic diagrams, also called "thematic maps" (Cobo *et al.*, 2011), for the cleaned abstracts. We used bigrams and edited text (title, abstract and keywords) by uploading a list of terms to remove, and a list of synonyms. We used the Walktrap clustering algorithm and selected 250 for the number of words, and five as the minimum cluster frequency. Each bubble corresponds to a cluster/theme, labelled using the two most recurrent bigrams. Figure 5 shows the thematic map of studies on SE in management. Themes in the upper-left quadrant are well developed (high density) but peripheral (low centrality), meaning that they have strong internal ties but unimportant external ties, thus their importance for the research field is marginal. Specifically, the yellow bubble represents studies on grocery shopping, self-service technology and customers' adoption intention. This bubble contains early studies in SE that now have a marginal role.

Fig. 5: Thematic map



Source: Authors' elaborations

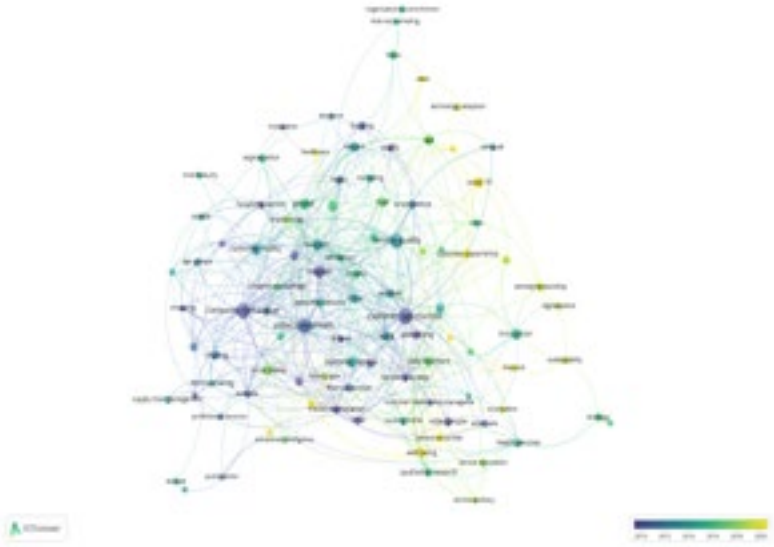
The themes in the lower left quadrant are both weakly developed and marginal; they can represent either emerging or declining themes, which means that these themes are not consolidated in the literature and can develop in different directions. The light orange bubble represents studies on public services aimed at providing older individuals with facilities, housing services and health care. This bubble considers older individuals as fragile individuals who need assistance and focuses on public organizations' role as service providers for this target group.

Themes in the lower-right quadrant have very strong external ties but unimportant internal ties, meaning that they are very important for the research field, even if they are not well developed. Topics in this quadrant are general and transversal. The peach bubble represents studies in services to improve the autonomy, independence, active ageing and well-being of older people-for example, through the use of technology and assistive robots, as well as participation in leisure activities such as tourism or by removing barriers to buying behaviour. This bubble also incorporates studies addressing the role of family members.

Finally, the themes in the upper-right quadrant are the "motor themes". These themes are both well developed (high density) and very important (high centrality). They have very strong external and internal ties, meaning they represent motor themes, namely service quality (light green) and service providers (light blue). The light green bubble addresses older individuals, mainly from a consumer behaviour and service marketing perspective, in a variety of service contexts, including health-care services, food services, tourism and financial services. Specifically, some studies in this bubble investigate the older market in terms of customer experience and segmentation strategies. Others focus on older customers' perception of quality, satisfaction and brand loyalty or on marketing and communication strategies. Research represented in the light blue bubble focuses on various service providers from service innovation, customer orientation and firm performance perspectives. A variety of service sectors is addressed, including financial, tourism and hospitality. These studies also address older customers' decision-making processes and investigate the role of technology in improving service delivery and consumption processes.

The trend of research focusing on population ageing from a management/marketing perspective is confirmed also by analysis of the so-called overlay network (Van Eck and Waltman, 2014), which shows how research has evolved over time in terms of key words. Indeed, the overlay map (Figure 6)-in which the colour shading of the nodes indicates the average year of publication-shows key words such as "well-being", "technology adoption" and "customer experience" are the leading terms in recent research relative to consolidated key words such as "consumer behaviour" and "older consumers". In addition, the key word "Covid-19" highlights the relevance of the ageing issue, especially in relation to vulnerable populations who find it difficult to cope with a pandemic and therefore indicate the need for adequate and appropriate services.

Fig. 6: Overlay network



Source: Authors' elaborations

5. Contributions, implications and a research agenda

This paper contributes by systematizing knowledge on SE in the management literature and proposing a comprehensive research agenda for management scholars. The literature review provides an overview of research on various issues in an important and growing part of modern economies, the SE. A systematic review of the literature published between 1969 and 2022 was conducted using bibliometric techniques. In the analysis, 10 clusters emerged, showing the heterogeneity of contributions on SE in management studies. Analysis of the thematic map reveals five main research topics, classified in terms of degree of relevance and degree of development. Service quality and service providers were found to be the motor themes.

The literature review shows that a clear and unambiguous definition of the SE is lacking in management studies. This seems to be related, on one hand, to the interdisciplinary nature of the topic and, on the other, to the strict linkage with development and health policies. Furthermore, the existence of scholars in different academic disciplines using a wide range of theoretical and methodological perspectives is also a way to understand why there is no widely accepted definition of the SE. The term "silver economy" mainly refers to an empirical phenomenon rather than a theoretical concept. However, we believe that a definition would be useful when it comes to, for example, creating statistics that make it easy to compare data from different countries, as well as comparing different groups or segments within the SE domain.

This literature review provides managers and policy makers with some guidelines regarding management opportunities related to production and delivery of goods and services designed for SE customers. These management challenges include how to respond to the emerging complexities and specific needs and preferences of older consumers. In management studies, technology seems to play an important role, both as an enabling factor for the use of goods and services (active ageing) and for the provision and expansion of treatments and health care (fragile ageing) (Čaić *et al.*, 2018), especially considering the lessons learned from the pandemic (Frishammar *et al.*, 2022). In the field of transformative service research (Anderson *et al.*, 2013), the importance of digital technologies is emphasized for the integration of resources, thus enabling the co-creation of social well-being (Caridà *et al.*, 2022) through the identification of social inclusion of older people for companies providing goods and services. Therefore, the findings of the bibliometric analysis provide relevant implications for firms, organizations and policy makers on the process of service design and the provision of market offerings and health-care and medical services adjusted to the specific needs of older individuals.

Future studies could analyse the different clusters in more depth to identify specific features of SE in the various management research fields, including their theoretical underpinnings. Empirical studies on different management and marketing challenges are also needed. Finally, based on the discussion of the clusters and the evolution of themes in the SE, we outline a research agenda for management scholars who wish to address challenges and opportunities in the SE-in particular, issues that emerged from the literature analysed in this paper-identifying eight key research challenges for future research and investigation.

Theme 1-Innovation in services. A key task is defining innovation in services focusing on older people and their specific needs:

- What do we know about service innovations for older people in different markets?
- How does the management of innovation address these needs?
- What are the challenges in scaling up service innovations in markets for older people?

Theme 2-Goods specifically designed for older persons. Understanding the needs of older individuals poses interesting challenges, including the following questions:

- What do we know about goods designed for older persons?
- What drives the scaling up and success of products for older persons?
- How are different categories of goods designed for different groups of older persons?

Theme 3-Public health-care or home-assistance services. Although the issue of health care and home assistance for older people is developed in studies about public service providers, many questions remain, including:

- How can older persons be engaged and empowered in health-care and home-assistance services?

- What aspects of health care services do older persons complain about and why?
- How do public service providers engage older persons in service design and provision?

Theme 4-The active role of older individuals and their role in society. This theme concerns the issue new and changed familial and societal structures and poses questions such as:

- What role do older persons play in the family economy (e.g., taking care of older family members or grandchildren)?
- How can older individuals be engaged in various volunteer roles and services in society?
- What organizations engage older persons in society?
- What types of caregiving services do older persons perform in society and why?

Theme 5-Marketing, communication and distribution. Research priorities includes exploring marketing and communication strategies for addressing the needs among older individuals; in particular, to answer the following questions:

- How do businesses design their marketing communication strategies to reach older customers?
- What is driving success and failure in the management of strategies, and relations with older individuals?

Theme 6-Culture and creative industries. Understanding the role of culture and creative industries in improving older individuals' engagement and well-being poses interesting questions for investigation, including:

- What do we know about managing older individuals' well-being?
- How can older people be engaged in designing and implementing well-being services?
- What role do the creative industries have in, and what services can they provide, to older people's well-being?

Theme 7-Research extension. The need to extend the research on managing services for older people in more contexts and markets than have been focused on so far offers opportunities and challenges, including posing the following questions:

- What do we know about services adapted to the needs of older people in different markets?
- How can artificial intelligence (AI) provide or support services for older people?
- What service types currently do not meet older people's needs?
- What can be learned from comparing the successes and failures in managing services for older people in different markets?

Furthermore, digital technologies and platforms are becoming increasingly important in management practice. This poses additional questions, such as:

- How and in what situations can digital technology and AI be used to manage services for older people?
- What would permit robots to be perceived as human actors in different service contexts?
- How can managers and older customers, who have different goals, cope with the logic and boundaries of different service ecosystems?
- How can management and marketing empower older customers to achieve their intended goals and outcomes within a service ecosystem?

Theme 8-Terminological issues. The co-existence of multiple concepts and definitions of older people requires a common terminology to construct theoretical and operational models. This raises challenging research questions, including:

- What do we know about the terminology used in management research on older individuals and in different market segments?
- What are the key management concepts in the domain of the SE and how are the concepts operationalized?
- What can SE research learn from key concepts and terminology in other management domains?

We may conclude that the management challenges and opportunities are multifaceted and the need for further research is evident. This paper has provided one basis for this and contributed some suggestions for future management research in the domain of the SE.

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sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s119.2022.07
pp. 149-171

Original Research Papers

Exploring the impact of social media on entrepreneurial intention: a survey on high-school students[1]

Received
19th November 2021
Revised
24th March 2022
Accepted
30th November 2022

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Roberto Parente

Abstract

Purpose of the paper: *In modern society, the media system is one of the most important agents of influence on minds and is a very powerful tool that generates awareness around entrepreneurship as well as acceptance and interest in this activity.*

Built on Media Systems Dependency theory and theory of Planned Behavior, the study aims to explore if and how social media dependency affects students' cognitive processes that lead to intention to engage in entrepreneurial behavior.

