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EXPERTISE

Experienced Purchasers Education Research Transfer for Industry 4.0 Skills Expertise

White paper for work package 2:
Insights from literature review

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Lead Beneficiary	TU Dortmund University
Author(s)/Organisation(s)	University of Economics in Bratislava, Lappeenranta-Lahti University of Technology, University of Twente, TU Dortmund University
Contact Email	florian.pafrath@tu-dortmund.de
Work Package	WP2
Delivery Date (DoA)	December 2023
Abstract:	The whitepaper analyses the 'silver workers' and their position in the labour market. It reveals a notable gap in training and education for older workers, particularly those over 50. The literature review highlights the predominance of training focused on younger workers and the scarcity of programs tailored to the needs of silver workers. Key themes include the importance of interactive and personalized learning experiences, the role of mentors, and the need for supportive organizational culture. The review also discusses challenges related to age discrimination and the rapid pace of technological advancement, emphasizing the necessity for ongoing ICT and Industry 4.0 oriented training. The review underscores the need for updated training strategies and a shift in attitudes towards older workers, advocating for targeted, age-appropriate programs to enhance the employability of the aging workforce in procurement.

EXPERTISE Consortium			
#	Participant Organisation Name	Short Name	Country
1	TU Dortmund University	TUDO	DE
2	Universiteit Twente	UT	NL
3	Lappeenranta-Lahti University of Technology	LUT	FI
4	University of Economics in Bratislava	UEB	SK

List of Abbreviations

Abbreviation	Meaning
WP	Work package
VET	Vocational Education and Training
HR	Human Resources
PSM	Purchasing and Supply Management
EU	European Union
ICT	Information and communication technology

Content

List of Abbreviations	3
List of Tables	5
List of Figures	5
1. Introduction	6
2. Definition of the 'silver workers' and their position	7
3. Preliminary study results	8
4. Systematic literature review for identification of existing teaching and training methods in practice (business)	12
4.1 Syntax creation.....	12
4.2 Database selection.....	13
4.3 Definition of inclusion and exclusion rules	14
4.4 Results of search in SCOPUS and EBSCO	15
5. Results of the systematic literature review	20
6. Findings from systematic literature review	31
7. Findings from diverse Sources.....	34
8. Conclusion	38
References	39

List of Tables

Table 1 Searching string for a definition of the term silver worker, its variation, and results in Google Scholar.....	8
Table 2 Preliminary study for academic databases and Google search related to the silver workers and their training. In case of Google Search detecting the trends of employee training and development in general.	9
Table 3 Results of preliminary search in chosen sources.	10
Table 4 Keywords clusters, links, and occurrences in the preliminary research.....	10
Table 5 Term for specific segments used in the systematic literature review.....	13
Table 6 Inclusion and exclusion rules for the systematic literature review.	14
Table 7 Distribution of the abstracts among consortium partners	16
Table 8 Inclusion and Exclusion rules	17
Table 9 Skills with the highest count of mentions.....	18
Table 10 Distribution of the articles for the full text reading among consortium members.....	18
Table 11 Proposed questions for the full text reading	19
Table 12 Identified Age Ranges of employees being trained in analyzed articles....	22
Table 13 Main categories and subcategories of lecture methods in analyzed articles	26
Table 14 Evaluation method of the employee and his participation in training and education	28

List of Figures

Figure 1 The map of keywords links, clusters, and occurrences in the preliminary research. Used software: VOSviewer.....	11
Figure 2 Obtained sources by a year	15
Figure 3 Obtained source by a document type	15
Figure 4 Counts of articles and articles with specific skill mentioned in abstracts....	17
Figure 5 Distribution of specific positions where the training was conducted.....	22
Figure 6 Distribution of company size in analyzed articles.....	23
Figure 7 Distribution of industry where was training conducted	23
Figure 8 World Cloud of most frequent words in relation to the requirements and training design principles	25
Figure 9 Pie chart of main methods used for lecturing the employees	27
Figure 10 Evaluation method of the employee and his participation in training and education	29

1. Introduction

The European Union (EU) is witnessing a significant demographic shift as its population matures. This aging trend is not just a matter of numbers; it's reshaping the very fabric of the workforce. As the years roll by, the EU is seeing a workforce that's not only growing older but is also, in some sectors, beginning to contract. This presents a unique set of challenges and opportunities for businesses operating within the EU. Historically, the EU's workforce was characterized by its youthful vigor. Young professionals, fresh out of universities, brought with them innovative ideas, energy, and a willingness to adapt. However, as the demographic pendulum swings towards an older population, the priorities and perspectives of the workforce are evolving. This doesn't necessarily mean a decline in productivity or innovation, but rather a shift in values, motivations, and expectations.

But how can organizations navigate this transition smoothly? Firstly, it's essential to recognize the value that an older workforce brings. Their years in the industry can translate to invaluable insights, wisdom, and a deep understanding of the business landscape. By tapping into this reservoir of knowledge, companies can foster a culture of continuous learning and growth. Moreover, businesses should also consider implementing flexible working arrangements, health and wellness programs, and continuous training opportunities. Such initiatives not only cater to the needs of an aging workforce but also demonstrate a company's commitment to its employees' well-being and professional development.

The purpose of this document is to analyze the literature review that forms a cornerstone of second work package (WP2) in the EXPERTISE project. This initiative embarks on a systematic exploration of the current landscape in vocational training, with a particular focus on 'silver workers' – a demographic that is increasingly significant in the contemporary labor market. The methodology for this analysis is strategically segmented into two core areas: firstly, the precise definition and understanding of 'silver workers' and their evolving role in the labor market; secondly, conducting a systematic literature review aimed at identifying effective teaching methods within companies for these mature professionals. This approach is designed to offer comprehensive insights and pave the way for the development of more

inclusive and effective vocational training strategies tailored to the unique needs of the aging workforce.

2. Definition of the 'silver workers' and their position

Aging is characterized by a rise in the median age of a nation or region, stemming from prolonged life expectancies and falling birth rates. This phenomenon is starkly visible in the EU. According to the European Commission's 2024 Aging Report, the segment of individuals over 65 is projected to surge from 21,2% to 30,0% between 2022 and 2060 (European Commission, 2024). Should these estimates materialize, the EU, which currently has four working-age individuals for every senior citizen, will see this ratio halve by 2060. Furthermore, the EU's fertility rate is among the world's lowest. A 2.1 fertility rate is essential for generational continuity, yet in 2022, the EU's rate stood at 1.46 (Eurostat, 2024). This average, however, masks significant variations among EU nations. Northern countries like France (1.79), Ireland (1.54), and Sweden (1.53) exhibit higher fertility rates, while central and southern nations such as Portugal (1.43), Spain (1.16), Greece (1.32), and Poland (1.29) lag behind (Eurostat, 2024). Over time, reduced fertility contributes to aging populations, which in turn impacts fiscal strategies, labor policies, and the global competition for skilled workers. Collectively, these shifts suggest that EU nations must recalibrate their economies and societies to accommodate an aging, possibly diminishing, populace. Consequently, businesses and institutions in the EU will need to adapt to an increasingly mature workforce.

The oldest generation of employees nowadays are silver workers. Since the most of them have already retired, they are only sometimes observed working. Some members of this generation work in addition to receiving a pension as senior consultants or part-time employment. The baby boomers, whose approximate birth years are 1956–1965, are a close previous generation to the silver workers, whose approximate birth years are 1945–1955. Based on shared beliefs and abilities with varying emphasis, silver workers are frequently seen as members of the Baby Boomer generation. The generation is described as a post-war generation that actively experienced the economic miracle and contributed to its creation. Growing awareness of the need to expand labor market participation in the context of demographic change to ensure sustainability in skilled labor, and the need to maximize the use of such labor. They successfully sought a humanization of the workplace in the 1970s, which had a long-

lasting impact on the era's strict social structures and conventions. Due to the post-war era, this generation places a high importance on responsibility, diligence, and thrift as essential principles for the current generation (Eberhardt, 2021).

The silver workers are included in the baby boomers' definition of birth years 1945–1965 since they are regarded as a sizable cohort. Since a high in birth rates was seen during this time period, some writers have included the baby boomers' birth years in their analyses more specifically, for instance, from 1959 to 1968 (Tiemann, Mohokum, 2021). In 1964, when 1,357,304 births were recorded in Germany as a whole, the birth rate reached its highest point (Ette et al. 2014). The baby boomer generation, who had many children after the Second World War, was born in 1964, the year with the greatest birth rate after the war.

In this white paper we define silver workers as “all employees with an age of 50 and older and have permanent working position in company”.

