Review

Generational differences in technology behavior: A systematic literature review

Reema Choudhary[1,*], Younus Ahamad Shaik[2], Pankaj Yadav[3], Ayesha Rashid[4]

[1] Department of Software Engineering, University of Gujrat, Gujrat 50700, Pakistan

[2] Embedded Systems Software Group, Aptamitra Global Consulting, Bangalore 560097, India

[3] Data Center & Artificial Intelligence Group, Intel Technology India Pvt Ltd, Bangalore 560103, India

[4] Department of Computer Science, University of Gujrat, Gujrat 50700, Pakistan

* Corresponding author: Reema Choudhary, reema.choudhary@uog.edu.pk

Abstract: This research looks into the differences in technological practices across Gen-X, Gen-Y, and Gen-Z employees in the workplace, with an emphasis on motivation, communication, collaboration, and productivity gaps. The study uses a systematic literature review to identify factors that contribute to these variations, taking into account each generation's distinct experiences, communication methods, working attitudes, and cultural backgrounds. Bridging generational gaps, providing ongoing training, and incorporating cross-generational and technology-enhanced practices are all required in today's workplace. This study compares the dominating workplace generations, Gen-X and Gen-Y, with the emerging Gen-Z. A review of the literature from 2010 to 2023, which was narrowed down from 1307 to 20 significant studies, emphasizes the importance of organizational management adapting to generational changes in order to increase productivity and maintain a healthy workplace. The study emphasizes the need of creating effective solutions for handling generational variations in workplace.

Keywords: generational differences; technology integration; technology; Gen-Z; Gen-Y; Gen-X; age divide; workplace; technical expertise

1. Introduction

Over the past decade, the widespread influence of digitalization and interconnected networks has led to a significant rise in technology adoption. The contemporary media technology landscape offers a diverse range of devices, channels, and social networking platforms, fostering seamless interaction and communication among users. The prevalence of mobile gadgets such as convertibles, laptops, and handsets has further intensified connectivity, granting users on-the-go access to various technological benefits, including social connection, immediate communication, information retrieval, work management, and entertainment (Murray et al., 2011).

It is important to understand the generational difference by keeping in view the technology at workplace. If there is a huge gap between them then it will be difficult for the management to introduce technology oriented changes which is necessary for the organizations in this era. **Figure 1** highlights the importance of paying attention to the generational differences. The adoption and usage of technology by individuals is influenced by generational differences. Businesses must comprehend these distinctions in order to create user-friendly technology, educational materials, and support systems that are suited to the requirements of various generations.

Generational preferences can influence the way that goods and services are advertised in the marketing setting. Businesses can adjust their tactics to better suit the requirements and demands of every generation. Understanding generational disparities can help policymakers and training programs design inclusive and effective policies and programs that more effectively address the distinct needs and strengths of each generation.

Figure 1. Importance for the generations.

Among the myriad factors influencing technology use and engagement, age emerges as a noteworthy variable. Generational cohorts, defined by individuals born during the same period, share common ideas, goals, values, and behaviors, contributing to distinct generational identity (Lyons and Kuron, 2014). Notably, there are observable variations in the technology usage patterns of different generational groups. This study specifically focuses on comparing three distinct generational cohorts: Gen-Z, often labeled as "digital natives," Generation Y, often referred to as Millennials and Generation X, representing an older demographic.

Companies are today experiencing some significant challenges mainly because there is the presence of different generations at workplaces, as well as having different wants and needs. Failure to address the challenges posed by the fact that organizations now employ workers from multiple generations poses a threat of chaos in any organization. Therefore, a thorough stakeholder management is crucial in ensuring organizations continuously get the support of the stakeholders while gaining an insight into the issues facing the firm to facilitate the development of means of maintaining order in the workplace. To this end, the following are key points arising from the literature on generational differences: Due recognition and acceptance of the former beliefs, values, expectations, and goals of different generations go a long way in helping organizations to make the best of the strengths that the different generations have to offer hence complimenting each other in the current new generations working environment (Parab et al., 2022).

The goal of the Crooks et al. (2020) is to better understand how human behavior interacts with evolving technology and work practices, such as remote work and telecommunications, in the context of generational dynamics in the workplace. It talks

about the difficulties in negotiating these relationships, particularly when technology is changing due to abrupt changes in the sociocultural, political, or economic spheres, like the Covid-19 epidemic. The study article (Statnickė et al., 2019) focuses on the connection between mobile learning and work engagement across various demographic cohorts in the workplace. The results show notable variations in mobile learning and job engagement between generations. In comparison to Generation Z, Gen X and Gen Y exhibit greater levels of work engagement. On the other hand, Generation Z seems to be more inclined to use mobile learning in the workplace. The group least likely to implement mobile learning in the workplace is the baby boomer generation. While earlier studies explore the perceptions of Gen-X towards technology, an attempt to examine the motives that compel the generation towards use of technology more than previous generations has not yet been investigated thoroughly in the current literature. To address this gap, our research therefore seeks to fill this gap in the literature by further comparing and contrasting the technological behavior for the generational groups; Gen-Z, Gen-Y and Generation X in order to understand the complex relationships between generation and technology usage, hence our objective of looking at the specific factors that contribute to technology use in these two generational groups.

This paper highlights the reasons behind the difference in the behavior of generations X, Y, Z in using the technology in a workplace. The study not only explore the fundamental causes or reasons that underlie these behaviors in a workplace, even though it admits that there are noticeable variations between these generations' interactions with technology. In addition, the study implies that additional research is necessary in order to extend these behaviors into a wider context on the Internet, implying that the current analysis may be limited in scope. This literature helps in identifying the reasons, key factors that influence the generational differences in the workplace and also the communication gap between different generations in a workplace. Different generations use technology according to the motivation they have which surely is different in different generations. More than that the barrier faced by them in learning new technology is also a point to be discussed.

It enables research to grasp the theoretical foundations and an ideal model that has been employed in analyzing technology acceptance and usage across different generations in workplaces. In light of the existing literature review, researchers are able to identify specific angles which have not been discussed or not extensively discussed with regard to the utilization of technologies in the workplace thus explaining the need for the current study. This informs the research how various methodologies have been conducted in previous studies thereby aiding in the development of research strategies for the current study. To achieve a higher coherence in the analysis, it would be possible to present a literature survey that establishes the context under which the current study is conducted and published, and in this manner, it is easier to designate the work's contribution into the field and into the human interactions at the workplace.