Methodology*: To test the proposed empirical framework and hypotheses, the study adopts a quantitative approach, through a survey and OLS Regression Analysis.*

Findings*: Social media dependency plays a significant role in the formation of students' entrepreneurial intentions and this relationship is mediated by the effects that the classical antecedents of intentions (according to the TPB) have on behavioral intentions. Social media dependency results in contributing to both behavioral and normative beliefs among students.*

Research limits: *Sampling procedures and outcomes may limit the generalizability of results.*

Pratical implications: *The study advances entrepreneurship research on "exogenous" determinants of entrepreneurial intention also offering some practical suggestions for educators and policy-makers who wish to boost the effectiveness of entrepreneurship discourse through new digital tools.*

Originality of the paper: *In the studies on the determinants of entrepreneurship, this is the first piece of research that highlights the role of Media Dependency in the formation of entrepreneurial intention in a very young population and which condenses in an empirical framework two relevant theories from different fields.*

Key words: student entrepreneurship; entrepreneurial intention; social media dependency; theory of planned behavior; cognitive model

[1] While the paper is the result of the authors' joint reflections, in terms of its final drawing up, paragraphs 1, 2.3 and 6.1 are attributed to Massimiliano Vesci, paragraphs 2.1, 3.2, 3.3 and 4 are attributed to Chiara Crudele, paragraphs 2.2, 3.1 and 5 are attributed to Rosangela Feola and paragraph 6.2 is attributed to Roberto Parente.

1. Introduction

In modern society, the media system is a crucial agent of influence on minds and represents a very powerful tool (Khajeheian, 2013). Media attention generates awareness around entrepreneurship and can increase acceptance and interest in this activity across a society (GEM, 2019). It also plays a key-part in affecting entrepreneurial phenomena as well (Fait *et al.*, 2015), by diffusing a variety of contents that transmit values and images associated with entrepreneurship and by fostering an entrepreneurial spirit overall in society (Bogatyreva *et al.*, 2019). As today's students are "digital natives" who are born with new information technologies and display a very strong use of social media (Schriever, 2021), we still lack knowledge about the implications of how social media use may affect young students' awareness of entrepreneurship and their predisposition to pursue entrepreneurial tasks. Grounded on the Media System Dependency Theory (MSD, Ball Rokeach and De Fleur, 1976) social media are also assumed to be impacting on users' cognitions, emotions and behaviors.

Furthermore, giving momentum to the students' entrepreneurship as an interesting and growing field of inquiry, which has been explored in a number of studies on academic entrepreneurship and entrepreneurial universities (for the Italian context see for example, Feola *et al.*, 2017, Riviezzo and Napolitano, 2014, Schillaci *et al.*, 2008), some authors have emphasized that the years of childhood and adolescence represent the ideal phase in which acquired information and knowledge of entrepreneurship nurture an overall positive attitude towards entrepreneurship itself (Geldhof *et al.*, 2014; Peterman and Kennedy, 2003). Moreover, students' entrepreneurship is assuming more and more importance because the very early development of entrepreneurial intentions among young people can lead to future persistence in their efforts to startup a new venture (Douglas *et al.*, 2021; DeGeorge and Fayolle, 2008).

To detect why an individual chooses an entrepreneurial career as a possible and feasible option, requires focus on the relations between intention and its cognitive determinants, which involve aspects such as attitudes and perceptions (Peterman and Kennedy, 2003; Fayolle *et al.*, 2006; Liñán, 2004). In addition, the broad theory behind intention models (Shapero, 1982; Ajzen and Fishbein, 1977; Ajzen, 1991) clearly contends that perceptions and attitudes are also the result of external social and cultural dynamics, which consistently impact on individuals' cognitive processes and values system (Shapero and Sokol 1982).

Based on these considerations, this study focuses on social media as an exogenous factor that plays a significant role in determining and influencing entrepreneurial intentions, especially in a young and not entrepreneurial educated population. Thus, this study intends to provide an answer tot the following research questions:

RQ1) Do social media influence high-school students' entrepreneurial intention?

RQ2) How does social media affect students' cognitive processes and perceptions of entrepreneurship (i.e., their overall entrepreneurial attitudes, perceived capabilities and social norms)?

Therefore, built on MSD theory (Ball-Rokeach and DeFleur, 1976; Ball-Rokeach, 1985), and the TPB (Ajzen, 1991, Ajzen and Fishbein 1975), this study analyzes the effect of social media on high school students' cognitive process and their consequent intention to engage in an entrepreneurial behavior.

The present research advances entrepreneurship theory and practice in three directions. First, it contributes to the student entrepreneurship field by examining in depth factors and causes that shape entrepreneurial intention in young students. Given the recognized importance of fostering entrepreneurship in the early stages of adolescence and pre-university age, undoubtedly, very little efforts have been made to try to explain the development of students' entrepreneurial intention specifically in the secondary school context.

Second, this study improves on past research on the external conditions that influence student entrepreneurship, suggesting a consistent role played by the social media system: virtually no research has examined how the user's (in our case, students/potential entrepreneurs) opportunities for communication and information on processes that accompany the use of social media may impact on their own cognitions, perceptions and consequent actions. Moreover, despite the emerging research on digital entrepreneurship in general (e.g., Soluk *et al.*, 2021; Nambisan, 2017; Sussan and Acs, 2017) and the extensive adoption of social media in modern communities, relatively little exploration has addressed the role of social media in the entrepreneurship domain.

Finally, this article offers some practical contributions to students, educators and policy makers, disseminating some insights on the potential of the new digital tools in augmenting and fostering students' attitudes and inclinations.

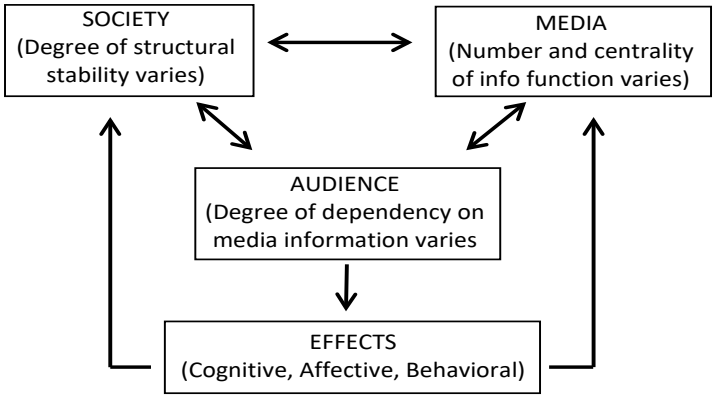
2. Theoretical Background and Hypotheses

2.1 Media Systems Dependency (MSD) theory applied to social media

In contemporary societies, where people cannot count exclusively on their interpersonal resources and relations to acquire all the needed information for their daily lives, the mass media system arises as an indispensable information source-system. Ball-Rokeach and DeFleur (1976), propose the Media System Dependency (MSD) theory which relates to the factor of dependency and its outcomes (Figure 1). The framework (Ball-Rokeach, 1985) explains that people rely on information that is "created, gathered, processed, and disseminated by media, which in turn brings about cognitive, affective and behavioral changes" (Ball-Rokeach and DeFleur, 1976, p. 9). So, it emphasizes the concept of dependency, i.e., a relation in which "the attainment of goals by one party is contingent upon the resources of another party" (Ball-Rokeach and DeFleur 1976, p. 6). The power of media is considered as the resultant of a limited control of information resources and of the capacity of media systems of information in gathering/creating, processing, and diffusion

(Ball-Rokeach, 1998). People establish a number of dependency relations with a broad variety of new and old media. However, it must be noted that, in the existing information and communication domain, the powerful weight of traditional mass media has given way to new emerging forms of new media (e.g., among others, the social media).

Fig. 1: Social Media Dependency Framework



Source: Adapted from the original MSD Theory (Ball-Rokeach and DeFleur, 1976)

Kaplan and Haenlein (2010) define social media as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and allow the creation and exchange of user-generated content" (p. 61). They include platforms such as Facebook, Instagram, Twitter (Olanrewaju *et al.*, 2020). Indeed, applying the idea of "dependency" to the contemporary communication and information environment becomes a significant effort. Besides affecting marketing, instruction, and communication (Kim *et al.*, 2014a), the use of social media seems, in fact, to have transformed, in particular, students' information-seeking behaviors. The pervasiveness of social media such as Twitter, Instagram, and Facebook offer remarkable opportunities for individuals to communicate through social networks (Junco, 2013; Nadkarni and Hofmann, 2012). According to Suliveres (2014), human face to face interactions are becoming less important following the emergence of social media in society nowadays. Social media have become a more common method for interpersonal communications (Kujath, 2011) and have attracted a large number of users, especially from teenagers and university students alike. In particular, Ahn (2011) shows that teenagers are among the most prolific users of social media. A number of other researches also corroborate that social media is, in fact, the most popular form of technology and the most common activity among teenagers today (O'Keeffe and Clarke-Pearson, 2011; Reich, Subrahmanyam, and Espinoza, 2012). This shift in students' habits could also cause a shift in how they obtain, evaluate and process information obtained from social media, and then influence their behaviors. In light of these considerations, expanding the idea of "media system dependency" from the MSD theory, Kim and Jung

(2016) suggest the concept of Social Media dependency, conceptualized as the degree of perceived benefit and effectiveness of a Social Media tool for achieving a variety of critical goals in individuals' everyday lives. The advent of social media has revolutionized not only the ways in which people stay connected and communicate, but also substantial processes that generate new opportunities and challenges for students and educators (Kaplan and Haenlein, 2010).