To explore the use of the term silver worker in a preliminary study, there are used four main academic databases: Google Scholar, EBCSO, ScienceDirect and Scopus. For an additional information for the preliminary study, there is also used Google search engine for detecting the trends of development, training, and education of the employees in companies.

3. Preliminary study results

In the preliminary study the focus of the research was on the term silver worker(s) with relation to their training or education during their professional careers. First, the search for a term silver worker and its variations in Google Scholar was done. This is described in Table 1, and the search produce 36 results.

Table 1 Searching string for a definition of the term silver worker, its variation, and results in Google Scholar.

Searching string	results
"silver workers" OR "silver-workers" OR "silver-worker" OR "silver worker" AND "definition" -retirement -mine -mining -history -health -Indians	36

Table 2 Preliminary study for academic databases and Google search related to the silver workers and their training. In case of Google Search detecting the trends of employee training and development in general.

Database/Source	Searching string
Google Scholar	((("silver worker" OR "silver-worker") AND ("training" OR "education"))) -"part-time" -mine -university -"higher-education" -aerobic -medicine
EBSCO	AB (silver worker OR silver-worker) AND AB training OR AB education NOT AB (medicine or medical or health or healthcare) NOT AB (mine or mining or resource extraction) NOT AB (university or higher education or college or student) NOT AB (children or adolescents or youth or child or teenager)
ScienceDirect	silver worker OR "silver-worker" AND "training" OR "education" NOT mine NOT university NOT "higher-education" NOT students NOT medicine
Scopus	TITLE-ABS-KEY (silver worker OR silver-worker) AND TITLE-ABS-KEY((training OR education)) AND NOT TITLE-ABS-KEY(medicine OR medical OR health OR healthcare OR mine OR mining OR resource extraction OR university OR "higher education" OR college OR student OR children OR adolescents OR youth OR child OR teenager)
Google Search	("education" OR "training") AND (employee OR workers) AND company "report" OR consultant company "report" -students -university -"higher-education" filetype:pdf 2018..2023 source:XXX ¹

Secondly, the preliminary review of the academic articles, book chapters and conference papers in databases like Google Scholar, EBSCO, ScienceDirect, and Scopus was done. The aim of this review was to find literature mentioning the activities concerning education or training related to the silver workers. To restrict the search to be more focused on project's aims aimed, there were some restrictions in the searching string (marked as "-" or "NOT") that had to be done to filter out the sources not related to the topic. Google Search was used to detect trends in employee trainings during the professional career in general, while focusing on the biggest business consulting groups. In the Table 3 the results of the preliminary research are showed. We obtained 484 results combined from academic databases, and 11 results related to the latest

¹ XXX in search for a source of a particular consulting group of: PwC, KPMG, Deloitte, Ernst and Young, McKinsey, and Boston Consulting Group.

trends in corporate training from Google search. In order to create syntax for systematic literature review, the mapping of keywords in obtained sources was made. Results of this mapping in the preliminary study are going to help to identify segments and design of syntax for systematic literature review. Table 4 summarizes fifteen most occurred keywords in the preliminary research.

Table 3 Results of preliminary search in chosen sources.

Database/Source	Results
Google Scholar	24
EBSCO	287
ScienceDirect	127
Scopus	46
Google Search	11

Table 4 Keywords clusters, links, and occurrences in the preliminary research.

Keyword	cluster	Links	Total link strength	Occurrences
knowledge management	1	26	51	62
human capital	1	22	38	55
Education	2	23	40	46
Training	3	21	38	45
human resource management	5	18	31	39
Innovation	3	25	44	37
Skills	4	24	47	37
Learning	4	26	46	31
Knowledge	4	19	41	25
industry 4.0	1	14	21	24

Sustainability	4	11	14	19
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Figure 1 depicts the relations of the keywords presented in Table 4. These results help to construct and design searching segments to conduct systematic literature review. According to these results, we propose to aim our search on four main segments: I. Company – enterprise segment, II. Worker’s segment, III. Training and education segment, and IV. Skills segment.

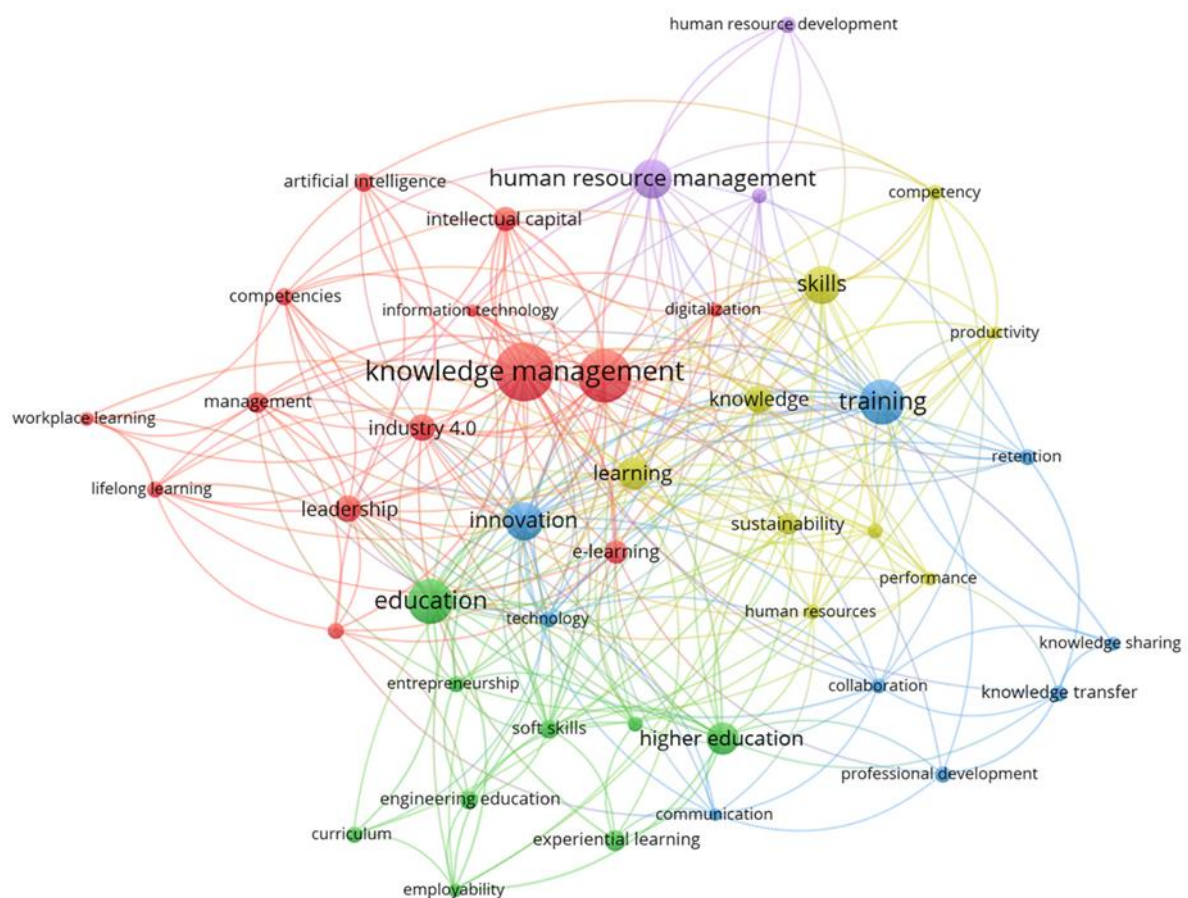


Figure 1 The map of keywords links, clusters, and occurrences in the preliminary research. Used software: VOSviewer.

4. Systematic literature review for identification of existing teaching and training methods in practice (business)

The presented literature review is focused on the identification of existing teaching and training methods within the companies. It has several steps:

4.1 Syntax creation

The purpose of the syntax creation step is to propose a suitable search syntax (string) that can identify articles describing existing teaching and training methods. In order to identify and examine teaching and training methods connected to procurement. According to the preliminary research results, we decided to divide the search string into four segments:

- **Company enterprise segment:** includes all synonyms and keywords connected with businesses, etc.
- **Worker's segment:** includes all synonyms and keywords connected with the mention of the workers in the company.
- **Training and education segment:** includes all synonyms and keywords connected with the process of development of skills by the company.
- **Skills segment:** include all synonyms and keywords connected with skills, such as:
competencies, digital skills.

We used the conjunction “AND” to connect different segments and the conjunction “OR” to connect keywords within the segments.

To define the term **skill**, we refer to the terminology of European education and training policy: Skill describe “the ability to apply knowledge and use know-how to complete tasks and solve problems”².