This study aims to better understand generational disparities in workplace technology adoption and behavior, with an emphasis on Generation X, Generation Y, and Generation Z. The study attempts to provide a thorough overview of intergenerational relationships in professional contexts by examining how each

generation interacts with technology as well as their attitudes toward workplace dynamics, communication, and collaboration. The findings will aid organizational leaders, human resource managers, and policymakers by providing insights on how to build specialized management methods, increase employee engagement and productivity, and foster a more inclusive and productive workplace. This study will benefit researchers and academicians in the domains of sociology, organizational behavior, and human resource management by expanding theoretical frameworks and informing future studies on generational dynamics

1.1. Research questions

This study seeks to offer a thorough insight into the differences in technology behavior across generations at workplace. Specifically, we seek to address the following research questions. **Table 1** summarizes the research question and data collection parameters.

RQ1: How do the technology usage patterns of Gen-X, Gen-Y and Gen Z differ in the workplace?

To answer this research question, the study will gather and evaluate data on technology adoption rates across generations (D1–1). This will entail investigating how quickly and to what extent each generation incorporates new technologies into their workplace habits. The investigation will assist in identifying distinct patterns in technology usage among Gen-X, Gen-Y, and Gen-Z in the workplace.

RQ2: What are the key factors that influence generational differences (Gen-X, Gen-Y and Gen-Z) in workplace technology behavior?

This research question will be examined by investigating various data collection parameters. Technological upbringing and digital proficiency (D2-1) encompasses comprehending the impact of technology exposure during formative years on the digital competencies and comfort levels of different generations. Communication preferences and styles (D2-2) scrutinizes the favored modes and styles of communication for each generation, explaining the influence of these preferences on technology utilization in professional settings. Work values and expectations (D2-3) entail evaluating the fundamental work values and expectations of each generation, and how these factors affect their engagement with workplace technology. Social media usage (D2-4) examines how each generation utilizes social media and financial technologies, offering insights into their overall technology usage patterns. Multitasking abilities and learning preferences (D2-5) involve assessing the multitasking capabilities and preferred learning styles of each generation, which can impact their utilization and adaptation to new technologies. Worldview and career perspectives (D2-6) delves into the broader worldview and career aspirations of each generation, and how these outlooks shape their behavior towards workplace technology.

RQ3: How do these generational differences (Gen-X, Gen-Y and Gen-Z) impact communication, collaboration, and productivity within and across generations in the workplace?

In order to address this inquiry, the research will gather information concerning: The analysis of Communication channel metrics (D3-1) entails evaluating the

efficiency and choices of distinct communication channels utilized by each age group, aiding in comprehending the influence on organizational communication. The scrutiny of Collaboration tool usage analytics (D3-2) explores the utilization patterns of diverse collaboration tools among different age groups, offering insights into generational preferences and the efficacy of these tools in enhancing collaborative efforts. The assessment of Productivity metrics derived from generational surveys (D3-3) encompasses the compilation and examination of productivity data obtained from surveys conducted across different generations to evaluate the impact of generational disparities in technology utilization on overall workplace efficiency.

The objective of this research is to identify existing knowledge and theories related to each research question. To understand the current state of knowledge and how it addresses each research question.

Table 1. Research question and data collection parameters.

RQ#	Research question	D#	Data collection parameter
RQ1	How do the technology usage patterns of Gen-X, Gen-Y and Gen Z differ in the workplace?	D1-1	Analysis of technology adoption rates for different generations.
RQ2	What are the key factors that influence generational differences (Gen-X, Gen-Y and Gen-Z) in workplace technology behavior?	D2-1	Technological upbringing and digital proficiency
		D2-2	Communication preferences and styles
		D2-3	Work values and expectations
		D2-4	Social media usage
		D2-5	Multitasking abilities and learning preferences
		D2-6	Worldview and career perspectives
RQ3	How do these generational differences (Gen-X, Gen-Y and Gen-Z) impact communication, collaboration, and productivity within and across generations in the workplace?	D3-1	Communication channel metrics
		D3-2	Collaboration tool usage analytics
		D3-3	Productivity metrics based on generational surveys.

2. Background

Since the invention of technology started being implemented in workplaces, it has been a key revolution in determining complexity of communication and flow of work. It is now possible to work with representatives of different generations, and this means that attending meetings, trainings, and other events, you will meet representatives of Generation X (1965–1980), Generation Y (1981–1996), and Generation Z (1997–2012), and as a result, their attitude toward the technology will differ, and it will be quite important to establish a common language and discuss these peculiarities (Güloğlu, 2023). Generations X, Y, and Z demonstrate distinct characteristics across multiple domains. Generation X, Y, and Z display notable differences in personality traits, strategies for conflict resolution, and coping skills, encompassing variations in confrontation, emotional expression, and coping mechanisms such as substance use and denial (Tania, 2022). Despite both being digital natives, the Y and Z cohorts find themselves in divergent socio-technological contexts due to encountering distinct technological shifts, thus influencing their reactions to

digital advertising and influencer marketing. Generation Z, who has matured in a more technologically sophisticated period, exhibits a superior technological proficiency in comparison to X and Y, who are in the process of adjusting to the new technological epoch. Moreover, disparities in values and cognitive patterns within the workplace have been observed among generations X, Y, and Z, facilitating Human Resource managers in comprehending and conveying organizational priorities. Variances in financial behavior also exist between generations Y and Z, shaped by factors like financial literacy and locus of control, resulting in substantial impacts on the financial conduct of Y but not of Z (Dwidienawati et al., 2021).

Generation X is defined as adaptable generation of the personal computers and the start internet use at the right time and experienced the very first basic form of workplace computerization. Generation Y or Millennials come of age in the new environment that is actually based more and more on the digital mediums and channels. On the other hand, the first real 'digital natives'; Generation Z, stepped into the world of work with an indigenous understanding of practices such as the use of smart phones, social media, and an overall always connected online environment (Ateşgöz and Ulukan, 2022). Shaped by such generational experiences, technology in the workplace has indeed evoked variations in technology behaviors. The distinction between the generational cohorts lays in their; preferences for communication channels, attitudes towards remote work, as well as facility with various emerging technologies. Dtifferences and similarities that are associated with the generation should be understood and observed particularly if an organization intends to increase productivity, engagement and also meet the technological advances.

2.1. Generational cohort theories

The theoretical framework which examines generational differences was developed in the 1950s as it is acknowledged that a person is defined by the context they were raised in and part of a particular generation. Referring to the social position of a generation by present, the aspects such as life behaviours, feelings, and attitudes (Latkovikj et al., 2016). The idea of a "cohort" means people who are in a particular age group, who are assumed to have similar experience in a given time period or timeframe enter a system and are presumed to have similarity in experiences (Norval, 2005). Mannheim's Theory of generations (Latkovikj, 2020) also comprises of the social space of the individual which is their life cycle and the historical time they belong to. Generational time divides people into groups of a certain age or age range, whereas historical time is more engulfing cultural or developmental trends that affect individuals and families. A cohort is defined as a set of historical events and related processes observed which define a clear and distinct separation between generations.