With the growing volume and variety of information that spreads through social media, the related concept of "information literacy" becomes more and more important. Information literacy can be defined as "the ability to access, evaluate, organize and use information in order to learn, problem-solve, make decisions in formal and informal learning contexts, at work, at home and in educational settings" (Bruce, 1997 a, b). To be information-literate and for an effective use of social media for information-seeking, individuals should have the necessary skills to identify the most appropriate sources as well as properly evaluate the information acquired from the selected sources. This concept can be easily transposed to the social media domain. Social media, in fact, are different from traditional media. While on traditional media, contents are commonly provided by unidirectional flows of communication, social media entail interactive, multi-directional, co-operative processes centered on "Web 2.0", in which information can be easily produced and shared- Social media users are interconnected by accessing each other's profiles and posts, commenting and sharing ideas (Vitak *et al.*, 2011). Therefore, social media competence encompasses knowledge and expertise and self-efficacy in which attitude plays an important role in enhancing social media literacy (Vanwynsberghe *et al.*, 2011). The users must possess dynamic behavior by having right attitudes and confidence to use that skill. Bahk, Sheil, and Lin (2010) for example, clearly show a strong connection between social media and the millennial community, to use social media platforms, particularly in seeking for job opportunities.

2.2 Entrepreneurial intention and its antecedents: the Theory of Planned Behavior

Conceived as a process, at the heart of the entrepreneurship process is the notion of voluntary decision-making embedded in the concept of intention. According to the extensive literature on social cognition, entrepreneurial intention is the best predictor of a certain behavior, i.e., career choice, which is basically built on cognitive processes (Krueger *et al.*, 2000; Peterman and Kennedy, 2003; Lanero *et al.*, 2015). As a growing research field, entrepreneurial intention is indeed being assumed as the best predictor of an individual's planned behavior, especially when such behavior is difficult to observe or concerns a certain unpredictable time lag. It is therefore essential to understand how these intentions are actually formed.

Recently, some new theoretical perspectives have emerged to explain the actions and logic that underlie entrepreneurial behavior (i.e., effectuation theory, Sarasvathy, 2001, bricolage theory Baker and Nelson,

2005). Effectuation, for example, refers to a logic that is complementary to traditional causation logic, and is more appropriate for dealing with situations of extreme uncertainty and which require assets such as creativity, problem solving and tolerance for ambiguity (Sarasvathy 2001). Effectuation is therefore a theory of design, which responds to uncertainty, goal ambiguity, and social enactment of meaning in actions (Sarasvathy 2004), mainly dealing with more advanced stages of the entrepreneurial process. Conversely, the TPB has been extensively adopted in the field of entrepreneurship to predict students' entrepreneurial intention (Lortie and Castrogiovanni, 2015; Linàn, Urbano, and Guerrero 2011; Ramos-Rodrıguez *et al.*, 2010), and better deals in explaining future, perspective planned actions. Moreover, the existing research has widely tested and validated this empirical framework (see for example: Krueger *et al.*, 2000; Krueger, 1993; Tkachev and Kolvereid, 1999; Peterman and Kennedy, 2003; Kolvereid, 1996; Guerrero *et al.*, 2008) adapting the original theorization to various kinds of entrepreneurial endeavors.

The TPB is in fact widely considered one of the most adopted and influential frameworks for explaining and predicting specific individual behaviors. It identifies three close determinants of behavioral intention: perceived attitudes toward the behavior, the social norm, and perceived behavioral control. According to the TPB, attitude represents the overall desirability that individuals manifest in respect to a specific behavior, and can be summarized as the personal beliefs and expectations about the behavior in question. Social norm refers to the sum of the perceptions of individuals regarding how influential people in their lives judge their involvement in a certain behavior, such as starting a business. Therefore, it is based upon a belief of social expectation that conditions such behavior (Bicchieri, 2012; 2017).

The circle of influential people usually includes family, friends, and people who are particularly relevant to the individual. Perceived behavioral control refers to individuals' personal beliefs about being capable of performing a specific behavior and represents the perceived ease or difficulty of performing such behavior (Ajzen, 1987; Ajzen, 1991). At the core of the TPB is that all social behaviors are reasoned, controlled or planned (Ajzen and Fishbein, 2000) and intention, which is the extent an individual is committed to some prospective target behavior, robustly explains and predicts any plannable social behavior (Krueger and Carsrud, 1993; Krueger *et al.*, 2000). Since in the current research entrepreneurial intentions are considered a clear manifestation of voluntary and conscious decisions to possibly join in new venture creation, it becomes crucial to an in-depth understanding of how such decisions are made.

2.3 Hypotheses' development

In the overall media system, social networks are the most visited websites in which students engage in online chatting and forums (often instead of face-to-face interactions) making them generally highly dependent on the internet (Kuss *et al.*, 2013). Students show good knowledge of ICT due to its widespread usage and application in schools and academia. Today

they use a wide range of devices and online platforms to enable their learning process (Gualtieri *et al.*, 2012). According to Tsai *et al.*, (2009), the use of internet and online platforms has a significant effect on students' habits and behavior. The social media is used as a platform to create networking and for knowledge sharing, business dealing and employment. Laurence (2012) explains young users spend time on the internet for various reasons, such as employment, professional relations and social interactions. Furthermore, undergraduate students are technology savvy and fast learners in technology development, making them the most active group following the latest trends of technology (Park, 2010). Experienced internet users have greater self - control in terms of their addiction to the internet and apply it more purposefully because they have greater exposure on internet usage and function (Mafé and Blas, 2006). In light of the aforementioned perspectives, social media are assumed to impact on individuals' cognitions, emotions and behaviors. As such it is possible to conclude that social media dependency affects students' attitudes, their idea to have control over realizing a certain action, and the way they perceive the judgement of their peers, families and society at large, in performing certain actions.

Although to date limited research on individual-level media dependency (e.g. Lowrey, 2004; Ho *et al.*, 2015; Morton and Duck, 2001) has analyzed these influential effects on users' attitudes and behavior, Lowrey (2004) adopting the MSD framework on a sample of U.S. residents, examined people's media dependency following the September 11 terrorist attacks, finding that individual-level media dependency significantly predicted changes in the respondents' overall attitudes and behavior. Ho *et al.*, (2015), applying the TPB and MSD theory on Singaporean citizens, found that media dependency positively predicts two types of pro-environmental behaviors. Morton and Duck (2001) examined the effect of media dependency in predicting safe sex attitudes and behaviors in a gay community.

Therefore, built on MSD theory and combining the concept of information literacy with the evidence underlying this theory, this study hypothesizes that social media have an important role in shaping entrepreneurial awareness and consciousness in students. Their effect is even better understood in high school students who have not received an entrepreneurial education, and whose strong digital culture influences the way in which they seek, process and share information and knowledge.

As a consequence, the following hypothesis is formulated:

Hp.1: Social Media dependency positively affects students' Entrepreneurial Intention

The previous section has clarified that the TPB distinguishes perceived attitudes, social norm, and perceived behavioral control as close determinants of a specific behavioral intention (Ajzen, 1987; Ajzen, 1991). As Ajzen (1991) originally theorized, attitudes, subjective norms, and PBC were believed to be preceded by one's general beliefs. Entrepreneurship scholars have expanded upon this original theorization to include all types

of different variables that precede the TPB and earlier research applying the TPB highlighted that the three usual antecedents of intention are in turn affected by external/exogenous phenomena, mainly related to individuals' social, cultural and institutional context (Linan *et al.*, 2011). Accordingly, other constructs that were not a part of the original TPB have also been tested as antecedents to the model. For example, gender (Kolvereid, 1996; Zhao *et al.*, 2005), autonomy, authority, self-realization, and economic opportunity (Kolvereid and Isaksen, 2006) personality traits, i.e. openness, conscientiousness, extraversion, agreeableness, and neuroticism, (Obschonka *et al.*, 2010, Roy *et al.*, 2017), past entrepreneurial experience, education, and growing up in a family with a family business (Carr and Sequeira 2007; Dimov 2010; Lim *et al.*, 2010; Peterman and Kennedy 2003; Zhao *et al.*, 2005) have been found to be significant antecedents to attitudes, subjective norms, and PBC.

Therefore, over the last 20 years, entrepreneurship scholars have expanded and altered the original theorization to include all these types of different determinants and antecedents, in order to improve the applicability of the TPB in explaining and predicting several entrepreneurship phenomena (Lortie and Castogiovanni, 2015). Hence, to accomplish with the study research aims, this prior evidence is deemed to be supportive in introducing an additional construct in the TPB base-model as a possible antecedent of entrepreneurial intention, namely social media dependency. In fact, the acquisition of information and knowledge through social media tools might make the difference, particularly in young students' development of favorable/unfavorable beliefs and perceptions regarding various kinds of entrepreneurial endeavors.

As noted above, very little research on individual-level media dependency has considered these enhanced effects on individuals' attitudes and behavior. However, applying the TPB and MSD theory in the field of mass communication, Ho *et al.*, (2015) examine the effects, amongst other variables, of the three antecedents from the TPB and media dependency on certain kinds of pro-environmental behaviors.

Hence, this study attempts to examine how the level of entrepreneurial knowledge and information gathered through social media influences the three closed antecedents of entrepreneurial intentions. As such, we formulated the following hypotheses:

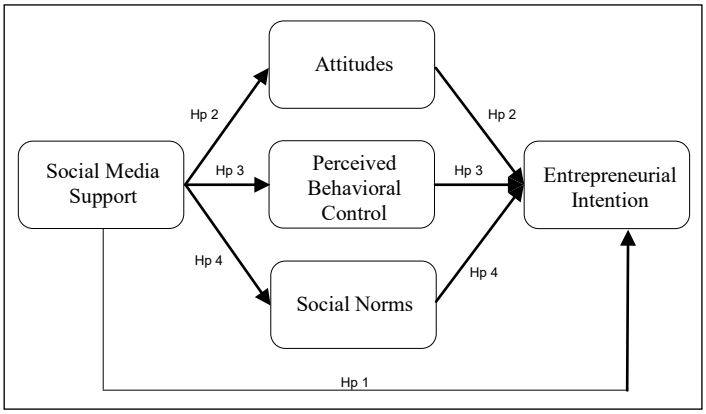
Hp.2: The relationship between Social Media dependency and Entrepreneurial Intention is mediated by Attitudes

Hp.3: The relationship between Social Media dependency and Entrepreneurial Intention is mediated by Perceived Behavioral Control

Hp.4: The relationship between Social Media dependency and Entrepreneurial Intention is mediated by Social Norms

All the above hypotheses are summarized in the model depicted in Figure 2.