In order to be sure, that all main searching terms and their synonyms are included in the searched string, we developed Table 5 where every partner of the project

² Cedefop (2024). *Terminology of European education and training policy: a selection of 430 terms: third edition*. Luxembourg: Publications Office. Cedefop reference series.
<https://data.europa.eu/doi/10.2801/991753>

EXPERTISE could add terms to a specific segment. These terms were then included in the search string:

Table 5 Term for specific segments used in the systematic literature review.

Company enterprise segment:	Worker's segment	Training and education segment	Skills segment:
business	Workers	training	competencies
company	Employees	Education	digital skills
enterprise	Position	Practice	skills
external	Experience	Teaching	measurement
internal	working environment	Learning	ability
industry	Human capital	Lesson	capability
organization	Knowledge management	Course	
	Professionals	curriculum	

After the selection of proper phrases, the next step was to determine for which part of the article which segment will be searched. The consortium decided that, all articles which mention the company enterprise segment, workers segment, and their training or education (or synonyms) in the abstract were incorporated in the preliminary search and identified.

4.2 Database selection

As proposed in the project agreement, the databases used for the systematic literature review were Scopus, ScienceDirect, EBSCO, Google Scholar, and Google. We proposed to divide the systematic literature review into two parts, described in the sub-chapters below. The following chapters include examples of the research syntax used for selected databases.

The main part of the systematic literature review was conducted in the databases Scopus and EBSCOhost – Academic Search Complete. The reason of choosing these two databases is because of the variability and modification of the advanced search within these two platforms, with no restrictions to Boolean operators, as it is in the case

of ScienceDirect, where the restriction is set to maximum of eight Boolean operators (AND, OR, NOT).

Example of the research syntax (SCOPUS):

ABS (business **OR** company **OR** enterprise **OR** external **OR** internal **OR** industry **OR** organisation) **AND** **ABS** (workers **OR** employees **OR** position **OR** experience **OR** working **AND** environment **OR** human **AND** capital **OR** knowledge **AND** management **OR** professionals) **AND** **ABS** (training **OR** education **OR** practice **OR** teaching **OR** learning **OR** lesson **OR** curriculum **OR** course) **AND** **FT** (competencies **OR** skills **OR** digital **AND** skills **OR** ability **OR** capability **OR** measurement) **AND** (**LIMIT-TO** (**SUBJAREA** , "SOCI") **OR** **LIMIT-TO** (**SUBJAREA** , "BUSI") **OR** **LIMIT-TO** (**SUBJAREA** , "ENGI") **OR** **LIMIT-TO** (**SUBJAREA** , "COMP") **OR** **LIMIT-TO** (**SUBJAREA** , "ECON") **OR** **LIMIT-TO** (**SUBJAREA** , "DECI") **OR** **LIMIT-TO** (**SUBJAREA** , "MULT")) **AND** (**LIMIT-TO** (**DOCTYPE** , "ar") **OR** **LIMIT-TO** (**DOCTYPE** , "cp") **OR** **LIMIT-TO** (**DOCTYPE** , "ch"))

Example of the research syntax (EBSCO):

AB ((business **OR** company **OR** enterprise **OR** external **OR** internal **OR** industry **OR** organisation)) **AND** **AB** ((workers **OR** employees **OR** position **OR** experience **OR** working **AND** environment **OR** human **AND** capital **OR** knowledge **AND** management **OR** professionals)) **AND** **AB** ((training **OR** education **OR** practice **OR** teaching **OR** learning **OR** lesson **OR** curriculum **OR** course)) **AND** **TX** ((competencies **OR** skills **OR** digital **AND** skills **OR** ability **OR** capability **OR** measurement))

4.3 Definition of inclusion and exclusion rules

Based on our previous experiences with a systematic literature review, we find it very useful to determine inclusion and exclusion rules. These rules will be useful in selecting procedures to determine which articles should go to the selection and which not.

Table 6 Inclusion and exclusion rules for the systematic literature review.

Inclusion rules	Exclusion rules
Abstract written in English.	Research conducted before 1980.

Scientific peer-reviewed articles.	Scientific poster or conference abstracts.
Papers mentioning concrete skills.	

4.4 Results of search in SCOPUS and EBSCO

The results of screening abstracts, keywords and fulltext search in the databases SCOPUS and EBSCO have delivered 1422 results combined (articles, conference papers, and book chapters). Literature sources are mainly occurring after year 2006, peaking in 2022, as described in Figure 2. According to the distribution of the documents (Figure 3), the most documents are classified as a scientific articles (57.4%), followed by conference papers (33.9%) The following step was to equally distribute gathered abstracts of articles among consortium members.

Figure 2 Obtained sources by a year

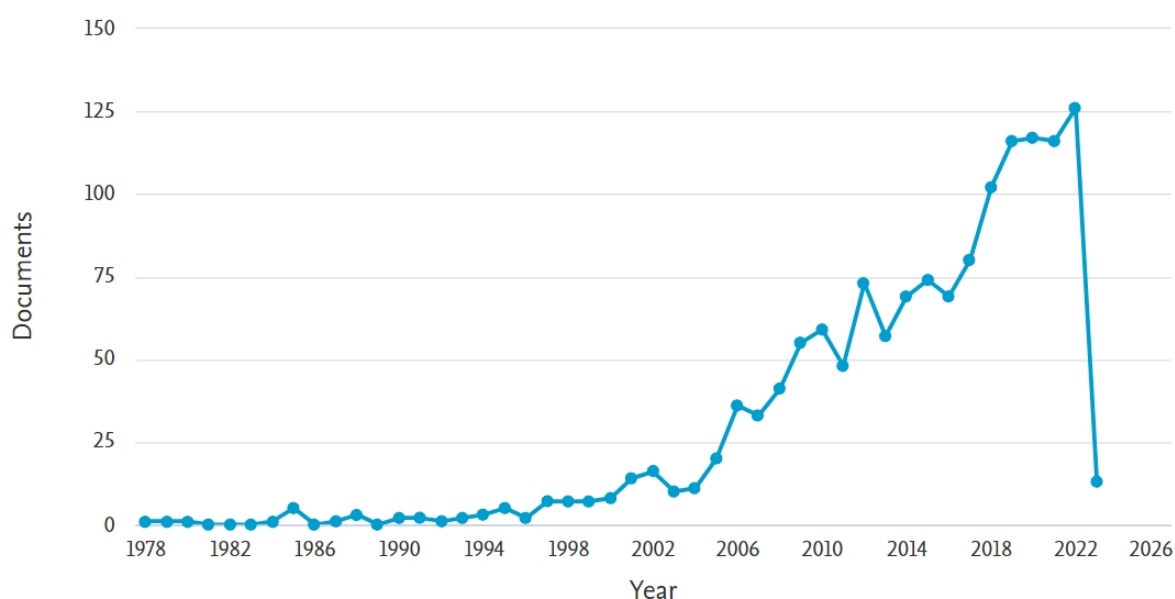
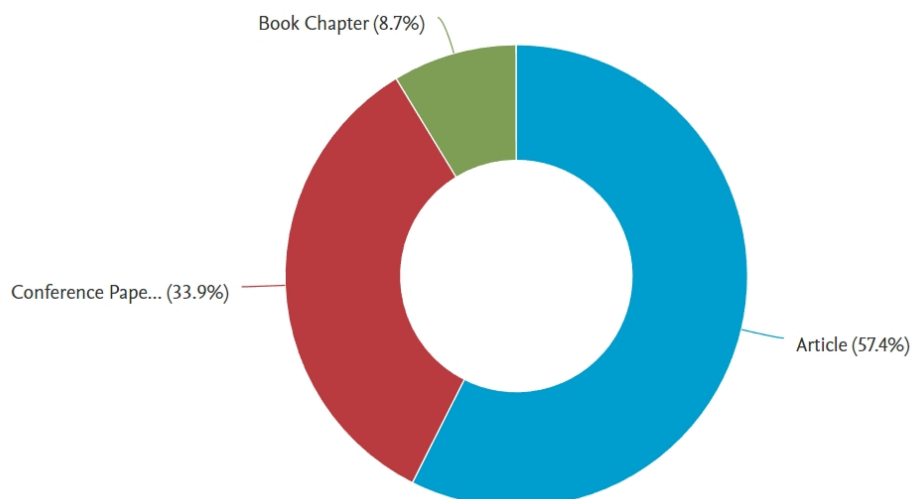


Figure 3 Obtained source by a document type



The database of 1,422 articles identified by search string was divided among project partners. The aim of this step was to examine the title and abstract and identified articles suitable for full-text screening.