Generational cohort theories have a profound impact on the advancement and integration of novel technologies by explaining the dynamics of how distinct age demographics engage with and accept technological progress (Çera et al., 2022). Studies have found that generational cohorts have an important influence in technology acceptance, with findings indicating that generations govern the linkages between the antecedents of technology acceptance models and behavioral intents, influencing adoption rates. Generation cohorts influence innovation dissemination,

with later cohorts seeing higher rates of diffusion and early adoption, so defining the diffusion path for future generations (Pustovoyt et al., 2022). Research shows that older persons experience challenges to technology use, underscoring the significance of recognizing generational disparities in technological skill and adoption rates. Despite these implications, some research imply that generational cohorts do not have a substantial impact on technology competency in some circumstances, as regular exposure to technology is more important in increasing adoption rates (Wilson, 2018).

Six generations have been identified (**Figure 2**): Soldiers, blue collars, echo boomers, millennials, greatest generation, net generation, and alpha generation. In this paper, the focus will be on analyzing whether or not each generation has attributes that differentiate it from other generations, with a special focus on Generation X (born between 1960 and 1980), Gen-Z (born between 1980 and 1995) and Generation Z (born between 1995 and 2012).
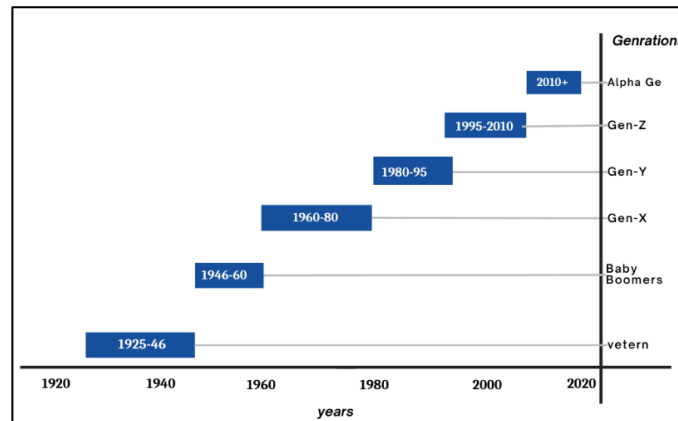

Figure 2. Timeline of generations (Wilson, 2018).

2.1.1. Generation X (Gen-X)

It is for this reason that Generation-X has been dubbed as the independent, 'lone rangers', innovative or survivors. It is for this reason that they came of age during this period of technological evolutions and big events such as the PC revolution and the World Wide Web. Consequently, they are mostly ICT literate individuals who are in touch with online discourses. The next generation, the so-called Generation X, also faced numerous social and political transformations such as the demise of the Cold War and emergent globalization. This is evident in economic hardships termed as the recession in the early 1980s, grossed the impact on their approach to work and financial stability. (Mahmoud et al., 2020).

2.1.2. Generation Y (Gen-Y)

It is very important to understand that there is no precise age range of Millennials but commonly it is defined as people born between early 1980s and mid-1990s. This generation has been a witness to metamorphosis of global technological advancement from the traditional methods of the analog age to digital age that employs the internet, mobile gadgets and social networks. They are members of the Millennial Generation, which is characterized by relatively high levels of technological advancement from an early age, which in turn shaped their expectations of tele-working and technology-based communications at work. (Mahmoud et al., 2020).

2.1.3. Generation Z (Gen-Z)

The Gen-Z or in some cases referred to as "digital natives" has grown in a world characterized by technology and social media platforms. This is evidenced more by sampling tech-savvy gadgets, being adept with the social networks, and having first and nearest access to information. Generation Z is perceived as diverse, inclusive with great attention to the global social issues. They have been learning from various occurrences that are likely to shape their deep concern in environmental issues, as well as equality in the society such as the world financial crisis in the year 2008 (Deloitte, 2022).

Analyzing the differences within Gen-X, Gen-Y and Gen-Z enables the point of increased theological understanding of how previous epochs have shaped young generations. It is important for the businesses, decision makers who implement policies, educators, and even the society as a whole to come to terms with the differences brought by the different generations.

This background lays the foundation down for a more in-depth assessment of how these generational cohorts approach technology in the workplace and makes a case for the implementation of relevant strategies that are compatible with the technological preferences and skills of each generational cohort in the workplace.

2.2. Characteristics of generations

According to the data available in the literature, the cultural continuity theory claims that there are generational differences not only because of age but also because of differing exposure to certain kinds of life events. Generation X (Gen-X) is a group of technology and media users that use technology and media services by choosing a necessity and usefulness of the certain services rather than by enthusiasm. Prior to incorporating technological innovations into their instructional models, they assess the relevance and dependability of such tools. Another generation, which can be considered to be using hi-tech products and solutions, is Generation Y (Gen-Y), also referred to as the millennial generation. While they consider technology as perhaps the most important aspect of organizational and personal growth, they are always on the lookout for trends and innovations about these technological inventions. Generation Z (Gen-Z) are the children of this generation and are also referred to as the internet generation or millennial. It goes without saying that children are at ease with a vast spectrum of technology products and applications through their day-to-day contact.

Gen-X connects flexibility and remote work as they positively impact their work-life choices and enable them to balance between the professional and personal domains. This generation is seeking employment in that they can well be employed online or work at night so as to address their responsibilities. Gen-Y desires flexible employment relations which call for separation between the employment relations of a person and his/her personal life. They opt for such environments, where these roles overlap, thus use technology as a way of staying connected and working. Gen-Z is pretty much digital native which makes them okay with the concept of remote work and communicating with your colleagues online. Launched as such, peer to peer and outsourcing are perceived by them not as exotic ways of work but as the norms (Arsalan, 2021; Dhewandrie and Yuniawan, 2023; Puiu et al., 2022).

Gen-X for instance is quite in a position to be cynical on over- promotional zed technological advancement. They are rather conservative with new technologies, waiting until they observe visible advantages and stability of those innovations. It should be noted that Gen-Y is more receptive of new trends than the previous generation, but the reception is equally cautious. Technologically savvy, they focus on the business aspects but also become enthusiastic when they find the real use of technology and prefer reliable solutions. How Gen-Z applies technologies into real-life situations is nearly similar, that is, it emphasizes on usability of a particular technology. Since they're essentially tech-savvy, they are more likely to skip the glamour of the technology though they would appreciate the pragmatic application of the technology (Fuchs et al., 2022; Goessling, 2017; Waworuntu et al., 2022).