Fig. 2: The empirical model of research



Source: Authors' elaboration

3. Data and Method

3.1 Sample

To test the above hypotheses, a survey on high school students in two poles located in Southern Italy was developed administering a web-based structured questionnaire during classes in March-April 2019. The school was a technical institute which includes three different professional macro-profiles: fashion and textiles, tourism, and mechanics. All the students in our sample had never received any kind of course or education about entrepreneurship.

This study followed recommendations by Conway and Lance (2010) for minimizing the issue of common method bias in three ways. First, the study adopted a self-reporting response method to capture individuals' attitudes and perceptions - all of which representing information with limited alternative sources. Second, providing robust construct validity and absence of overlaps amongst items (details are provided in the measurement section). Third, the study adopts proactive design steps in order to lessen these effects by randomly distributing three different versions of the survey, in which each one presented a different order of the questions, and a different order of the items within each question. At the end of the process, 363 valid responses were obtained.

3.2 Measures and common method variance

Following Churchill (1979) and Kline (2005), in this study all the constructs were measured with multiple items generally adapted from validated scales from previous studies (Table 1). Table 2 shons all the key independent and dependent measures and their related statistics for construct validity.

Entrepreneurial Intention was measured with six items based on the Entrepreneurial Intention Questionnaire (EIQ) first developed by Liñán and Chen (2009) and later modified by Liñán *et al.*, (2011). Following Liñán and Chen (2009), this study adopted a pure-intention measure. To assess the psychometric qualities of the intention measure, a principal component analysis with Varimax rotation was performed. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.91) and the Bartlett test (significant at the 5% level) provide assurance that the scale is homogenous and adequate. This is also confirmed by Kaiser's criteria (unidimensional measurement scale) and the explained total variance (83%). The reliability of the scale is also acceptable based on Cronbach's alpha (0.95), Jöreskog's rho (0.96) and the rho of convergent validity (0.83).

TPB variables were measured with 14 items in total, partially adapting the scale proposed by Liñán *et al.*, (2009) attitudes (5 items), subjective norms (3 items), and perceived behavioral control (6 items).

To obtain a score for the Attitude variable, a component score between the five items was computed for this construct (Bartlett test significant at the 5% level, KMO 0.85). The reliability of the scale is good based on Cronbach's alpha (0.89), Jöreskog's rho (0.92) and the rho of convergent validity (0.71). The same procedure was developed for Perceived Behavioral Control measure (Cronbach's alpha 0.92, Jöreskog's rho 0.94 and the rho of convergent validity 0.72) and Subjective Norms (Cronbach's alpha 0.79, Jöreskog's rho 0.88 and the rho of convergent validity 0.71).

To measure Social Media dependency, this study developed a Social Media Entrepreneurial Support scale heavily built on the scale proposed by Liñán and Chen (2009) adapting their five items used to evaluate how entrepreneurial education support affects attitudes and intentions. As such, respondents indicated their agreement with the following four statements: "Social Media generated in myself a greater appreciation of the figure of the entrepreneur"; "Social Media generated a preference in myself for the opportunities offered by being an entrepreneur; "Social Media helped develop the skills needed to be an entrepreneur"; "Social Media helped develop the intention to become an entrepreneur". Interviewees were asked to indicate the extent of their agreement/disagreement with each statement on a 7-point Likert scale or, in the case of social media support, to what extent each factor is supportive in developing entrepreneurial awareness. The final score for Social Media dependency was calculated as the component score of the four adapted items. The reliability of the scale is good based on Cronbach's alpha (0.88), Jöreskog's rho (0.92) and the rho of convergent validity (0.74).

Based on previous research (Linan and Chen, 2009; Yordanova and Tarrazon, 2010; Parker, 2009; Rotefoss and Kolvereid, 2005; Tkachev and Kolvereid; 1999) this analysis considers a set of control variables that could potentially influence a student's entrepreneurial intention: in particular,. (i) gender a dummy variable that equals one if the individual is a female, and zero otherwise -, (ii) age - which equals the individual's age - (iii) work experience - respondents were asked to indicate "yes" or "no" to the following question "Have you ever worked in the past?" -, (iv) entrepreneurial background (respondents were asked to indicate "yes" or

"no" to the following question "Are your family members Have your family members ever been business owners?" -, (v) time spent on social media, have been included as control variables.

Tab. 1: Research constructs and items

Latent Variable	Items	References
Attitude (ATT)	Being an entrepreneur implies more advantages than disadvantages to me	Linan *et al* 2009
	A career as entrepreneur is attractive for me	
	If I had the opportunity and resources, I'd like to start a firm	
	Being an entrepreneur would entail great satisfactions for me	
	Among various options, I would rather be an entrepreneur	
Perceived Behavioral Control (PBC)	To start a firm and keep it working would be easy for me	
	I am prepared to start a viable firm	
	I can control the creation process of a new firm	
	I know the necessary practical details to start a firm	
	I know how to develop an entrepreneurial project	
	If I tried to start a firm, I would have a high probability of succeeding	
Subjective Norms (SN)	If you decided to create a firm,would people in your close environment approve of that decision? Indicate from 1 (total disapproval) to 7 (total approval).	
	Your close family	
	Your friends	
	Your colleagues	
Entrepreneurial Intention (EI)	I am ready to do anything to be an entrepreneur	Linan and Chen 2009
	My professional goal is to become an entrepreneur	
	I will make every effort to start and run my own firm	
	I am determined to create a firm in the future	
	I have very seriously thought of starting a firm	
	I have the firm intention to start a firm some day	
Social Media Dependency (SMD)	Social Media generated in me a greater appreciation of the figure of the entrepreneur	Self-elaboration from Liñán and Chen (2009) entrepreneurship education scale
	Social Media generated a preference in me for the opportunities offered by being an entrepreneur	
	Social media helped develop the skills needed to be an entrepreneur	
	Social media helped develop the intention to become an entrepreneur	

Source: Authors' elaboration

To assess some typically specific endogeneity threats, this study examined the data for common method variance using the Harman single-factor test, which is commonly utilized in entrepreneurship and small business studies for detecting such bias (Walter and Block, 2016). The results of the factor analysis suggest that there is not a single dominant

factor, as the data revealed that all factors with eigenvalues exceeding one, accounting for 35.1 percent of the variance (where adequate threshold is <50 percent). Thus, the results suggest that common method variance is not a substantial concern, given that no single factor accounts for the majority of the variance within our data.

Tab. 2: Study measures and construct validity estimates

	Items (n)	Cronbach's alpha	RHO of convergent validity	RHO (Joreskog)	Eigenvalue	KMO	Percent of variance explained
Entrepreneurial Intention	6	0,959	0,831	0,967	4,985	0,915	83,090
Attitude	5	0,898	0,710	0,924	3,553	0,852	71,062
Perceived Behavioral Control	6	0,923	0,727	0,941	4,362	0,868	72,701
Subjective Norms	3	0,794	0,715	0,882	2,144	0,698	71,473
Social Media Dependency	4	0,884	0,743	0,920	2,971	0,832	74,271

Source: Authors' elaboration

3.3 Analytical method

To test the research hypotheses (i.e., the direct effect of social media dependency and the mediating effects of attitude, perceived behavioral control and social norm on entrepreneurial intention) OLS regression analysis was employed. Prior to running the analysis, to assess some typically specific endogeneity threats, the study checked for simultaneity problems a following prescriptions from Anderson *et al.* (2018) and Anderson (2022) 'swapping' the independent and dependent variables and evaluating whether the original dependent variable was a statistically significant predictor of the original independent variable. This approach yielded little insight into whether endogeneity is present in a model (Wooldridge, 2010). Our results show no statistical significance, assessing that simultaneity is not an issue in our data. This study followed the multi-step procedure of Baron and Kenny (1986) to test the mediating effects of TPB variables. In particular, the first model only took the control variables into consideration. The second model incorporated social media support to study hypothesis Hp1. In model 3,4 and 5, we regressed social media support on the three variables derived from Ajzen's TPB (namely, social norms, attitude and perceived behavioral control). Finally, model 6 includes the effects of overall independent variables, namely social media support and the three variables that represent the traditional dimensions of the TPB, to investigate Hp 2 ,3 and 4. In addition, to assess the mediating effects the bootstrap approach suggested by Zhao *et al.*, (2010) and the method by Preacher and Hayes (2008) was employed, setting the bootstrap samples to 5000 and the confidence level to 95%. Finally, to assess multicollinearity, the variance inflation factor (VIF) of each independent variable was computed.

4. Results

Descriptive statistics of the variables used in the study are provided in Table 3. As can be seen, more than half (57%) of the respondents are females, average age is of 18 years old. The majority of students (72.2%) do not have an entrepreneurial background but at the same time have previous work experience (78.8%). About the time spent on social media, about 27% of respondents said they used social media for less than an hour up to 2 hours a day, 47% for 2 to 4 hours a day and a good percentage (about 26%) comes to use social media from 4 to more than 5 hours a day.

Tab. 3: Descriptive Statistics of the study's sample (N=363)

Variables		N	%
Gender	Man	156	43
	Woman	207	57
Entrepreneurial Background	Yes	101	27.8
	No	262	72.2
Work Experience	Yes	286	78.8
	No	77	21.2
School Year	Fourth	153	42.1
	Fifth	210	57.9
Study profile	Tourism	232	63.9
	Fashion and textiles	47	12.9
	Mechanics	84	23.2
Social Media Use (frequency)	Less than 1 hour per day	27	7.4
	1 to 2 hours a day	71	19.5
	2 to 3 hours a day	104	28.7
	3 to 4 hours a day	67	18.5
	4 to 5 hours a day	46	12.7
	More than 5 hours a day	48	13.2

Source: Authors' elaboration

Results of regression analyses are presented in Table 4. All VIFs displayed in the last column of Table 4, show values under 2.5, below the threshold (VIF<3) set by scholars (Hair *et al.*, 2010); thus, multicollinearity bias is not an issue.

In Model 1, the control variables all load on the dependent variable. The results show that Work Experience ($p < .01$) and Entrepreneurial Background ($p < .001$) have statistically significant relationship with EI. Social time has a significant relationship at $p < .1$.

These observations suggest that time spent on social media decreases entrepreneurial intent while work experience and the presence of entrepreneurial activities within the family context positively influence the EI. As model 2 in Table 4 shows, standardized Betas for Social Media support ($\beta = .48$; $t = 10.807$; $p < .001$) is positive and strongly significant, confirming Hp1. As we can see from Models 3, 4 and 5, Social Media support significantly affects Attitudes ($\beta = .48$; $t = 10.936$; $p < .001$), Perceived Behavioral Control ($\beta = .49$; $t = 11.430$; $p < .001$) and Social Norms ($\beta = .25$; $t = 4.882$; $p < .001$).