Table 7 Distribution of the abstracts among consortium partners

Partner	Number of Abstracts	Years covered	Database
LUT	355	1978 - 1994, 1998, 2003 - 2004, 2006 - 2007, 2012 - 2013, 2018	Scopus, EBSCO
EUBA	357	1996, 2008-2011, 2016 - 2017,	Scopus, EBSCO
TUDO	355	1995, 2005, 2015, 2021 - 2023	Scopus, EBSCO
UT	355	1997, 1999 - 2002, 2014, 2019 - 2020	Scopus, EBSCO

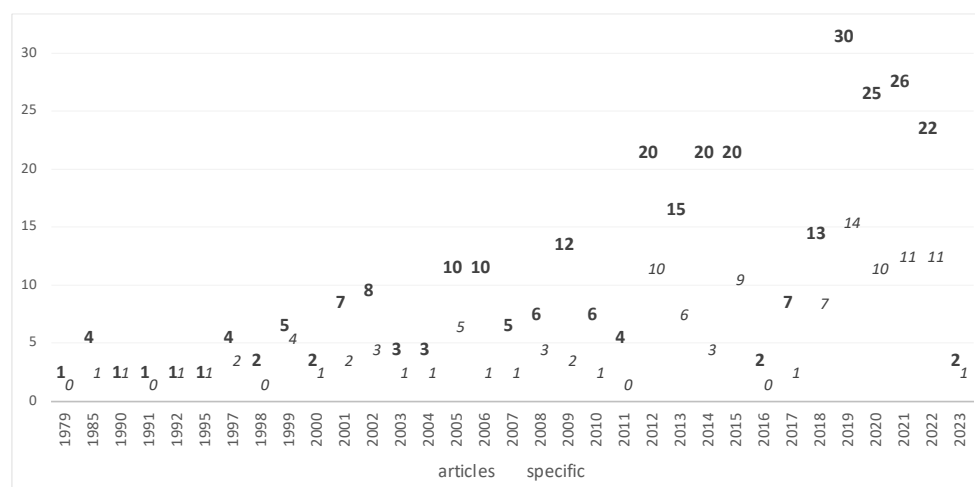
Reading of the obtained abstracts also contains inclusion and exclusion rules, which are presented in Table 8. The goal of the inclusion and exclusion rules is to identify the most suitable articles/conference papers for full-text screening and conducting the systematic literature review.

Table 8 Inclusion and Exclusion rules

Inclusion rules	Exclusion rules
Abstract of the document is mentioning any process of employee (workforce) education (training). → If so:	Abstract of the document pointing out that education or training of employees is in relation to higher education, university, etc.
<ul style="list-style-type: none"> Is there any mention about specific skill for employees? If yes, we need <u>to list (markdown) the skills</u> from abstract. Is it only about general activities without mentioning specific skills? 	Abstract of the document is dealing with the education or sort of training after the retirement. Similarly, also the education programs of third age universities.
	Abstract mentioning education or training related to the part-time or side-job employee activities, as well as the requalification courses.

As presented in the Table 8, beside the screening of the abstracts of documents if they meet inclusion and exclusion rules, there was also conducted secondary screening for various skills mentioned in abstracts. In the results there were identified 298 abstracts in line with set rules. All the mentioned abstracts of the articles were passed for the full text reading.

Figure 4 Counts of articles and articles with specific skill mentioned in abstracts



Beside filtering the articles according to the set rules, the consortium members were also searching for any specifically mentioned skills, which were mentioned in the abstract. In the end there were identified 114 specific skill mentioned in the abstracts.

Table 9 Skills with the highest count of mentions

Skill	Mentions
soft skills	7
Leadership	7
problem solving	6
Creativity	5
digital skills	4
IT skills	4
cyber security	4
technical skills	3
big data	3
Industry 4.0	3
Technical	2

In the similar manner, the identified articles for full-text screening were divided among partners. The distribution of 298 articles is presented in the table 10. While reading the articles researchers had to answer questions proposed by the consortium partners and presented in the table 11.

Table 10 Distribution of the articles for the full text reading among consortium members

Partner	Number of Articles	Years covered	Database
LUT	70	2013, 2019 – 2020	Scopus, EBSCO
EUBA	88	2008 – 2012, 2014 – 2015	Scopus, EBSCO

TUDO	70	2016 – 2018, 2021 – 2022	Scopus, EBSCO
UT	70	1979 – 2007, 2023	Scopus, EBSCO

Table 11 Proposed questions for the full text reading

Q1	What is the age (range) of the employees which were trained or educated?
Q2	Education of the employees was focused on a specific group of the employees.
Q2.1	-> Education in company is focused on junior positions/freshmen/graduates
Q2.2	-> Education in company is focused on middle management
Q2.3	-> Education in company is focused on top management
Q2.4	-> Education in company is focused on specialist within the company
Additional comments for Q1 - Q2	Please write any additional comment regarding previous question(s)
Q3	The education of employees was conducted in one organization, or simultaneously in more than one company?
Q3.1	-> If the education was done in one company, is it possible to classify the size of the company
Q3.2	-> If it is possible, categorize the business to specific sector in the industry.
Additional comments for Q3	Please write any additional comment regarding previous question(s)

Q4	The presented article defines specific methods used for employee education within the company.
Q4.1	-> If yes, what are the specific methods used for the education?
Q4.2	Are there any requirements/or mention of design principles of the training?
Q5	The presented article mentions the size of groups (class) where the employees were educated
Q5.1	-> If yes, what is the size of the groups?
Q6	Development of the skills mentioned in the article are related to the RPA, Industry 4.0., or digitalization?
Additional comments for Q4 - Q6	Please write any additional comment regarding previous question(s)
Q7	The article mentions that the education was recurrent/periodical for the same group of the employees.
Q7.1	-> If yes, how often the training was repeated?
Q8	Is in the article the mention of the evaluation of the training/ education?
Q8.1	-> If yes, how it was evaluated
Q8.2	-> Is there also mentioned about the evaluation of the employee feedback?
Additional Comments Q7 - Q8	Please write any additional comment regarding previous question(s)

5. Results of the systematic literature review

The full text reading reduces the number of relevant articles from 298 to 128 articles. These 128 articles, were suitable for detailed examination for later stages of the

project, mainly to design the expert interviews. In general, there is a gap in scientific research which deals with the topic of educating or training silver workers in the business area. Analyzing the answers of the Q1 the age of educated or trained workers seems to be centered mainly around thirties. In the SLR we were able to identify the mention about the age of workers in 17 articles. To provide a generalized categorization, the samples seem to cluster around certain age groups, reflecting different life and career stages.

1. Young Adults (Early Career) - typically includes those in their late teens to mid-twenties (16 to 25). In this group, people are usually just starting their careers and may be more likely to pursue entry-level or junior positions. Some of them might still be pursuing education or are early in their work-life, gaining new skills and experiences.
2. Early-Mid Career Adults - This group generally includes those from mid to late twenties and up to their mid-thirties (26 to 35). These individuals are likely more established in their careers, and their educational or training pursuits may be focused on advancing in their current fields or transitioning to new ones.
3. Mid-Late Career Adults - This group generally includes individuals from their late thirties to early fifties (36 to 50). These people are likely to be well-established in their careers and may be pursuing education or training for leadership roles or to update their skills due to changing job roles or industry trends.
4. Late Career Adults - These are individuals in their late fifties to mid-sixties (51 to 64). They are likely to be very experienced in their field, possibly in senior or leadership roles. The education or training they undertake might be related to consulting, mentorship, or even preparation for a career shift or retirement.

In terms of age, the latest group, known as 'Late Career Adults,' is predominantly considered 'silver workers' by the majority of scientific literature. Therefore, based on the results of the literature review, for the purpose of this research, we will define silver workers as employees who are over 50 years old and have permanent working position in company.