When it comes to communication, Gen-X is straight to the point with a special preference of using short and powerful words. The business people cherish direct and functional interactions that do not include too many extras, which implies that they appreciate clear and concise forms of communication. Gen-Y emphasizes the importance of mutual communication and respects frankness and representing each other's ideas in relations. Though they are more suited to the responsive style of communication, they are more inclined towards an open form. Gen-Z approbate this kind of communication that is free and open. May forgo social pleasantries and be direct in their communication, they expect the same from others (Karanfiloğlu et al., 2022; Raslie, 2021).

Gen-X enjoys face-to-face communication and values personal meetings, as well as solid and proven. Work constraints: organize meaning from interpersonal relationships and face-to-face communication, which are appreciated more than structural communication forms. It might be noted that Gen-Y is born and raised in a digital world, or a world that is entirely wired. The respondents are not afraid of using new technologies and applications for teamwork; they enjoy the technology's effectiveness and align it with their preferred working model. Similarly, Gen-Z is receptive to experiencing environments that are digitally connected. They prefer and are more inclined to use social media and other online platforms when it comes to interactions and group projects rather than face-to-face interactions (Grenčíková and Vojtovič, 2017).

Performance Management that focuses more on achieving results and getting things done is the major feature of Gen-X. These entities are self-driven and are focused on goal accomplishment, process enhancement and the provision of definitive results. This generation involves the results of their work and tangible outcomes as the measure of their success. Gen-Y and Gen-Z has passion for purpose in their work and the purpose has to be social. They work for employers who provide them with opportunities that are replacements of their passion and create societal contributions. They seek employment, job satisfaction, and career advancement within their careers. They also look for meaning and social justice and shares a similar equivalent of work that has purpose and is worth it. People who work there are motivated by the primary objective of making a difference from what they do (Grenčíková and Vojtovič, 2017; McHenry and Ash, 2013).

The above discussed features with respect to the generations are summarized in **Table 2**.

Table 2. Difference characteristics of Gen-X, Gen-Y and Gen-Z.

Feature	Gen-X	Gen-Y	Gen-Z
Technology adoption	Pragmatic adopters	Early adopters of digital technologies	Digital natives
Work-life balance	Values flexibility and remote work	Seeks work-life integration	Comfortable with online collaboration
Tech hype	Skeptical of flashy trends	Adopts trends with caution	Seeks practical applications
Communication	Prefers direct and concise communication	Values open and transparent communication	Values open and transparent communication
Collaboration	Appreciates in-person interaction	Thrives in digitally connected environments	Thrives in digitally connected environments
Work motivation	Driven by results and efficiency	Seeks purpose and social impact	Seeks purpose and social impact

3. Materials and methods

In this study, we're delving into the differences in how Generation-X, Generation-Y and Generation Z interact with technology at work. Our goal is to offer a nuanced understanding of their technology behaviors in professional settings. Using a method of content analysis, we aim to comprehensively explore this topic. In this section, we'll explain how we go about searching and selecting the right publications for our analysis. In brief, our methodology consists of three phases– (1) planning, (2) implementation, and (3) synthesis. Subsequent sections will provide detailed explanations of each of these phases.

3.1. Planning

During this stage, the strategy for searching publications in different search engines is planned. Following the principles of systematic mapping studies, a predefined set of domain-specific keywords (pertaining to the generation gap in technology behavior) are applied to search popular digital libraries for publications that align with our criteria. To identify publications for our study, four search engines were considered including ACM digital library, IEEE Xplore, Science Direct and Springer. These libraries with short description, URL and their areas are outlined in **Table 3**.

Table 3. Digital libraries queried in literature review.

Database	Description	URL	Areas	Advance research y/n
ACM digital library	Complete collection of ACM publications.	https://di.acm.org/	Computing & information technology	Y
IEEE Xplore	Contains scientific and technical articles published by IEEE and its publishing partners	https://ieeexplore.iece.org/	Engineering & Technology	Y
Science direct	Vast scientific and technical literature platform.	https://www.sciencedirect.com/	Interdisciplinary	Y
Springer	Global powerhouse in scientific, technical, and medical (STM) publishing.	https://link.springer.com/	Interdisciplinary	Y

To identify the most effective terms for researching the generational gap in technology behavior, an initial search was undertaken in four credible digital

repositories: IEEE Xplore, ACM Digital Library, SpringerLink, and ScienceDirect. The goal was to identify common phrases or their counterparts that are often used in scholarly works exploring differences in technology adoption between generations. To improve precision, search queries were refined iteratively. The final iteration of the search string is shown in **Figure 3**:

["Generation Gap" OR "Age divide " OR "Inter-generational differences"]AND ["Workplace" OR "Work environment" OR "Work site"] AND "[Technology" OR "Technical expertise" OR "Technological advancements"]

Figure 3. Search string.

Inclusion and exclusion criteria.

The description within the **Table 4** explains the criteria for inclusion and exclusion in the review of literature concerning the generational gap in technological behavior at workplace. The inclusion criteria require that sources be published in the subject of sociology, assuring relevance to the study of social behavior and institutions. The research must concentrate on the dynamics of Generation X, Generation Y, and Generation Z, the three cohorts of importance. To ensure a thorough evaluation and analysis, the sources should be written in English and made available online in full form. Data-driven analyses are preferred as they provide actual evidence to back up the findings. Exclusion criteria exclude websites, leaflets, and grey literature in order to retain academic rigor. To ensure relevance and accessibility, studies that focus on non-relevant age groups or do not provide full-text access online are removed. Non-peer-reviewed sources are also omitted from the literature review to ensure its credibility and dependability.

Table 4. Inclusion and exclusion search parameters.

Inclusion	Exclusion
Published in Sociology	Websites, leaflets, and grey literature
Dynamics between gen-x, gen-y and gen z	Non-relevant age groups
Written in English	Full-text not available online
Preference for data-driven analyses	Non-peer-reviewed sources

3.2. Implementation

In this phase, a delineation of the procedure for processing and refining the publications obtained from the search in the digital library is provided. Initially, a search conducted across five digital libraries produces 1307 publications, with Springer yielding the highest count of publications (806). Subsequently, a three-phase quality control mechanism is executed to exclude publications that do not meet the specified criteria. The volume of publications filtered at each stage is demonstrated in **Figure 4**.