Tab. 4: Results of Hierarchical Regression Analysis

Variable	Model 1 (DV:EI)	Model 2 (DV:EI)	Model 3 (DV:ATT)	Model 4 (DV:PBC)	Model 5 (DV:SN)	Model 6 (DV:EI)	VIF
Gender	-.066 (-1.210)	-.035 (-.748)	-.067 (-1.147)	-.054 (-1.163)	.010 (.182)	.022 (.825)	1.189
Social Time	-.084+ (-1.593)	-.084+ (-1.593)	-.039 (-.852)	-.080+ (-1.806)	.057 (1.079)	-.050* (-1.980)	1.121
Work Experience	.143** (2.790)	.121+ (2.718)	.127** (2.831)	.122** (2.804)	.033 (.642)	.008 (.321)	1.087
Entrepreneurial Background	.224*** (4.396)	.139** (3.085)	.095* (2.104)	.160*** (3.633)	.088+ (1.671)	.037 (1.465)	1.115
Social Media Dependency		.480*** (10.807)	.489*** (10.936)	.496*** (11.430)	.253*** (4.882)	.036 (1.221)	1.500
Attitude						.666*** (17.599)	2.495
PBC						.228*** (5.981)	2.532
SN						.023 (.846)	1.251
Constant	-.140 (-.798)	-.057 (-.372)	-.133 (-.869)	-.081 (-.543)	-.267 (-1.505)	.057+ (.672)	
N. Observ	363	363	363	363	363	363	
R2	.105	.325	.316	.357	.084	.797	
Adjusted R2	.095	.316	.306	.348	.071	.793	
F-Value	10.478***	34.453***	32.961***	39.605***	6.536***	173.838***	

Bold values indicate: + p < .1 * p < .05 ** p < .01 *** p < .001

Source: Authors' elaboration

When including Attitudes, Perceived Behavioral Control and Social Norms (Model 6), the effects of Social Media support on Entrepreneurial Intention is no longer significant, confirming the mediation power of the TPB (only social norms do not affect EI significantly). To better assess the mediating effects, the bootstrap approach recommended by Hayes (2009) and Zhao *et al.*, (2010). indicates that the confidence intervals (bias corrected confidence intervals) of the indirect effects of Attitudes and Perceived Behavioral Control are .58-.75 and .13-.32, respectively. These confidence intervals did not include 0, demonstrating that the indirect effects are significant, and the mediations are established. Therefore, these results support Hp 2 and Hp 3, whereas Hp 4 (the mediating effect of Social Norms on Intention) does not find support in the data.

5. Discussion

The present study aimed to understand the role that social media play in the formation of entrepreneurial intentions among high school students. It considers a sample of individuals that have never been subjected to notions of entrepreneurship (having never followed courses or specific education on the theme of entrepreneurship), setting a research design that involved the investigation of the impact of social media, defined as information sources and knowledge vehicles, on the attitudes and perceptions that

lead to students' entrepreneurial intention. With this aim the study tried to fill two main gaps emerging from the existing literature on student entrepreneurship: first, the considerable lack of studies analyzing the very early formation of entrepreneurial intentions, by considering pre-college level students; second, the ignored role that social media have in fostering awareness and interest in entrepreneurship as a career choice among the youngest.

In order to deal with the study's aims, two theories were taken into account for the construction of our theoretical framework and hypotheses, namely the TPB (Ajzen, 1987; Ajzen, 1991; Krueger and Carsrud,1993) and MSD theory (Ball-Rokeach and DeFleur, 1976; Ball-Rokeach, 1985), into which we also integrated the concepts of information and social media literacy (Vanwynsberghe *et al.*, 2011; Bruce, 1997) that contribute to our understanding on how people access, evaluate, organize and use information in order to learn, problem-solve and make decisions. To achieve our empirical goal a survey on classes of high school students was performed, to test the direct effect of social media dependency on entrepreneurial intention, and the mediated effect through their influence on perceptions and attitudes.

Our empirical results demonstrate that social media dependency plays a significant role in the formation of entrepreneurial intention and that this relationship is mediated by the effect that the classical antecedents of intention have had on intention to startup a new venture. Social media dependency, in fact, appears to favor both behavioral and normative beliefs among high school students in two ways: first, by affecting behavioral beliefs that produce either favorable/unfavorable attitudes toward the target behavior, and also affecting individuals 'perception of feasibility; second, by influencing normative beliefs that give rise to the social norm. This in light of the role of social media as one of the most important channels through which young people, above all, communicate, make relationships, exchange information and knowledge with relevant others. All our hypotheses, with the exception of the mediation effect of the social norm, have been confirmed, assessing the robustness of the TPB (Ajzen, 1991) in explaining the formation of entrepreneurial intention among high school students. However, the social norm has been non-significant in a number of different studies, representing the most difficult component of TPB to be interpreted. Ajzen (1991) himself found that this factor is frequently the weakest element of the TPB and, in line with Aizen, Linan *et al.* (2011) affirm that personal attitude and perceived behavioral control are the most relevant factors explaining entrepreneurial intentions. Finally, we can observe that social media dependency, positively associated with entrepreneurial intentions, validates the idea that students may rely on the social media for informational and behavioral guidance. This finding clarifies the instrumental role of social media dependency in inspiring and fostering entrepreneurial awareness, in shaping cognitive and perceptual processes and the consequent intention.

6. Conclusions

6.1 Implications of the study

Evidence from our study makes important contributions to extant literature on student entrepreneurship.

The importance of our work derives from having introduced, within a classic model of intentionality, an exogenous variable, namely social media dependency, in an effort to describe how this construct can explain the formation of positive attitudes and perceptions toward entrepreneurship. Thus, this study expands on the Media System Dependency Theory (Ball-Rokeach and DeFleur, 1976) body of knowledge emphasizing the role of new social media platforms in people (and particularly in very young users) and dependence on information disseminated by social media themselves, that, in turn, determine individuals' cognitive, affective, and behavioral changes.

Considering the social media system for the first time as a critical factor in the development of students' entrepreneurial intention, the empirical framework developed in this study proposes an extension to the classic cognitive approaches, widening the sphere of analysis by increasing the elements that contribute to the development of intentionality patterns. Starting from this pilot study, future research has the potential to increase knowledge about the influence of new media and digital tool on some kind of entrepreneurial tasks and endeavors. In light of this theoretical perspective, studying this aspect is increasingly urgent, given the pervasiveness of these new digital tools, and the importance they have in conveying information, models, lifestyles and knowledge, especially among the youngest (Kim, 2014 a, b).

The study has also some practical and policy-making implications. The Internet is certainly the most important social revolution of recent times, and the drastic nature of the changes made by social media is undeniable: they have changed our lives, the way we relate to ourselves and to others, our way of thinking, of behaving and, last but not least, our education and information processes. The youngest (so called "Millennials") certainly represent that segment of the population most affected by this revolution. Born at the turn of 2000, it is the first generation, in history, that in adulthood shows familiarity with the use of digital instruments. Students use socials as communication tools, transmission and collaboration between networks of people, communities and organizations enhanced by technological features and mobility. When we talk about the primacy of digital, we mean that change in the culture of individuals that causes them to first consult digital channels to communicate, have fun and even get informed. The fruition and production of knowledge takes place more and more often online. According with the results of this study, it seems clear that the influence of social media in our daily activities exists as digital technologies facilitate the search for information. Social media could become a resource to be exploited for students' education. If smartly used, they can help tomorrow's people and professionals grow. Educating everyone to understand digital mechanisms and allowing them to relate

in an informed way has become a necessity. To enhance entrepreneurial intentions, educators should be aware that the social media may offer very interesting didactic possibilities, from the development of creativity to the growth of digital skills and they can help develop, through the spread of entrepreneurial culture and narratives, awareness, and consciousness of entrepreneurship as a possible career choice among students.

In addition, policy makers and educators should acknowledge the importance of social media from an institutional point of view: entrepreneurship research has widely acknowledged that entrepreneurial activity is an important element for a country's economic growth, dynamism (Acs *et al.*, 2012; Acs *et al.*, 2008; Audretsch and Keilbach 2004, 2008) and well-being (e.g., Audretsch *et al.*, 2005; Wennekers *et al.*, 2005). For some people, starting a business may be well outside their range of personal experience. They may live in an environment in which entrepreneurs are few, or in which entrepreneurship has a low profile. Conversely, they may have family or friends who have started their own business or be in an environment in which entrepreneurship is high-profile, with significant positive media attention. The difference is important, as it affects the awareness and perceived attractiveness of entrepreneurship as a positive career option. Therefore, it may be necessary for policy-makers to welcome these new tools as a communication and information vehicle that shapes attitudes and perceptions, especially of the youngest, and should therefore implement entrepreneurship discourse through social media. Along these lines, this study also suggests to educators, teachers, and academics that it is essential to acknowledge the importance of social media as a communication and information tool for the youngest. Accordingly, they should try to develop and integrate within the educational settings the most suitable skills that allow students to manage social media with the aim of seizing and exploiting opportunities and establishing favorable networks.

6.2 Limitations and future research suggestions

Although we believe that the present study is of great importance for having considered, for the first time, the influence of social media on the entrepreneurial process leading to behavioral intentions, this research is not without limitations that present new avenues for future research. First, the convenience sample and our analysis of cross-sectional data prevents causal inference and makes it more difficult to generalize our result to other samples. So future research could apply longitudinal perspectives on more random samples. Moreover, experimental design could clarify causation. A second limitation lies in the measurement items for social media dependency construct. Given that to our knowledge, there is no construct adapted to this concept in the field of entrepreneurship, we adapted other measures for our research purposes. Future research could investigate in depth and refine the measurement pattern. Third, since our sample consists only of high school students who have not received any type of entrepreneurship education, it would be useful and interesting to investigate the same framework on a sample of university students, who have followed specific courses on entrepreneurship, in order to

better disentangle the role that social media have in the formation of entrepreneurial intention compared with education. Finally, endogeneity is an issue especially for those constructs that are novel and could present a bidirectional relationship of influence. And this study is not exempt from this limit. However, this is the first study that has adopted the new construct of SMD in the entrepreneurship field and the simultaneity issue has been managed following the literature on method prescriptions in the application of OLS analysis. But new research avenues have been opened, and future studies can apply in the specific context of entrepreneurship's social media dependency on more powerful tools (like Structural Equation Modeling, Bagozzi and Yi, 2011; Kaplan, 2008) in testing their hypotheses.