Table 12 Identified Age Ranges of employees being trained in analyzed articles

Category	Age Ranges	Frequency
Young Adults	16-25	7
Early-Mid Career Adults	26-35	6
Mid-Late Career Adults	36-50	8
Late Career Adults	51-64	2

Figure 5 Distribution of specific positions where the training was conducted

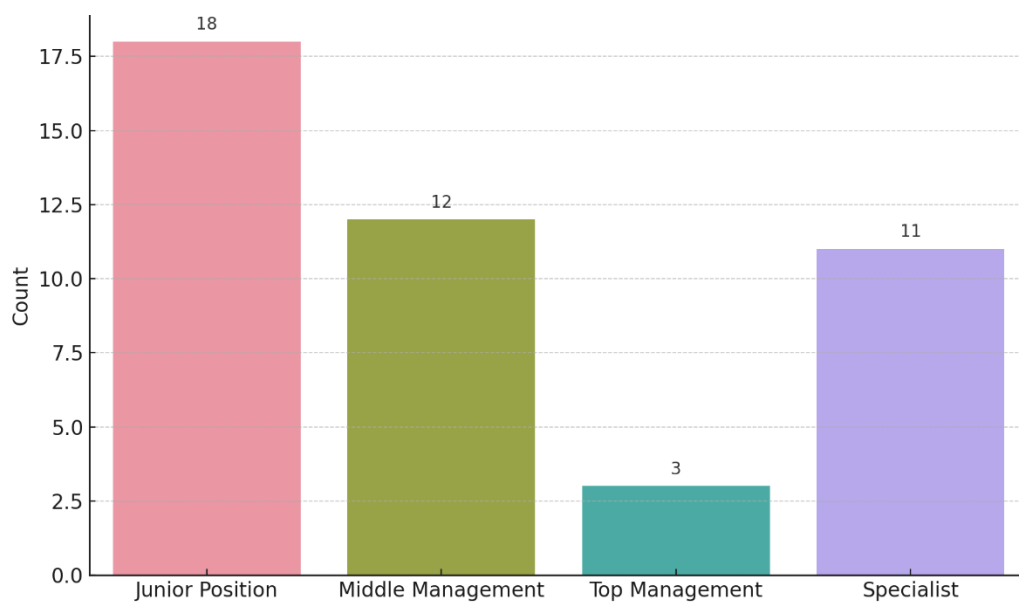


Figure 6 Distribution of company size in analyzed articles

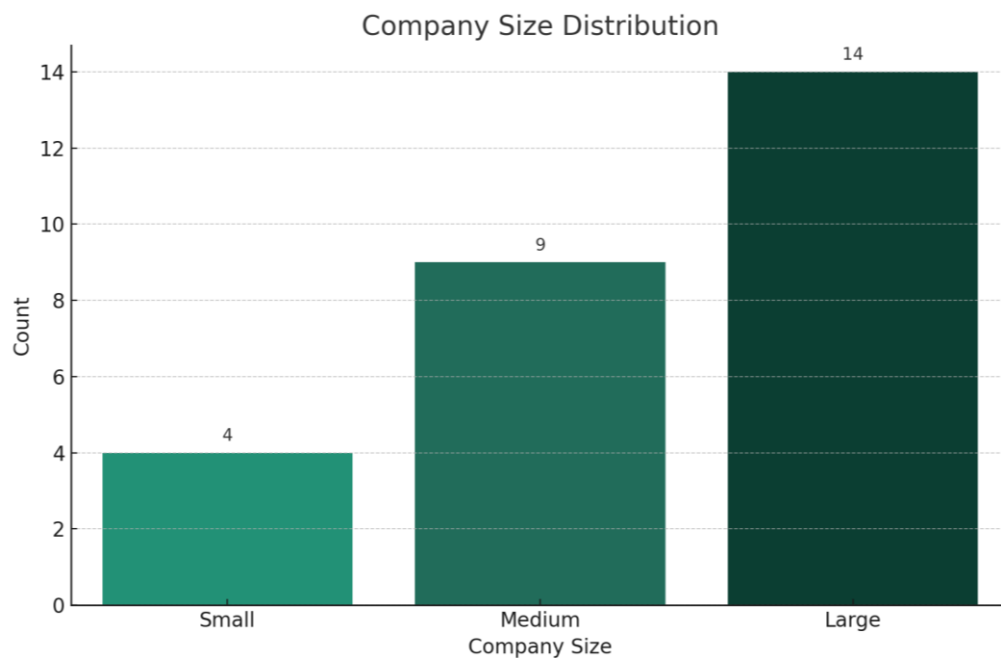
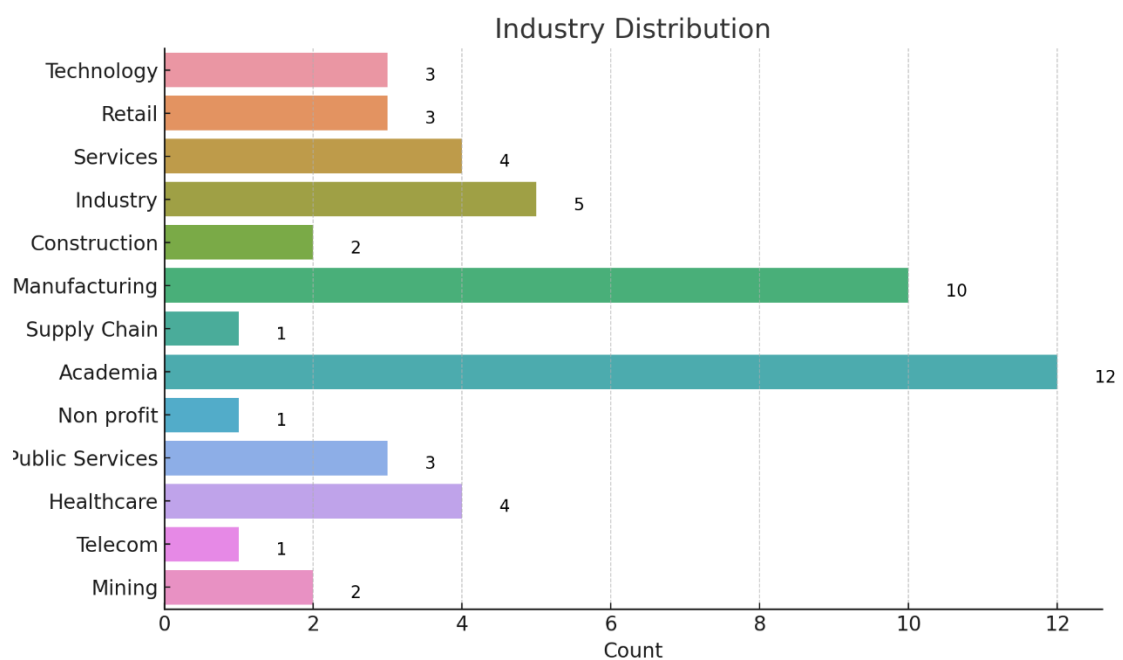


Figure 7 Distribution of industry where was training conducted



While analyzing the requirements and design of principles of the training, we were able to identify eight most common areas mentioned in the articles:

1. **Approaches to Learning and Training:** Various methodologies and theories are mentioned, such as the 4-step model, Bigg's model, Bloom's taxonomy, andragogical model, competency-based education, and scaffolding assignments. These represent different philosophies and approaches towards designing effective training programs.
2. **Tools and Technology:** Several tools and technologies are mentioned like nDiVE, ePortfolio, AI-model, Wiki software, e-learning platforms, LMS (Learning Management Systems), ITS (Intelligent Tutoring Systems), and simulation environments. These tools can facilitate the training process and offer different means of delivering content.
3. **Structuring and Planning Training:** The importance of structured and planned training is emphasized. Details like having a regular training schedule, identifying talent gaps, outlining a learning plan, and following certain stages (such as assessment, design, implementation, and evaluation) are mentioned.
4. **Interactive and Engaging Learning:** Techniques like gamification, problem-based learning, and "learning-by-doing" are highlighted. Creating a safe learning environment for knowledge sharing and promoting high activity interaction between students and teachers are also pointed out.
5. **Tailoring Training to Individual Needs:** The training should be personalized to the learners' needs and skills. Concepts like individualization and differentiation of learning, and independent work are brought up.
6. **Role of Mentors and Experts:** The significance of mentors and experts in the learning process is discussed. They can provide guidance, contribute knowledge, and "teach" AI models.
7. **Assessment and Evaluation:** Multiple references are made to the need for assessments, feedback, and evaluation. This includes control effectiveness, checking student improvements, and competency-based education.

8. **Organizational Culture:** The need to foster an organizational culture that supports learning and training is underlined. This includes defining a vision for learning, listing short- and long-term goals, nurturing self-assessment, and managing the skill map of the organization.