The initial stage comprises the extraction of research articles, resulting in the elimination of 768 publications, thereby leaving 539 potential publications for the subsequent stage. During the second stage, criteria for inclusion and exclusion are enforced to address duplication concerns, leading to the exclusion of 77 duplicate

research articles. This thorough process culminates in the incorporation of 462 publications. The third stage involves filtration based on title and abstract. By utilizing the inclusion and exclusion criteria, the selection is refined to a mere 20 publications.
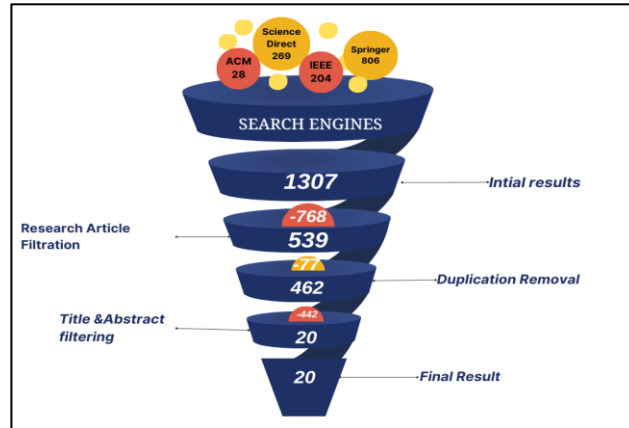

Figure 4. Publication volume resulting from filtering process.

The result dataset contains 20 papers, each meticulously categorized to delve into topic with nuance. Within this collection, 17 papers are distinguished research articles sourced from reputable scholarly journals, offering profound analyses and authoritative perspectives. 3 papers fall into the category of conference papers, contributing unique perspectives from various academic forums. This deliberate breakdown ensures a well-balanced representation of diverse paper types, specifically encompassing journals and conference papers, thereby enriching the overall comprehension of the subject matter.

Table 5 lists all the publication titles, they are assigned id as S1, S2, ……. , S20. Instead of using the titles to answer research questions the ids will be used. The names of the author and the publication type are also part of the table.

Table 5. Publication type related to generational studies.

Studies	Author(s)	Publication type
[S1] 'Leave or remain': intentions of Gen X and Y employees. (Weerarathne et al., 2023)	R. S. Weerarathne	Research article
[S2] The AI generation gap: Are Gen Z students more interested in adopting generative AI such as chatgpt in teaching and learning than their Gen X and millennial generation teachers? (Chan and Lee, 2023)	Cecilia Ka Yuk Chan & Katherine K. W. Lee	Research article
[S3] Generational Differences in Work Values, Perceived Job Rewards, and Job Satisfaction of Chinese Female Migrant Workers: Implications for Social Policy and Social Services. (To and Tam, 2014)	Siu Ming To & Hau Lin Tam	Research article
[S4] Policy Initiatives to Address the Challenges of an Older Population in the Workforce. (Nagarajan and Sixsmith, 2023)	N. Renuga Nagarajan & Andrew Sixsmith	Research article
[S5] The Generation Gap Revisited: Generational Differences in Mental Health, Maladaptive Coping Behaviors, and Pandemic-Related Concerns During the Initial COVID-19 Pandemic. (Grelle et al., 2023)	Kaitlin Grelle, Neha Shrestha, Megan Ximenes	Research article
[S6] Virtual Links: intergenerational learning and experience sharing across age divides and distances. (Hilsen and Ennals, 2009)	Anne Inga Hilsen & Richard Ennals	Research article
[S7] The impact of the work environment on ethical decision making: Some Australian evidence. (Soutar et al., 1994)	Jennifer Sarich, Sandra Kiffin-Petersen Geoff Soutar	Research article

Table 5. (*Continued*).

Studies	Author(s)	Publication type
[S8] Exploring the gap of the digital divide. (Kamil, 2020)	Kamil	Research article
[S9] The gender perspective in maritime education and training. (Horck, 2010)	Jan Horck	Research article
[S10] Bridging the Generation Gap in ICT Education (Kushnir et al., 2013)	Nataliya Kushnir, Anna Manzhula & Nataliya Valko	Conference paper
[S11] Generational Differences in Satisfaction with E-Learning among Higher Learning Institution Staff. (Ahmad and Tarmudi, 2012)	Mohd Amin Ahmad, Shafiee Md Tarmudi	Research article
[S12] Knowledge Management System's Implementation in a Company with Different Generations: A Case Study (Novianto and Puspasari, 2012)	Ovi Novianto , Dewi Puspasari	Research article
[S13] Leadership and the Characteristic of Different Generational Cohort towards Job Satisfaction (Ahmad and Ibrahim, 2015)	Hadijah Ahmad , Badaruddin Ibrahim	Research article
[S14] Generational Differences in the Workplace: Thinking Outside the Boxes (Beaven, 2014)	James Beaven	Conference paper
[S15] Bridging the Research-Practice Gap in Requirements Engineering through Effective Teaching and Peer Learning (Connor et al., 2009)	Andrew Mile Connor; Jim Buchan; Krassie Petrova	Conference paper
[S16] The 3A Interaction Model: Towards Bridging the Gap between Formal and Informal Learning (Helou et al., 2010)	Sandy El Helou; Na Li; Denis Gillet	Research article
[S17] Mind the gap: technology, millennial leadership and the cross-generational workforce (Murray, 2011)	Adam Murray	Research article
[S18] Generational differences in technology behaviour: comparing millennials and Generation X (Calvo-Porral and Pesqueira-Sanchez, 2020)	Cristina Calvo-Porral and Rogelio Pesqueira-Sanchez	Research article
[S19] Workplace expectations of different generations -a review of literature (Sharma and Pandit, 2021)	Janet S. Jones, Samantha R. Murray	Research article
[S20] Are You Ready for Gen Z in the Workplace? (Schroth, 2019)	H. Schroth	Research article

The analysis of 20 publications on generational differences reveals a notable trend of increased research output in recent years. **Figure 5** shows the bar chart showing the paper published year wise.
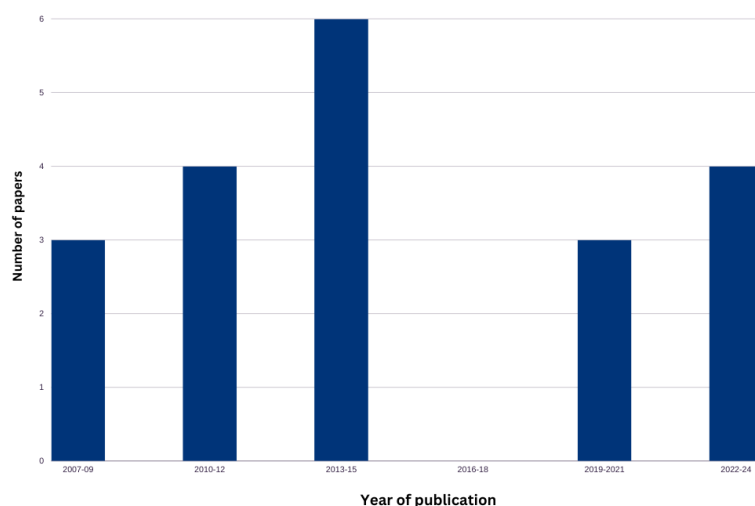

Figure 5. Published paper per year.