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sinergie
italian journal of management

ISSN 0393-5108
ISSN 2785-549X
DOI 10.7433/s119.2022.08
pp. 175-198

Business model for sustainability: motivations and antecedents[1]. An exploratory case of a global manufacturing company engaged in the energy transition

Received 17th May 2022
Revised 28th July 2022
Accepted 15th December 2022

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Abstract

Purpose of the paper: *The UN Sustainable Goal #13 on Climate Action aims to achieve decarbonization targets. The literature tackles a number of motivations and antecedents for an organization to address this. However, the impact of such a transformation on the organization's business model remains underexplored, and the business case remains undetermined.*

Methodology*: This paper is based on a literature review and interviews. This is an exploratory a single case study. As a result, this paper is a conceptual piece of work with insights from literature and an empirical framework from the selected exploratory case. The empirical framework of this paper is the energy transition, which aims to achieve net-zero greenhouse gas emissions by 2050. This is accomplished through reducing emissions in a variety of energy sectors as well as implementing UN Sustainable Goal #7 for affordable and clean electrical energy.*

Findings*: This paper contributes to understanding the strategic motivation and antecedents within an organization that seeks to achieve sustainable targets and where a main business model is already in place. In addition, this paper contributes to the literature on sustainable business models.*

Research limits: *The research has been limited to one single company. By including larger samples and new cases, it can be expanded for a more thorough and in-depth investigation.*

Practical implications*: Building on business model literature, business model innovation, and business models for sustainability as a foundation, this paper initially addresses the theoretical list of antecedents and motives that lead management to define and implement an energy transition strategy. It then checks this list against a real case by adopting an in-depth investigation approach.*

Originality of the paper*: A multinational manufacturing corporation that recently announced an energy transition investment plan to accelerate global decarbonization is thoroughly investigated. It uncovers the emergence of new antecedents such as (1) digitalization, (2) advancement of specific technologies, and (3) the corporation's own culture. Observations reveal that digitalization is becoming an antecedent for business model sustainability. Hence, this paper contributes to clarifying the position of digitalization in relation to sustainability.*

[1] Selected paper from the 7th International Conference on New Business Models "Sustainable Business Model Challenges: Economic Recovery and Digital Transformation", June 23-24, 2022, LUMSA University Rome.

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italian journal of management
Vol. 40, Issue 3, 2022

Key words: business model for sustainability; digitalization; energy transition; sustainable technology

1. Introduction

While describing potential future directions for business model theories, Massa, Tucci, and Afuah (2017) emphasize the need for formal business models for sustainability (BMfS) while taking into account a set of dynamics (e.g., key factors). In 2016, Schaltegger, Hansen, and Lüdeke-Freund (2016) contend that the nature of the BMfS can also emerge from organizations capable of creating new value while maintaining a "green" orientation. In this case, the authors also advocate the modeling of such business models, either for individuals or organizations, by incorporating theoretical constructs into the system dynamics.

Most recently, in their essay "A call for action: The impact of business model innovation on business ecosystems, society, and planet," Snihur and Bocken (2022) state that the need for further research on sustainable business models, or BMfS. Such investigations enable a better understanding of the factors that create long-term value for organizations that seek to add social and environmental dimensions to their economic one.

According to Pereira, Niesten, and Pinkse (2022), how enterprises pursue strategic goals and the management motivations to engage with BMfS in the sustainable energy generation domain are still underexplored. Indeed, given that the phenomenon is still evolving and not yet finalized, motivations for organizations to engage in BMfS may alter over time (Pereira *et al.*, 2022). Macroeconomic factors such as an economic crisis, stakeholder commitment, or a firm's pre-crisis competitiveness can all influence an organization's level of investment in sustainable activities (Bettinazzi *et al.*, 2020). In contrast, Bohnsack *et al.* (2021) claim that digitalization can enable new business models for renewable energy installation in order to optimize energy self-consumption and facilitate communication with end-users.

This research initially reviews theoretical foundations and subsequently investigates an exploratory single case in order to debate the antecedents and motives for enterprises shifting their business model to BMfS. A multinational corporation operating in global power management and energy transition is chosen. This organization is currently implementing its energy transition strategy. Senior managers that are addressing UN Sustainable Goal #13 by developing and implementing an energy transition strategy are interviewed and analyzed to reveal their motivations and antecedents for such a strategy.

By doing so, we hope to contribute to the BMfS literature, which in this case focuses on antecedents and motivators. As a result, the purpose of this paper is to investigate the drivers and antecedents of the business model for sustainability within the context of a developing strategic initiative of a global corporation. In particular, the role of digitalization and the emergence of sustainable technology in energy management is debated, as is their position as determinants. The results are based on an

empirical study of a division of a global manufacturing organization based in Switzerland and operating in the European, Middle Eastern, and African regions (EMEA). In this case, the strategy's implementation is still in its early stages, as the energy transition is a current phenomenon.

In this article, we investigate the following research question:

Research question: What are antecedents for BMfS for manufacturing companies that are moving their business model in the empirical framework of energy transition?

To answer the research question, an in-depth investigative approach is adopted, which is based on an exploratory single case study.

As a result, Part 2 discusses the theoretical context as well as the relationship between BMfS and the energy transition. Part 3 describes the research method employed to address the research question. This section also explains why the exploratory single case of a global manufacturing corporation was chosen. Part 4 presents data collection and analysis, including the interview method, and explicates how the data was processed. Part 5 discusses the results, and the relative details are argued. In the final section, the conclusions and potential future developments are presented.

2. Business model for sustainability - insights from the literature

The conventional idea of the business model is based on the concept of delivering and maintaining customer value, as well as on process optimization (Massa *et al.*, 2017; Zott *et al.*, 2011).

BMfS theories could evolve as a sub-field or as a stand-alone theory from well-established business model and business model innovation theories (Lüdeke-Freund and Dembek, 2017). As a result, academics have begun to investigate the relationship between BMfS and current available theories (Schaltegger *et al.*, 2016). Schaltegger, Hansen, and Lüdeke-Freund (2016) contend that the BMfS exists to share value across multiple stakeholders, which may diverge from the traditional business model assumption (Massa *et al.*, 2017).

In this case, the concept of "sustainability" refers to the incorporation of environmental issues into a company's strategy, operations, and business model in order to maintain an economical footprint while contributing to the environment through sustainable development (Massa *et al.*, 2017). Previously, in 2016, Schaltegger, Lüdeke-Freund, and Hansen (2016) claimed that BMfS could manifest as a coevolution of large and small enterprises toward business model transformation.

The definition of BMfS proposed by Schaltegger *et al.* (2016) and explained by Massa, Tucci, and Afuah (2017) implies that organizations have a responsibility to develop innovative solutions that transform their environmental challenges into market opportunities. By considering the triple bottom line, an organization can generate value for multiple stakeholders while also being a driver of societal progress. Thus, BMfS implies that by having organizations that can deliver economic value or change their value proposition, innovations can mitigate the negative impact on the environment and/or society. This is achieved through

implementing sustainable innovation initiatives (Bocken *et al.*, 2014). Therefore, these innovations can have an impact at the strategic level, such as in the value proposition, supply chain, customer interface, and financial model. They may also be technological, organizational, and/or social innovations (Boons and Lüdeke-Freund, 2013).

In addition, profit-driven business models are a significant impediment to many organizations' progress toward sustainability (Upward and Jones, 2016). BMfS expands the scope of the business model by having the potential to create other types of value, such as social and environmental, and to deliver this to a more extensive stakeholder group (Freudenreich *et al.*, 2019). This trend was also debated by Stubbs and Cocklin (2008), who demonstrated that the BMfS success level is linked to a multitude of shareholders. This expansion of shareholders includes local communities, suppliers, partners, and employees, as well as customers.

As previously discussed, the empirical case of this paper is the energy transition. In particular, Bohnsack, Ciulli, and Kolk (2021, p. 828) stated that the current stage of energy transition is characterized by the coexistence of both new and old business models, with energy transition defined as "the shift from fossil-fuel-based electricity generation to renewables and more sustainable sources." Pereira, Niesten, and Pinkse (2022) further examined how the energy transition drives changes in the business models of utilities operating in the field of sustainable energy generation. As a result, the current energy industry transformation has mobilized the academic community. Multiple studies have been conducted to investigate modifications in the business model toward more sustainable energy innovation and retention. This has focused on different types of activities and organizations, such as utilities (Pereira *et al.*, 2022), European electricity firms (Bohnsack *et al.*, 2021), electric vehicle (EV) manufacturers (Bohnsack and Pinkse, 2017; Bohnsack *et al.*, 2014), urban districts (Gauthier and Gilomen, 2016), solar photovoltaic generation (Vernay *et al.*, 2019), and smart grids (Shomali and Pinkse, 2016).

All of these studies provide an overview of how enterprises are converting their business models to embrace sustainable energy generation and how those models reflect value creation, delivery, and capture (Pereira *et al.*, 2022). Therefore, shifting from a traditional definition of a business model to a new theory that focuses on business models for sustainability (Bocken *et al.*, 2014; Boons and Lüdeke-Freund, 2013; Schaltegger *et al.*, 2016).

3. Research method and business context

3.1 Research Method

The research data is based on qualitative data and interviews. The data gathered from interviews in the exploratory single case is primary data collected directly from senior management of the organization. Indeed, semi-structured interviews aided in the creation of a map between input and output factors (Gray, 2004), which is connected to the gaps identified

in the literature. Furthermore, the semi-structured questionnaire used during the interviews offers some flexibility to explore a phenomenon from different perspectives. This eventually allows new factors to emerge, i.e., factors not cited in the theoretical list (Gray, 2004).

Indeed, the nature of qualitative research tends to be more exploratory, with open-ended thinking rather than pre-coded questions and responses (Easterby-Smith *et al.*, 2015). One remarkable characteristic of the qualitative approach is that it gathers data from a variety of sources, including observations and interviews (Gray, 2004).