Figure 8 World Cloud of most frequent words in relation to the requirements and training design principles



The table 13 and figure 9 showcase a range of lecturing methods utilized for training workers, along with the number of articles where their usage has been documented. These methods represent diverse approaches to imparting knowledge and developing skills in a professional setting. At the top of the list is "Assessment and Skill Development," which appears in 41 articles. This method focuses on evaluating the competencies of workers and providing targeted training to enhance their skills based on the identified areas of improvement. Next, we have "Digital Learning Platforms," which feature in 33 articles. These platforms leverage technology to deliver training content and engage workers through online resources, interactive modules, and digital tools. Following closely is "Self-directed and Personalized Training," found in 29 articles. This method emphasizes individual autonomy, allowing workers to tailor their learning experience according to their specific needs and preferences. The table also highlights "Interactive Learning Platforms" mentioned in 20 articles. These platforms facilitate active participation and engagement from workers through interactive exercises, simulations, and multimedia elements. "Media Based Learning" is featured

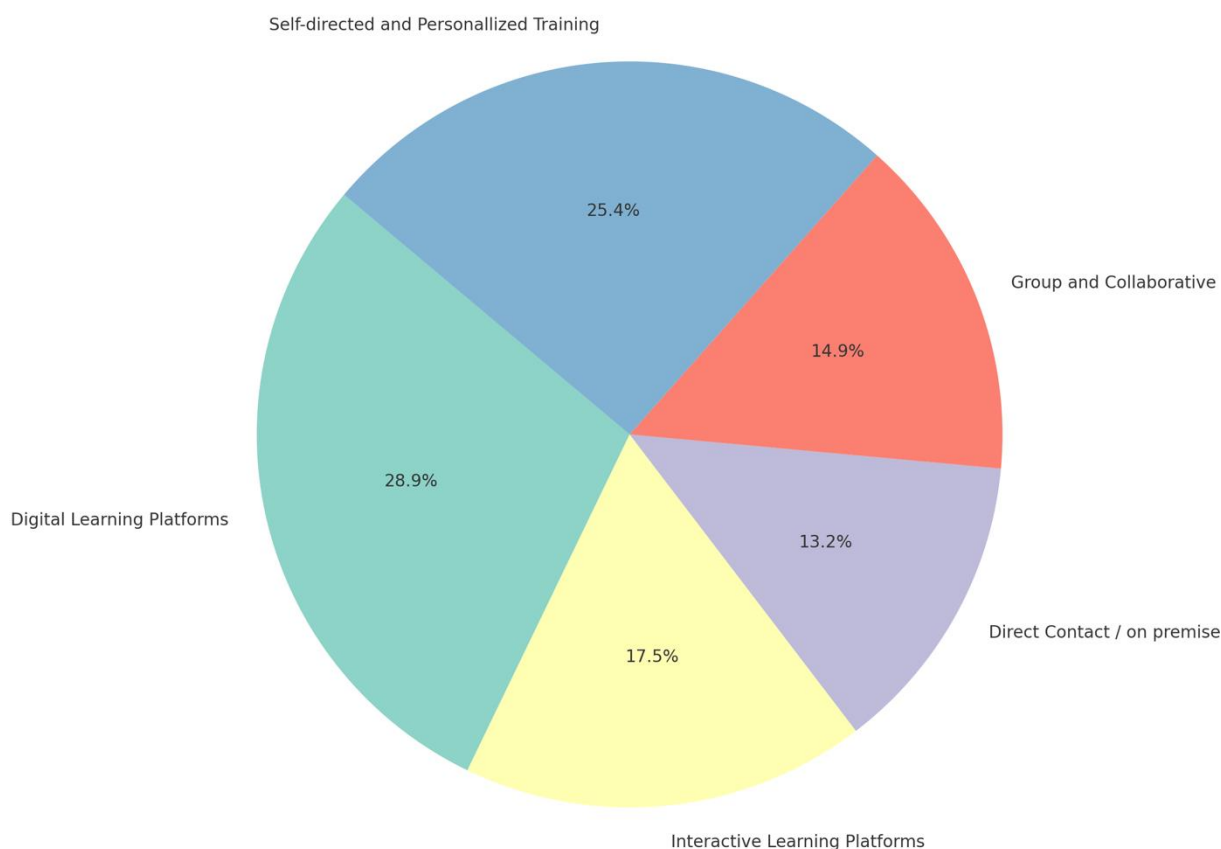
in 16 articles, showcasing the use of various media formats such as videos, audio recordings, and visual aids to deliver training content in an engaging and accessible manner. "Group and Collaborative Learning" appears in 17 articles, emphasizing the importance of teamwork and collaboration in the training process. This method encourages workers to learn from each other, share ideas, and solve problems collectively. Lastly, "Direct Contact / on premises" is mentioned in 15 articles, signifying traditional face-to-face interactions and training conducted in physical settings, where trainers directly engage with workers. Overall, this table provides insights into different lecturing methods employed for worker training, accompanied by the number of articles in which their use has been documented. These methods encompass a diverse range of approaches, leveraging technology, collaboration, individualized learning, and assessment to enhance the skills and knowledge of workers in various professional domains.

Table 13 Main categories and subcategories of lecture methods in analyzed articles

Category	Count
Digital Learning Platforms	33
E-Learning	17
MOOCs	5
Moodle	2
Web	6
Intranet	3
Interactive Learning Platforms	20
Games/Simulation	14
Discussions	3
Gamification	3
Direct Contact / on premises	15
Seminars	6
Courses	4
Lecture	5
Group and Collaborative Learning	17
Workshops, roundtables	5
Group/Team Assessments	12
Self-directed and Personalized Training	29
Personal training	8
Mentoring/Coaching	16
Microlearning	2

Face to Face	3
Assessment and Skill Development	41
Training	39
Assessments	2
Media Based Learning	16
Video	9
CD or other mediums	3
Audio medium specified (cassete, podcast)	4

Figure 9 Pie chart of main methods used for lecturing the employees



The table 13 also presents subcategories within the realm of lecturing methods for worker training, highlighting the number of articles where their use has been reported. These subcategories provide further granularity and insights into specific approaches and tools employed in training practices. The most times occurred "Training" is featured prominently, mentioned in 39 articles. This subcategory encompasses a wide range of training methods and approaches, indicating the overall significance and

prevalence of training initiatives in the articles analyzed. Next is "E-Learning," which appears in 17 articles, this subcategory focuses on training conducted through digital platforms and online resources, offering flexibility and accessibility for learners. "Mentoring/Coaching" is another notable subcategory, found in 16 articles. It emphasizes the importance of one-on-one guidance and support from experienced professionals to foster skill development and knowledge transfer. Following closely is "Games/Simulation," featured in 14 articles. This subcategory highlights the use of gamified elements and simulations as effective tools to engage workers and facilitate experiential learning. These subcategories provide a glimpse into the varied approaches and tools employed in worker training, as documented in the analyzed articles. They showcase the use of e-learning platforms, mentoring/coaching relationships, gamification, group/team assessments, and the broad umbrella of training initiatives.

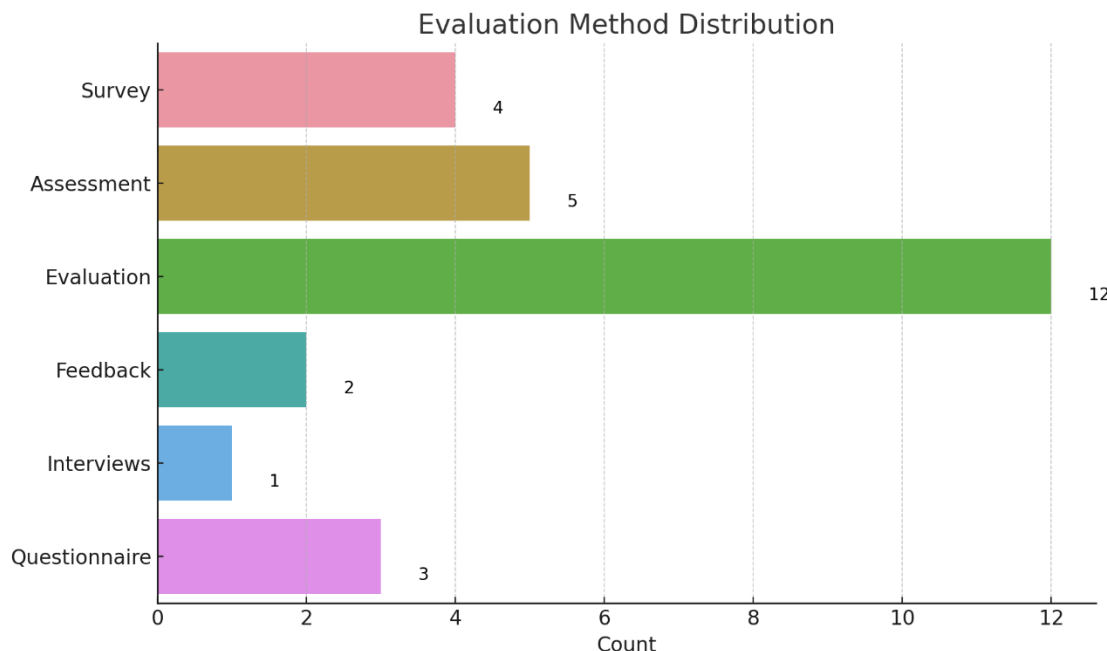
Table 14 Evaluation method of the employee and his participation in training and education

Evaluation Method	Frequency
Survey	4
Assessment	5
Evaluation	12
Feedback	2
Interviews	1
Questionnaire	3

The most used method in the analyzed articles is "Evaluation," it appears most frequently with a count of 12. This method involves comprehensive and systematic assessment of various aspects of the training, including learning outcomes, participant satisfaction, and overall program effectiveness. Next, evaluation method is "Assessment," which is mentioned 5 times. This method focuses on measuring the knowledge, skills, and performance of workers through tests, assignments, or other evaluative measures to gauge their proficiency and growth. Following closely is the "Survey" method, found in 4 instances. Surveys involve gathering data and feedback

from participants through structured questionnaires, enabling a quantitative analysis of the training program's impact.