3.3. Synthesis

During this phase, the extracted data is compiled to answer the study questions. First, the papers are classified into one of two categories: generational gap or

technological adoption. The generational gap category comprises hypotheses that explain the disparities between two generations (i.e., Gen-X, Gen-Y, and Gen-Z), whether at work or in any other setting. The technology adoption category includes articles that categorize and specify how different generations interact with, process, or use technology. This division assists in the methodical analysis of the literature to address various components of the research topics. **Table 6** summarizes the studied generations year wise.

Table 6. Studied generations by years of publication.

The studied generation	2000–2010	2011–2020	2021–2023	TOTAL NUMBERS	%AGE
Veteran generation	2	1		3	12.50%
Baby boomers	1	2	2	5	20.83%
Gen X		3	1	4	16.67%
Gen Y		2	1	3	12.50%
Gen Z			3	3	12.50%
Alpha generation			2	2	8.33%

4. Results and discussion

This section presents the results of our study questions, which were derived from a synthesis of the final collection of 20 papers pertaining to the changes in technological behavior between generations.

RQ1: How do the technology usage patterns of Gen-X, Gen-Y and Gen Z differ in the workplace?

In examining workplace technology usage, notable differences emerge between Gen-X, Gen Y, and Gen Z. Gen Z, being digital natives, demonstrate heightened proficiency and dependence on technology in comparison to Gen-X and Gen-Y. According to [S1], [S19] Generation X employees are familiar with significant technology equipment and tools used in the workplace. However, they may lack familiarity with technology that emerged after they entered the industry, such as social media and interactive tools. Generation Y employees, also known as Millennials, do not make a clear separation between work and personal life. They practice continual learning, have a stronger educational background, and are more likely to successfully implement new technology and advanced approaches in the job. Members of Generation Z are digital natives who are more technologically sophisticated than prior generations. They grew up during a period of tremendous technological growth and are familiar with a variety of digital tools and platforms in the workplace.

4.1. D1-1 Analysis of technology adoption rates for different generations

Research findings suggest that Gen Z places value on a positive attitude and clear objectives from their supervisors, whereas Gen-X and Gen Y prioritize open communication and feedback. Throughout their lives, members of Generation X have witnessed the move from analog to digital technologies. As 'digital immigrants,' they have had to adapt to new technical breakthroughs, such as artificial intelligence, yet

they may not be as familiar with these technology as younger generations. However, their resilience, adaptability, and professional expertise allow them to perceive the potential benefits of AI in a variety of scenarios, leading to eventual acceptance and implementation if proven effective [S2].

Millennials, as 'digital natives,' are more at ease with technology and are expected to be early users of AI-powered tools and services. They place a high emphasis on flexibility, efficiency, and creativity, which is consistent with the capabilities of AI technologies. Millennials are expected to use AI in a variety of areas of their lives, including career advancement, personal improvement, and social interaction, potentially driving the development of new AI-based goods and services suited to their generation's requirements and preferences [S18].

The adeptness of Gen Z with technology has been associated with workplace cyberbullying, highlighting potential negative consequences of their substantial reliance on technology. Gen Z's utilization of financial technology (FinTech) is influenced by technostress and consumer innovativeness, revealing a nuanced relationship between technology and workplace stress [S15].
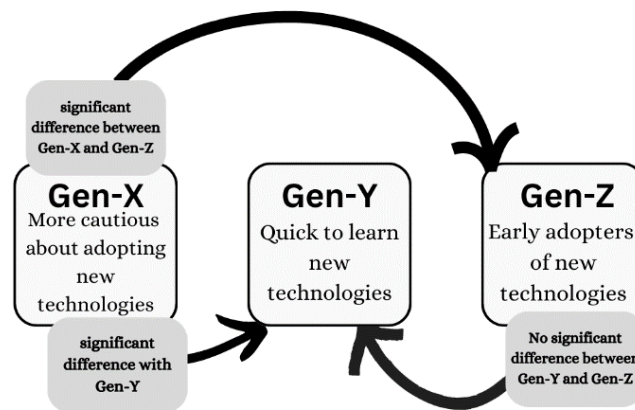

Figure 6. Comparison of Technology preferences by the Gen-X, Gen-Y and Gen Z.

Figure 6 shows the comparison of technology preferences by Gen-X, Gen-Y and Gen-Z. Studies note Gen Z's ability to multitask efficiently using technology in the workplace. In contrast, disparities in technology usage and beliefs have been observed between Gen X, Gen Y, and Gen Z, indicating a generational gap in preferences and behaviors. Emphasizing the increasing importance of mobile technology, social media, and internet usage for Gen Z, the research highlights their substantial reliance on these technologies in the workplace. The distinct worldview and career perspectives of Gen Z also play a role in shaping their approach to the workplace, signifying a departure from earlier generations in terms of work attitudes. The widespread utilization of social media by Generation Z for purposes such as education, entertainment, shopping, and social interaction highlights their dependence on technology across diverse facets of both their professional and personal spheres [S20]. Gen Z's workplace technology usage patterns diverge from those of Gen-X and Gen Y, evident in their proficiency, reliance, and multitasking abilities with technology. The substantial use of technology,

particularly social media and FinTech, has implications for workplace dynamics, stress, and career perspectives.

RQ2: What are the key factors that influence generational differences (Gen-X, Gen-Y and Gen-Z) in workplace technology behavior?

The question comprises several components that together seek to explore and understand the various elements shaping how individuals from different generations interact with technology in a professional setting. **Table 7** summarizes the factors influencing the generational differences with the publication in which it appears.

Table 7. Identified factors influencing generational differences.

Factors	Publications
Technological upbringing and digital proficiency	[S2] [S15]
Communication preferences and styles	[S20]
Work values and expectations	[S9] [S18] [S15]
Social media usage	[S1] [S7] [S15]
Multitasking abilities and learning preferences	[S2] [S15] [S19] [S20]
Worldview and career perspectives	[S15]

4.2. D2-1 Technological upbringing and digital proficiency

Existing literature frequently highlights the impact of early technology exposure on Generation Z, depicting them as digital natives with innate digital aptitude. The Gen-X generation is defined as having adapted to technology later in life. Growing up with the internet and experiencing the rise of digital technology during their formative years characterizes Gen Y's technological experiences, which fall between Gen X and Gen Z [S2]. They can be adaptable to evolving technology while not being as technologically sophisticated as Generation Z [S15]. **Figure 7** shows the percentage usage of technology by the three generations.
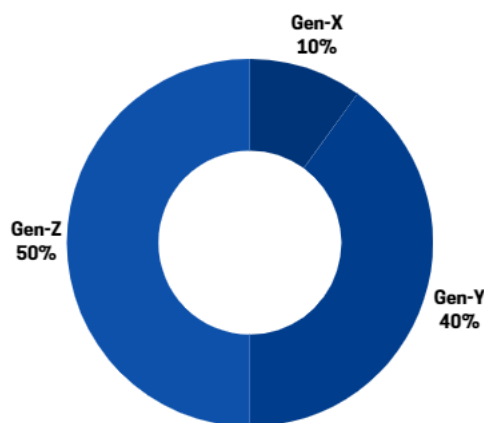

Figure 7. Tech usage of Gen-X, Gen-Y and Gen-Z.