3.2 Case Selection

According to the 2020 International Energy Agency's report on sustainable recovery (IEA, 2020), the energy sector must accelerate the use of renewable electricity sources in order to reduce the environment's carbon footprint. This can occur through the adoption of innovative solutions and technologies that directly improve the energy efficacy of buildings or residential homes, industrial processes, and transportation electrification, such as electric vehicles (EVs) and their charging infrastructure.

In fact, the European Commission's current vision is that buildings have great potential to contribute to the 2030 and 2050 decarbonization objectives. This is because they consume 40% of the energy and generate 36% of greenhouse gas emissions (European Commission, 2021). Most recently, in December 2021, the European Commission amended the directive on building energy performance, reinforcing the message that the goal is to reduce building energy use while making them more energy efficient and less dependent on fossil fuels.

A division of a multinational manufacturing corporation operating in Europe, the Middle East, and Africa (EMEA) that provides solutions for improving building energy efficiency, including energy storage, microgrids, EV charging stations, and associated energy management software, is appropriate in this context. With an annual revenue of over 17 billion dollars, the corporation can provide its clients globally with high-quality products and services in the power management field. This enterprise is well-positioned to observe the transformation toward sustainable solutions and digitalization, as was announced during the annual investor conference in 2021.

During this conference, the global leadership team announced the corporation's energy transition strategy for its electrical sector. This was the result of a global strategy where each region chooses to focus on one or more business segments. Prior to defining a global strategy for energy transition, the corporation was previously involved in other sustainable initiatives. Indeed, over the past decade, the company began with energy storage and focused on residential, commercial, and industrial markets, as well as microgrid segments. They partnered with a major electronic vehicle (EV) manufacturer to provide first and second life lithium batteries and power management. Their product line is centered on EV batteries, both new and used, which can also be used for stationary energy storage applications. Following this, the company chose to invest in an energy management

system to complement its software as a service offering. Most recently, in 2021, the company acquired an EV charging station and software charging point operator manufacturer. This enables the organization to bundle electric vehicle (EV) charging stations with its previous offerings, which provides additional value for their final customers.

Publicly available secondary data about the corporation (including comparisons with peers, industry reports, and business targets) as well as its official communication towards the energy transition were collected. Senior leaders were then invited to participate in the study and provide future updates on the evolution of the strategy's deployment. Traditionally, the division's headquarters are based in Switzerland, where they oversee all business operations in the EMEA region. This includes the design, manufacture, and sales of power quality products, as well as energy storage solutions for their B2B clients. Some software solutions, mainly to facilitate energy management and the user experience, are also provided to final customers.

4. Data and Analysis

4.1 Data collection

Individual interviews conducted via an online communication platform served as the primary method of gathering data. The majority of senior leaders were interviewed. In order to cover all geographical areas and directions such as general management, marketing, strategy, and sales, three individuals were identified. All of those interviewed were part of the corporate-wide team responsible for defining the company's energy transition strategy. Interviews lasted between 45 and 60 minutes and were conducted in November and December 2021. They have been recorded, transcribed, analyzed, and are displayed in Table 1.

The semi-structured interview questionnaire is presented in Appendix A.

Tab. 1: Overview of the interviews conducted

Role of the person	Responsibility	Type, date of contact
General Manager for electrical vehicle charging infrastructures, energy storage and microgrid	Responsible for the whole offering and business in the EMEA region	Web interview, 17 November 2021
Segment leader, Commercial & Industrial Building, EMEA	Leading the commercial and industrial building segment and involved in the energy transition strategy for buildings and electrical vehicle charging infrastructure	Web interview, 24 November 2021
General Manager and Sales leader for Italy	Responsible for the whole sales and market in Italy	Web interview, 23 December 2021

Source: Authors elaboration

As depicted in Table 2, secondary data was sourced from the official corporate website. These included investor conferences, white papers, and landing pages.

Tab. 2: Overview about secondary data

Date	Topic	Type of data
March 2021	2021 Annual Investor Conference - Electrical sector	Investor annual conference
January 2022	Understand how EV charging works in commercial buildings	White paper
2021	Energy Transition	Landing page

Source: Authors elaboration

4.2 Data analysis

Yin's (2018) pattern-matching approach was used to code the data. We discovered a main theme, such as antecedents and motivators for BMfS, and a relative pattern (Yin, 2018, pp. 165-200). This is presented in Table 3. The inductive strategy that we adopted begins with observations and interviews, then progresses to formulate empirical generalizations. Finally, how this exploratory case can contribute to existing BMfS theory is identified (Gray, 2004, p. 126).

As a result, in order to categorize the factors, provide context within the observed phenomenon, and link them to future outcomes, traditional axial coding was used for the data analysis (Gray, 2004). Indeed, axial coding lends itself to an additional interpretation of the phenomenon as a causal interaction between various parameters (Gray, 2004). As a result, the primary objective was to use the questionnaire to stimulate the classical features of business model theories that emerged from the literature review and to connect them to other aspects (Easterby-Smith *et al.*, 2015). These aspects include current claims in the literature regarding BMfS, stakeholders, and performance factors.

Table 3 displays the evidence of the collected data and the first level of coding employed. Consequently, the main contribution of this paper is to clarify the position of digitalization in relation to BMfS, revealing it as an antecedent. The second contribution of this paper is the confirmation of four business patterns, or BMfS archetypes, that emerge from the literature.

Tab. 3: Quotation table with evidence from primary

Theme	Data supporting the theme	Type of source	Pattern
Antecedents and Motivators for BMfS	"The effect on digitalization on the energy transition inside the company will be positive but it will be a transformation. Indeed, energy transition can be seen as 3D: decarbonization, decentralization and digitalization. Digitalization will help to get more data and more data means more analysis and more analysis means more services. Ideally, it will be possible to have more control, optimalization against user or customer preferences"	Primary	Definitions Position of digitalization
Antecedents and Motivators for BMfS	"Digitalization and digital transformation is needed for future products and if we need think around buildings where there are EV charging station, HVAC, PV and other assets in order to maximize the self-consumption you need those assets to communicate each other or you need to change a bit the behavior how to consume energy."	Primary	Facilitate self-sufficiency
Antecedents and Motivators for BMfS	"So, there is an implicit motivation to grow the sales of existing products and thanks to this transition the company decided to change its strategy to go more in the direction of sustainable approach. Indeed, we believe that it is possible to apply in their own buildings the solutions that are developing to reduce the CO2 footprint, energy consumption, etc.."	Primary	Move toward sustainability and renewable products Re position the business to have an environmental positive impact
Antecedents and Motivators for BMfS	"…the grid will need flexibility in the different sector where energy is consumed such buildings, industry, residential, EV charging infrastructure. Each of this sector can contribute to energy transition and they are also touched by the energy transition."	Primary	Efficiency

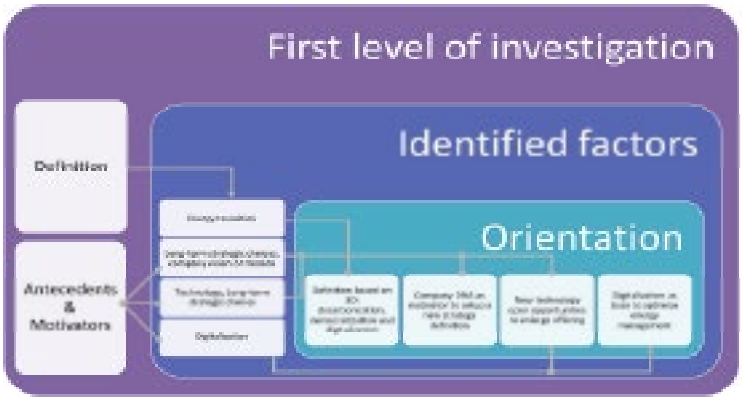
Source: Authors elaboration

5. Discussion

The exploratory single case study's energy transition initiative is the result of past activities toward sustainability that the corporation was already pursuing prior to the 2021 announcement. This initiative is built on three fundamental pillars: decarbonization, democratization, and grid digitalization. Decarbonization is linked with the notion that carbon neutrality is required by 2050, and it is aligned with the UN's Sustainable Goal #13 on Climate Action. Democratization and digitalization relate to the products and services that the corporation would like to provide in order to mitigate its carbon footprint. Generally, three major factors emerge as antecedents and motivators during the interviews.

The positioning of the factors and their relationships to one another are shown in Figure 1. This map serves as a visual representation of the current state of the organization under analysis. The research's primary findings have a specific current orientation that originates from the managerial understanding of the subject.

Fig. 1: Illustration of the relationship between factors and their orientation



Source: Authors elaboration

5.1 Digitalization becomes an antecedent BMfS

Organizations can now interact directly with end-users thanks to digitalization, and they can discover new ways to deliver value through energy efficiency optimization (Bohnsack *et al.*, 2021) or by recommending changes to user behavior (Vernay *et al.*, 2020).

To date, the relationship between digitalization and BMfS remains unclear. Some studies demonstrate that digitalization has a generic positive impact on sustainability, while other research tends to reject this claim and emphasize digitalization's negative consequences on sustainability (Bohnsack *et al.*, 2022). For instance, the high computational capability of digitalization can promote an increase in energy consumption (Itten *et al.* 2020).

Most recently, Pereira, Niesten, and Pinkse (2022) discovered that digitalization enables smart energy management. Indeed, they demonstrate that as utilities modernize their networks by including digital solutions, communication, and software services, they may focus on more digitalized and decarbonized energy generation (Pereira *et al.*, 2022). This will enable organizations to reconfigure their existing business model toward sustainability.

In addition, as debated by Vernay *et al.* (2020), the recent application of digital technology in the energy sector offers an innovative development for both enterprises that operate in this sector and for the industry as a whole.

The originality of this paper is demonstrated by the inclusion of digitalization as a motivator for BMfS. In fact, unlike utilities, which prioritize digitalization to reinforce an energy system's centralization (Pereira *et al.*, 2022), digitalization is seen as a way to trigger energy decentralization.

Digitalization enables the connection of multiple resources, such as EV charging stations, solar PV inverters, battery storage, and HVAC systems, to maximize the use of energy derived from solar generation. It

also facilitates energy management decisions that can alter the dynamic between how users consume or produce energy.