Figure 10 Evaluation method of the employee and his participation in training and education



The significance of work design for the experiences of older employees has been recognized by earlier researches (Truxillo et al., 2015; Boyes & McCormick, 2005; Goldberg, 2000; Walker, 2005). Work design techniques describe how work is set up in relation to resources, methods, and personnel to produce a desired result (products or services). The motivation and capacity of employees to carry out these responsibilities are influenced by the way in which job assignments are arranged. Skills variation, job identity, task importance, autonomy, and feedback are some characteristics of work design (i.e., Job Characteristics Model; Hackman & Oldham, 1975).

The ability to adjust to shifting objectives and life goals is an issue for other techniques. Adjustments to ergonomics and flexible work schedules are part of maintenance HR practices. These assist workers when they encounter issues relating to their age and stage of life, such as having family obligations. The use of workers' current skills and knowledge, task enrichment, lateral job changes, and task interest are all components of utilization HR practices (Zacher et al., 2018). According to Truxillo, Cadiz, Rineer, Zaniboni, and Fraccaroli (2012), autonomy enables older workers to take use of their

acquired work experience since the urge for autonomy rises with age (Kooij et al., 2011). Older employees can also overcome physical limitations by employing innovative techniques and equipment to continue to complete their task successfully. According to Armstrong-Stassen and Ursel (2009), career satisfaction and perceptions of organizational support were both correlated with interesting and difficult job assignments. Empirical results on older workers' choices for job design vary somewhat between research.

Workers should proactively shape their career trajectories, rather than solely relying on managerial decisions. While it's challenging to shift deep-rooted perceptions, it's crucial to consistently enlighten staff about the capabilities of colleagues in their twilight years. Tailored training for senior employees can not only enhance their sense of belonging and job satisfaction (Armstrong-Stassen & Ursel, 2009) but also boost their retention. Yet, a study of Canadian firms revealed a lack of adaptability in training approaches for older staff (Armstrong-Stassen & Templer, 2005). This research also highlighted a scant emphasis on age sensitivity training for management. Deliberate efforts to nurture and develop can significantly diminish age-related biases, promoting intergenerational harmony. Moreover, consistently investing in senior staff can pave the way for extended careers, retaining vital skills (Buyens, Dijk, Dewilde, & De Vos, 2009; Lazazzara & Bombelli, 2011). Such upskilling could bridge the disparity between workforce supply and organizational demands. As highlighted in the study of Chand and Markova (2018) the most countries in Eastern Europe face a serious aging challenge, as they could not find any examples of Eastern European companies implementing a novel practices to manage graying workforces.

Age-discrimination becomes an issue that has to be tackled. This discrimination is partly reflected in the reluctance of employers to hire and retain older workers (OECD, 2023). By combatting this reluctance through objective factors driving employer behaviour, such as seniority wages or stricter employment protection legislations, organisations would be encouraged to provide silver workers with more job opportunities (OECD, 2023). A different approach to these challenges is creating better working conditions in order to improve the employability of silver workers. By keeping them up-to-date with skills and providing good access to employment services, silver workers are able to stay longer at work. Even so, research at this time still identifies changing current pension schemes to allow for employment of older workers and of

retirees to be an existing method of combatting future shortages of qualified workers (Deller et al., 2009).

The combination of the greying workforce and the rapid pace of technological development, makes it “critical to develop a deeper understanding of the role of age in individuals’ interactions with technology”(Tams et al., 2014). It is a major challenge for the silver workers to keep up with the rapid pace of technological change. Research indicates that the benefits that information and communication technology (ICT) bring to organisations and individuals, are not enjoyed equally by all members of society (Hill et al., 2008). Especially older workers are less inclined to take advantage of ICTs. ICTs are an important part of technology within every organisation. More so nowadays, as they offer the flexibility and responsiveness.

According to the systematic literature review, there is an existing prejudice is that silver workers are resistant to change. This prejudice harms silver workers as it leads organisations failing to provide the same opportunities for all age groups which in turn fuels the resistance to changes (Silverstein, 2008). Silver workers are recently looked upon more positively as they can provide experience aiding in future development as their accumulated knowledge is not as susceptible to decline with age as their cognitive abilities (Kowalski-Trakofler et al., 2005). The prejudices of resistance to change and psychological abilities declining are becoming less dominant but the belief of older workers struggles with ICT remains (Powell et al., 2004). To counter this, the trainings offered should accompany individual needs and show understanding of the struggles the elderly face, and as technology constantly adapts these trainings should change accordingly (Torres W. J. & Beier M. E., 2018). With the greying population “businesses have to adjust to an increasingly older society, thus necessitating a change in attitudes and processes toward dealing with ageing” (Chand M. & Tung R. L., 2014). There are various factors which create burdens for silver workers to perform to maximum effectiveness but as shown in the report recent trends have shown more potential solutions and care towards supporting the ageing workforce in purchasing and beyond.

6. Findings from systematic literature review

The literature review conducted to identify procurement skills for silver workers has yielded valuable insights into the current state of research and practice in this area. A total of 128 relevant articles were identified, providing a comprehensive overview of

the landscape. This review has revealed significant gaps in the literature, particularly concerning the training and education of older workers in the business sector.

Age-Specific Trends in Education and Training:

The literature categorizes workers into four main age groups: Young Adults, Early-Mid Career Adults, Mid-Late Career Adults, and Late Career Adults, with the latter predominantly referred to as 'silver workers'. This review found that most educational and training efforts are centered around workers in their thirties, indicating a lack of focus on older age groups, particularly those over 50 who are not yet retired.

Training and Learning Approaches:

Various training methodologies and tools are discussed in the literature, including different learning theories, technological tools, and teaching methods. The emphasis is on creating interactive, engaging, and personalized learning experiences, with a significant role attributed to mentors and experts. The importance of organizational culture in supporting learning and training is also highlighted.

Methods and Strategies for Silverworkers:

The most common training areas identified include assessment and skill development, digital learning platforms, self-directed training, and interactive and media-based learning. These methods align with the need for tailored training approaches that consider the unique needs and capabilities of silver workers.

Work Design and HR Practices:

The literature underscores the importance of work design and human resource practices that are sensitive to the needs of older employees. This includes ergonomic adjustments, flexible work schedules, and the utilization of workers' existing skills and knowledge. Autonomy and challenging job assignments are linked to increased career satisfaction and organizational support.

Combatting Age Discrimination:

A critical issue identified is age discrimination in the workplace. The literature suggests combating this through improved working conditions, skill development, and policy changes, such as revising pension schemes to accommodate the employment of older workers.

Technological Challenges:

The rapid pace of technological advancement presents a significant challenge for silver workers. The literature indicates a need for ongoing training in information and communication technology (ICT), tailored to the individual needs of older workers.

Skillset Emphasis for silver workers:

The majority of the literature focuses on teaching silver workers long-established skills such as soft skills and problem-solving, reflecting their enduring relevance in the industry. These competencies, essential for effective communication, collaboration, and strategic decision-making, have been a consistent requirement over time. However, there's a noticeable gap in the literature regarding the teaching of newer skills, particularly digital and IT skills or knowledge related to Industry 4.0. These emerging areas, critical in today's technologically driven business environment, receive comparatively less attention. Furthermore, among the limited articles that do address these new skills, only a few specifically tailor their teaching approaches to the unique needs of silver workers. This indicates a significant area for development in educational and training programs, highlighting the necessity to update and adapt learning strategies to equip silver workers with the skills required for success in a rapidly evolving industry landscape.