4.3. D2-2 Communication preferences and styles

Different Generation-X, Millennials (Generation-Y), and Generation-Z communication styles are a result of their distinctive experiences and the changing landscape of media. Generation-X mostly prefers conventional approaches like

speaking eye-to-eye or using proper emails. They like structured meetings and have a direct formal manner of communication giving importance to professionalism and formality.

On the other hand, millennials are comfortable with digital communication tools such as instant messaging and video calls. They demand openness in communication; they love teamwork, being at ease both at informal or formal workplace interaction settings. As for Generation Z prefers instant messaging through platforms in social media which is asynchronous. These prefer short talks mainly involving visual elements such as emojis as well as videos. It's evident how technology has impacted each generation based on the kind of communication tools available when they were young ones. Understanding these preferences helps foster effective workplace communications and collaborations across generations [S20].

4.4. D2-3 Work values and expectations

The literature shows a tight relationship between workplace expectations and technological expectations of Gen-Z [S9]. This entails that they want more advanced office facilities and flexible working hours. Hence, organizations must make sure that their technological infrastructure keeps pace with the changing generational expectations to attract and retain talents.

Differing experiences and changes in society have shaped work values and expectations within Generation X, Generation Y (Millennials), and Generation Z. Where stability and work-life balance are core for generation X, seeking long-term commitments has become second nature to them. Wanting purpose-driven employment, flexibility, continuous learning, integrating technology in the workplace is now anticipated by the millennials. The generation Z values highly developed technologies, entrepreneurial opportunities, feedbacks through seamless tech integration [S15]. Each generation's work values have been influenced by their interactions with technology as gen x learnt later in life while millennials embraced it plus generation z were born in it. By engaging these ideals, employers can create inclusive workplaces with modern ideologies that suit the needs of all generations while at the same time contributing towards a positive organizational culture as well as talent retention [S18]. **Figure 8** shows the number of papers that discussed work value and expectations of Gen-X, Gen-Y and Gen-Z represented in graph.
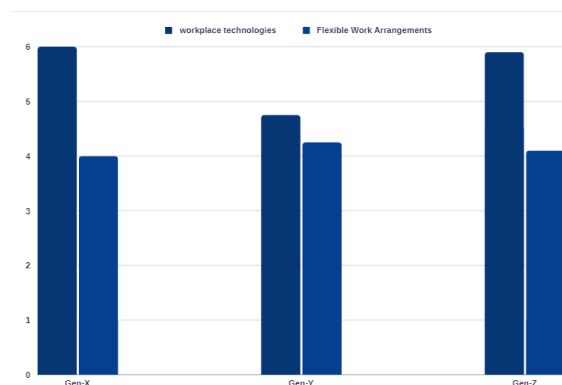

Figure 8. Work value and expectations of Gen-X, Gen-Y and Gen-Z.

4.5. D2-4 Social media usage

The literature emphasizes Gen-Z's considerable use of social media as well as their distinct attitude to financial technology use, implying consequences for workplace behavior [S1]. Because they observed the birth of social media platforms during their formative years, Gen-Y may participate actively in these platforms as well, albeit with different patterns and preferences than Gen-Z. Furthermore, Gen-X, which falls between Gen-Y and Gen-Z, may be more cautious when it comes to social media, being early adopters but not as innately immersed as Gen-Z [S7] [S15] [13].

4.6. D2-5 Multitasking abilities and learning preferences

The literature emphasizes Gen-Z's ability to multitask as well as their preference for micro learning and on-demand resources [S15]. The tendency for dynamic and on-the-go learning experiences may be shared by Gen-Y and Gen-Z, who are recognized for embracing multitasking and valuing continual learning [S19]. Generation X may demonstrate multitasking skills as they adapt to technology later in life, but with a different learning style, maybe preferring more structured or traditional learning techniques [S2] [S20].

4.7. D2-6 Worldview and career perspectives

The distinct worldview and career perspectives of Generation Z, impacted by technology, indicate a shift in attitudes from previous generations. Because they entered the workforce during economic downturns, Generation Y frequently emphasizes purpose-driven employment and seeks meaning in their professions. Because of many economic and societal forces, Gen-X may take a pragmatic approach to their professions, favoring stability and long-term goals. Recognizing these various points of view is critical for designing a workplace that meets the tastes and values of all three generations [S15]. **Figure 9** shows the number of papers that discussed world view and career perspectives of Gen-X, Gen-Y and Gen-Z represented in graph.
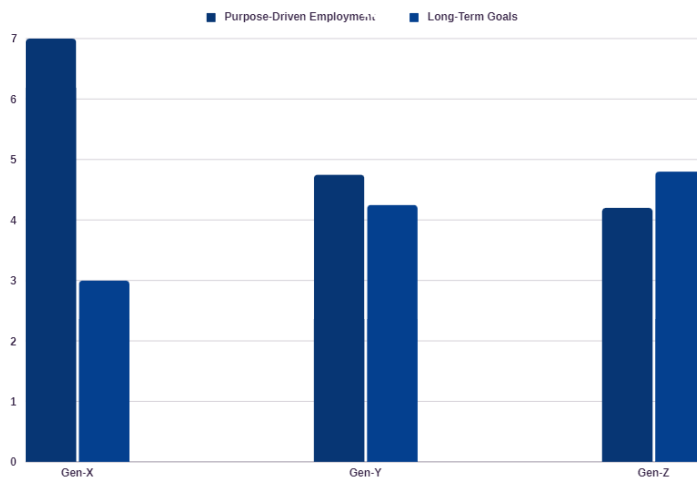

Figure 9. World view and career perspective of Gen-X, Gen-Y and Gen-Z.

Finally, it can be deduced from the critical analysis of the literature that generational differences in workplace technology behavior are multifaceted and

encompass various aspects concerning communication styles, values, stress factors and learning preferences. These distinctions have to be cleverly addressed by organizations in order to have a broad-based working environment that caters for different needs of Gen-X, Gen-Y and Gen-Z. This is an important perspective for talent management success as well as organizational success in digital ecosystem that is continually emerging.

RQ3: How do these generational differences (Gen-X, Gen-Y and Gen-Z) impact communication, collaboration, and productivity within and across generations in the workplace?