This paper demonstrates that the deployment of prior digital solutions serves as enablers for new BMfS, including photovoltaics (PVs), energy storage, data analytics, cybersecurity, and electric vehicle (EV) charging infrastructure. This is in contrast to Shomali and Pinkse (2016), who consider that the energy firm's ability to innovate business models while utilizing digital solutions such as smart meters is restricted.

Digitalization is therefore considered an antecedent, as without it, a full energy transition will be difficult to achieve. Indeed, part of the organization's definition of energy transition includes digitalization. Whereas, according to the second interviewee, "digitalization has become one fundamental pillar of energy transition strategy of the company, which is based on three components: decarbonization, democratization, and digitalization."

5.2 New technology open opportunities to embrace energy transition

Bohnsack, Ciulli, and Kolk (2021) recently demonstrated that new technologies such as storage or demand response have improved the reliability of renewable energy installations in order to provide energy over a certain timeframe. Digital technologies have augmented this antecedent by enabling direct communication with customers to share electricity consumption, incentivize electricity-saving behavior, or optimize energy self-consumption (Bohnsack *et al.*, 2021). To date, technology has emerged as a crucial enabler for the transition to new business models. Indeed, the volatility and intermittent nature of renewable energy will have an impact on grid stability. Consequently, the grid will need greater flexibility to manage various problems and loads, including demand response at both grid and site levels (Pereira *et al.*, 2022). In addition, the interviews reveal that the expansion of new technologies such as energy storage and electric vehicles could present both an opportunity and a challenge for sustainable energy management. On the one hand, emerging technologies could add capacity by making additional resources available to assist the grid when needed. On the other hand, grid operators such as utilities and distribution system operators will need to strike a balance between the supply and demand of energy (Helms *et al.*, 2016). In fact, some sectors affected by the energy transition will alter their traditional modes of operation. For example, this is the case for future buildings that will have to produce energy and support the grid whenever it is needed. The same rule could apply to electric vehicles or any other battery that could eventually provide additional capacity to assist the grid when other resources are unavailable.

Meanwhile, Helms, Loock, and Bohnsack (2016) contend that energy sector enterprises are developing new business models to address the need for time-based flexibility. As was evidenced from the interviews, this factor will become increasingly significant with the advent of electric vehicles. Their high demand for energy and power may generate congestion points that grid operators will need to manage. This implies, as the segment leader stated, that "in the future, the flow of the energy will be more and

more complex, impacting the whole traditional way to distribute energy that is moving from centralized to decentralized approach." Still, there are a few unresolved issues, particularly in the regulations, such as vehicle-to-grid, where the energy transfer from EV batteries to the grid is not fully standardized. These may add greater complexity to the development and prioritization processes.

From an empirical context, this paper validates four of the business patterns identified by Bocken *et al.* (2014). As shown in Table 3, the collected primary data supports the business patterns that this corporation under study is repositioning its strategy toward more sustainable products and solutions. This assists end-users in maximizing their energy self-sufficiency when this energy is generated from renewable sources. Finally, digitalization promotes the energy-efficient harmonization of multiple assets.

5.3 Company DNA plays a key role on motivation toward a new strategy definition

Bock *et al.* (2012) demonstrated that an organization's culture and strategic flexibility can influence the innovation of the business model phase. In addition, they contend that culture is a critical driver of business model innovation. Furthermore, innovation is a tool for transforming and reviewing the business model (Demil and Lecocq, 2010) and is key to an enterprise's performance (Zott *et al.*, 2011). It may also be a "permanent revolution," as the ongoing decisions of each firm have ramifications on the business model (Casadesus-Masanell and Ricart, 2010, pp. 198-200). As a result, according to Demil and Lecocq (2010), managers must constantly evaluate their portfolio of competencies and resources to modify the organization or business model elements in order to best optimize the corporation's potential. This suggests that every firm makes decisions with functional repercussions, regardless of the existence of a feasible long-term strategic plan or a satisfactory business model (Casadesus-Masanell and Ricart, 2010). In this specific exploratory single case study, the corporate DNA has been the fundamental driver in defining the energy transition strategy. Behind the implicit motivation to increase financial performance, we discovered that the current transition in the energy sector is creating a demand for sustainable approaches to satisfy multiple stakeholders. This includes investors, customers, shareholders, employees, and markets where the corporation operates.

5.4 Further implications for organizations and management

There are several unresolved questions regarding the impact of BMfS on energy-transitioning enterprises. When considering management cognition and the initial and boundary conditions, the future positioning of the factors remains unexplored.

Future analysis might consider other sets of factors as well as moderators and outcomes to examine how the corporation adjusts its business model toward sustainable energy management and how this may challenge the

traditional view of the business model by delivering benefits to multiple stakeholders. Future research might examine the evolution and dynamics of the new business models, as well as the adaptation of managerial skills and knowledge. These topics pertain to the exploration of how and to what extent the new organizational structure and activity reconfiguration will impact the performance of BMfS.

6. Conclusion

This paper investigates the early motivations and antecedents for a global power management corporation engaging in sustainable operations to address the energy transition. Digitalization is becoming a central component of its energy transition strategy because it can enable additional value for customers and alter the customer relationship dynamic (Parida *et al.*, 2019; Boons and Lüdeke-Freund, 2013). This relationship is fundamental to the success of the organization's energy transition strategy. In fact, the definition of digitalization as an antecedent for BMfS is the most significant primary theoretical contribution.

Other factors, such as the firm's DNA and technology, have also been identified as primary drivers of business model innovation. However, the lack of clarity in certain policies or standards, such as the vehicle-to-grid regulations, governs the energy flow from electric vehicles to the grid. This can complicate a company's priorities, investment plans, and business model developments. This is the second contribution of this paper, as it validates existing patterns for BMfS from an empirical case.

Finally, this research contributes to the literature on new business models associated with the sustainable energy transition by analyzing a specific case involving a division of a multinational corporation. Managers and academics who are interested in the potential of innovative business models in these settings can use them to become knowledgeable about how other organizations and industries practice.

In conclusion, the growing number of corporate sustainability initiatives that focus on sustainable energy management add to and enhance the literature on business models for sustainability and contingent theories.

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Appendix A - Interview questionnaire

Initial questions

1.1 Could you introduce yourself? Roles, background, etc.…
1.2 How do you define energy transition within your company?

Antecedents and Motivators

2.1 What is the division motivations to engage in the energy transition?
2.2 Could you list main drives (external or internal) for adopting an energy transition initiative?
- Internal/Long term strategic choice.
- Internal/Digital transformation of the company.
- External/Technology.

2.3 Do digitalization and/or digital transformation of your division help to the energy transition initiative? Please describe.

sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s119.2022.09
pp. 199-213

sinergie
italian journal of management
Vol. 40, Issue 3, 2022

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Vol. 40, Issue 3, 2022

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Sinergie Italian Journal of Management

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What is the positioning of Sinergie Italian Journal of Management?

Sinergie Italian Journal of Management, the official journal of the Società Italiana di Management (SIMA-the Italian Society of Management), is a peer-reviewed scholarly publication that presents leading research across all business and management areas and focuses on the main trends and boundary-pushing ideas in management studies.

What is this journal's topic coverage?

The journal has a broad thematic profile and covers various areas in the business and management field, such as strategic management, corporate governance, entrepreneurship, international business, sustainability, small and family business, operations and supply chains, strategic communication, marketing, retailing and service management, innovation and technology management, tourism and culture management and, of course, business ethics and general management.

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This journal aims both to bring the Italian management perspective to the international debate and to encourage scholars worldwide to contribute through an innovative approach on topics relevant to the sound conduct of businesses and other organisations. The journal's keywords include, but are not limited to, management applications specially relevant to the Italian economy and other mature economies, such as manufacturing, creativity, sustainability, open innovation, digital transformation, entrepreneurship in small and medium-sized enterprises, family business, networks, alliances and territorial ecosystems, innovative value proposals and circular business models, as well as to the management of specific businesses, such as food, fashion, furniture, industrial equipment, art, culture, tourism, design and luxury.

How broad is the scope of this journal?

Sinergie Italian Journal of Management aims to balance relevance with methodological rigour and encourages interpretation, reasoning and critical, context-aware discussion about phenomena and their managerial implications. Narrow discussions focussed only on highly specific sub-fields will be regarded as non-priority.

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When is the journal published during the year and are special issues part of the editorial planning?

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What principles drive the conduct of this journal?

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- **Relevance**: The journal values the usefulness of research to improving management practice and to addressing business challenges and socially relevant issues.
- **Originality**: The journal encourages creativity, curiosity and interdisciplinary contamination in an effort to develop fresh, sometimes out-of-the-box, ways of conceptualising management-related phenomena.
- **Collaboration**: The journal fosters collaboration and networking with the different components of the national and international scientific community by considering their 'voices' and by being open to proposals of partnership with other journals.
- **Respect**: The journal promotes constructive, respectful dialogue among authors, staff and readers and recognises the dignity of individuals and the validity of their opinions.

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The editors reserve the right to require changes to a manuscript, including to its length, as a condition of acceptance. The editors reserve the right, notwithstanding acceptance, not to publish the paper if for any reason such publication would, in the reasonable judgement of the editors, result in legal liability or violation of the journal's ethical practices. If the editors decide not to publish a paper, the author or authors are free to submit it to any other journal of any publisher.

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- acceptance with minor proposals for improvements
- acceptance subject to substantial modifications
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The review forms will be sent back to the corresponding author, who must return the paper within a specified time frame after revising it according to the reviewers' comments. In case of substantial modifications and of "revise and resubmit", the manuscript is sent again to reviewers for further evaluation.
Guidance by the editor-in-chief, guest editors and blind referees results in a 'training ground for young researchers', which at the time of foundation was declared as the mission of *Sinergie* by its founder, Giovanni Panati.

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Registered with Law Court of Verona, Italy, reg. no. 570, 1 April 1983

20 copies printed by

GRAFICHE BAIETTA -Via Carcirago, 14, 37022 Fumane (VR) Italy - Tel. 045 770 2088
December 2022

€ 66, 00

Sinergie italian journal of management

Official Journal of Italian Society of Management
Vol. 40, Issue 3 - Sept/Dec 2022 - ISSN 0393-5108 ISSN 2785-549X

Quadrimestrale - Poste Italiane s.p.a. - Spedizione in Abbonamento Postale D.L. 353/2003 (conv. in L. 27/02/2004 n. 46) art. 1, comma 1, DCB VERONA