Changing Attitudes and Practices:

The review highlights a shift in attitudes towards older workers, recognizing their valuable experience and knowledge. However, persistent prejudices, particularly regarding technological adaptability, need to be addressed. Businesses are encouraged to adapt to an aging workforce by changing attitudes and processes.

In conclusion, the literature review underscores the necessity of developing targeted, age-appropriate training and educational programs for silver workers, emphasizing the need for flexible, technology-oriented, and personalized approaches. It also calls for a shift in organizational culture and attitudes towards older workers, recognizing their valuable contributions and addressing the unique challenges they face in a rapidly evolving business landscape. This review sets the stage for future research and practical interventions aimed at enhancing the skills and employability of the aging workforce in procurement and related fields.

7. Findings from diverse Sources

In addition to the insights garnered from peer-reviewed English-language publications, our exploration of silver worker training has been enriched by incorporating findings from a variety of other sources. This includes reports from governmental and non-governmental organizations, articles published in foreign languages, and grey literature such as whitepapers, theses, and industry reports. These sources provide a broader and often more nuanced understanding of the topic, highlighting diverse training methodologies, cultural contexts, and policy frameworks that influence the professional development of older workers.

Key Strategies for Training silver workers

- **Lifelong Learning and Continuous Development** Lifelong learning and continuous training are essential for the permanent development of employees, including silver workers. Such training helps in maintaining their willingness and ability to perform their duties effectively throughout their careers (European Centre for the Development of Vocational Training, 2010). Qualification measures are vital not only for the development and maintenance of job-relevant skills during active employment but also to address knowledge loss after prolonged absence from work (Bundesministerium des Innern, 2012). Lifelong learning programs are crucial for ensuring older workers remain competitive in the job market. These programs focus on improving digital literacy, vocational skills, and general education, which are necessary for adapting to new job requirements and technological advancements. There is a notable impact on the mental and physical well-being of older adults participating in educational programs, leading to improved life satisfaction and reduced symptoms of depression (Hužovičová & Jakúbek, 2014; Stojanova & Bittnerova, 2016).
 - Lifelong Learning in Procurement: Lifelong learning has been identified as critical in the field of procurement, particularly for silver workers. NEVI (2024) and other organizations emphasize the importance of continuous learning to keep older workers updated with the latest industry developments. Historical analysis shows that while the concept has long been part of Dutch professional development, contemporary studies

highlight ongoing challenges and the need for improved program effectiveness (de Grip et al., 2018; Kallen, 1996).

- **Health and Ergonomics** Maintaining the physical and mental health of silver workers is crucial. Workplaces should be ergonomically designed to reduce strain and prevent injuries, while wellness programs can promote healthier lifestyles. These measures help in reducing absenteeism and maintaining high productivity levels among older employees (Bundesministerium für Wirtschaft und Energie, 2014; Flüter-Hoffmann, 2010; European Centre for the Development of Vocational Training, 2013).
- **Flexible Work Arrangements** Flexibility in work schedules, including part-time roles, telecommuting, and flexible hours, can help silver workers balance their professional and personal lives better. Such arrangements also support gradual retirement plans, allowing older employees to transition smoothly out of the workforce while sharing their knowledge with younger colleagues (Bundesministerium für Wirtschaft und Energie, 2014; Flüter-Hoffmann, 2010; European Centre for the Development of Vocational Training, 2015).
- **Knowledge Transfer** Structured programs for knowledge transfer are essential. Mentoring, coaching, and creating knowledge repositories ensure that the expertise of silver workers is passed on to younger employees. This can be facilitated through mixed-age teams and regular knowledge-sharing sessions (Bundesministerium für Wirtschaft und Energie, 2014; Flüter-Hoffmann, 2010; European Centre for the Development of Vocational Training, 2013).
- **Career Path Diversity** Offering diverse career paths such as advisory roles, project-based work, or part-time engagements can keep silver workers engaged and motivated. This helps in utilizing their experience effectively while also catering to their changing work capacity and interests as they age (Bundesministerium für Wirtschaft und Energie, 2014; Bundesministerium des Innern, 2012).
- **Workplace Culture and Recognition** Building an inclusive workplace culture that values and recognizes the contributions of silver workers is vital. Regular feedback, acknowledgment of achievements, and ensuring their involvement in important projects can enhance their job satisfaction and organizational commitment (Flüter-Hoffmann, 2010).

- **Tailored Training Programs** Training programs for silver workers should consider their unique needs, such as slower-paced learning environments and relevance to their accumulated experience. Customized training sessions focusing on both hard and soft skills can be more effective than generic programs (Bundesministerium des Innern, 2012; European Centre for the Development of Vocational Training, 2010). According to the report by Valtioneuvoston selvitys- ja tutkimustoiminta (2017), older employees require different types of support compared to their younger counterparts. Tailored interventions are necessary to help older workers adapt to the changing demands of their jobs, ensuring their continued engagement and productivity (Valtioneuvoston selvitys- ja tutkimustoiminta, 2017).

Additional Insights from Literature

- **Challenges for Older Employees:** Forma, Tuominen, and Väänänen-Tomppo (2010) identify various challenges that older employees face in maintaining their work life, such as health concerns, skill obsolescence, and the need for workplace adjustments to accommodate aging workers (Forma et al., 2010).
- **Working Performance House Model:** Kuusinen (2023) introduces a model called "working performance house," which outlines the factors influencing job performance among older workers. This model includes elements like workplace environment, job demands, and individual capabilities (Kuusinen, 2023).
- **Significance of Training and Continuous Learning:** Lipponen et al. (2020) emphasize the importance of training and continuous learning for older employees. Learning from colleagues and developing new skills are crucial factors for maintaining job relevance and satisfaction among aging workers (Lipponen et al., 2020). Continuous training methods are necessary to bridge the gap between industry developments and available skills. Delke's (2022) research highlights the critical need for ongoing professional development in purchasing and supply management to ensure silver workers can keep pace with industry changes.
- **Effective Training Programs:** Huttunen and Juntunen (2024) show that successful training programs for older workers are interactive and closely

aligned with their specific job roles. Targeted training helps retain older employees by enhancing their competence and confidence (Huttunen & Juntunen, 2024).

- **Digital Literacy and Employment:** The rise of digital skills among older workers is essential to bridge the generational digital divide. Developing digital competencies significantly impacts the employability of silver workers, helping them transition to late career stages with relevant skills (Hužovičová & Jakúbek, 2014; Stojanova & Bittnerova, 2016). As digital skills rise among older age groups, a generational digital divide remains evident between younger generations (18-24 years old with 100% digital literacy) and older generations (54+ years old with 74% digital literacy) (Velšic, 2020).
- **Government Policies and Programs:** Policies emphasize creating favorable working conditions, promoting age management strategies among employers, and offering incentives for hiring older workers (Stojanova & Bittnerova, 2016). The Sociaal en Cultureel Planbureau (2019) and other governmental organizations have explored the limitations and challenges in lifelong learning for older employees. These include motivational issues and the need for better educational frameworks to support continuous learning.
- **War for Talent:** The procurement sector faces a significant talent shortage, often referred to as the "War for Talent." Studies emphasize the importance of retaining and developing older workers to address this shortage. Organizations like NEVI, Conducto, and NCOI offer various training and leadership programs aimed at enhancing the skills and retention of older employees (Brugman, 2017; CFO, 2023; ICM, 2024; Inkoopacademie, 2024; UMIO, 2024). Retaining talent is critical in the procurement sector, prompting organizations to develop career opportunities and tailored development programs for older workers. This includes creating favorable work environments and offering continuous professional development to keep older employees engaged and productive (HRyou, 2024).
- **Intergenerational Learning:** Intergenerational learning is recognized as a crucial strategy to manage the increasing complexity of modern markets and to facilitate digitalization and adaptation to Industry 4.0. Tools like "DE TOOLBOX Generatieleren" by Cubiss Brabant (2022) provide guidelines for effective intergenerational collaboration, addressing differences in learning styles and

experiences between younger and older employees (Delke, 2022; Grondstra, 2019; Lex et al., 2011).

8. Conclusion

The effective training and management of silver workers are essential for businesses to leverage the full potential of their aging workforce. By implementing strategies that promote lifelong learning, flexible working conditions, health, and knowledge transfer, organizations can maintain a productive, motivated, and experienced workforce that contributes to their overall success. Addressing the unique challenges faced by aging employees through customized interventions can significantly improve their work performance and job satisfaction, benefiting both the employees and the organization as a whole.

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