This question comprises an exploration of the effects of generational differences, specifically between Gen-X and Gen-Z, on communication, collaboration, and productivity within the workplace. It involves examining how the distinct characteristics, preferences, and behaviors of each generation influence the dynamics of interaction and teamwork. The workplace is affected by generational differences like that of Gen-X, Millennial (Gen-Y), and Gen-Z in terms of communication, collaboration, and productivity. The influences are multi-faceted and they mirror generation-specific attributes and tastes. Communication styles that differ between generations might lead to misunderstandings and problems at work. For example, Generation X may favor face-to-face contact, whereas Generations Y and Z may rely more on digital communication. Work ideals and interests vary among generations, which can make teamwork difficult. For example, Generation Y may prioritize teamwork and collaboration, whereas Generation X may place a higher priority on individual contributions. Work norms and technology usage vary with generation, which can have an impact on productivity. For example, Generation Z's tech savvy may lead to more efficient use of digital tools, whereas Generation X's opposition to change may impede the adoption of new technology, reducing overall productivity. Generational cohorts may take different methods to knowledge exchange. For example, Generation Y's emphasis on continual learning may lead to more knowledge sharing activities than Generation X, influencing overall knowledge transfer in the workplace. Generational differences in workplace expectations, as well as historical events, can have an impact on communication dynamics and collaborative efforts. Understanding these expectations is critical for increasing intergenerational collaboration and productivity in the workplace [S1], [S14], [S19].

4.8. D3-1 Communication channel metrics

Differences in communication preferences among different generations become apparent when considering how Gen-X, who became accustomed to technology later in life, may lean towards traditional in-person communication. On the other hand, Generation Y values open and transparent communication, often opting for instant messaging and collaborative platforms. In contrast, Gen-Z, having grown up with technology, demonstrates a greater proficiency and reliance on technology-driven communication methods such as social media and voice platforms. These varying communication styles can present challenges in establishing effective workplace communication that satisfies all parties involved.

The table VIII shows the preferred communication methods of three generations: Generation X, Generation Y, and Generation Z. Generation X prefers in-person communication, landline calls, and email. This choice echoes their early years, when face-to-face encounters and landline phones were the norm, with email becoming more common in their professional life in the 1990s. Generation Y favors email, instant messaging, and social media. The emergence and quick acceptance of digital technology, including the internet, has impacted their communication habits. Generation Z, born between the late 1990s and the present, communicates mostly through instant messaging apps, social media platforms, and videos. Growing up in the age of smartphones and ubiquitous digital media, their tastes reflect a comfort and familiarity with real-time, multimedia-rich communication methods. **Table 8** shows the primary mean of communications discussed in papers by three generations X, Y and Z. Similarly in **Figure 10** the graph represents the percentage usage of different means of communication by different generations.

Table 8. Primary mean of communications by generations.

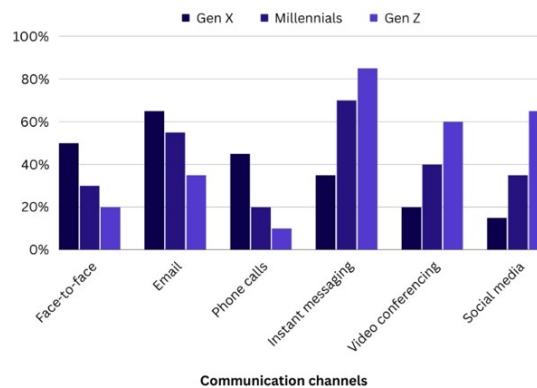| Generations	Responses	Papers
Gen-X	In person, phone calls (landline), and email.	[S1], [S2], [S5], [S14], [S17], [S18]
Gen-Y	Email, instant messaging, and social media.	[S1], [S5], [S12], [S14], [S16], [S17], [S18], [S19]
Gen-Z	Instant messaging apps, social media platforms, and video content for communication.	[S2], [S5], [S14], [S17], [S19]

Figure 10. Communication channel preferences of generations.

4.9. D3-2 Collaboration tools data analytics

Workplace dynamics are influenced by variations in work values and approaches to collaboration. The Gen-X generation, valuing stability and commitment to organizations, tends to favor hierarchical structures and traditional collaboration methods. On the other hand, Gen-Y, with their inclination towards digitally connected environments, and Gen-Z, who prioritize flexibility and innovation, are drawn to agile and technology-driven collaboration strategies. It is crucial to establish a collaborative environment that leverages the unique strengths of each generation in order to bridge generational gaps. The table IX shows the general comparison of forces that affect collaboration of generations X, Y, and Z in the workplace. Gen-X while ready for engagement is not self-sacrificing in nature; is proficient at work and partly rebellious.

They yearn for stability in their job positions, welcome the harshest words Constructive criticism and feedback, and appreciate training capacity. As for the behavior toward power, people show their understanding of the power relations and compliance with the existing structures. On the other hand, Gen-Y, characterized by the sharing the of beans principles and perspective of valuing enhancement of the self, aspires to stability, feedback, training, encouraging promotion ladder, autonomy and interesting work. They continuously analyze the social context and sometimes doubt the efficiency as well as equality of an organization's top-bottom structure. Gen-Z is self-focused and seeks jobs that will help him or her grow. It shows that they appreciate stability, clarity of communication and working frequency, interesting tasks and opportunities to develop. Their attitude towards hierarchy is rebellious and they do not like structures they tend to see power hierarchies as broken or soon to be broken systems, which would like more organic and molecular ones. The purpose of this paper is to pinpoint the differences in expectations, attitudes, and behaviors of generations, and to stress the necessity of using different approaches to enhance collaborative and productive relationships in the workplace for different generations. **Table 9** summarizes the discussion by identifying the factors that influence intergenerational collaboration in the workplace by Gen-X, Y and Z.

Table 9. Factors influencing intergenerational collaboration in the workplace.

Criteria	Gen-X	Gen-Y	Gen-Z	Papers
Attitude towards the employer	Ready for engagement, yet not inclined towards self-sacrifices. Proficient at work, critical of existing structures	Shared principles	Personal growth endeavor	[S1], [S2], [S4], [S5], [S17], [S18], [S19], [S20]
Employer expectations	Steadiness, Open to criticism and feedback Training potential.	Steadiness, Continuous feedback training opportunities promotion prospects decision freedom engaging tasks	Stability regular feedback meaningful projects growth prospects	[S1], [S2], [S7], [S12], [S14], [S16], [S19]
Behavior towards hierarchy	Power is acknowledged	Systems under scrutiny.	Authority questioned, structures fractured.	[S1], [S2], [S3], [S7], [S12], [S16], [S17], [S19], [S20]

4.10. D3-3 Productivity

Generational differences affect productivity in different ways. The experience and institutional knowledge of a generation and society make a difference. However, potential conflicts may arise when workplace structures and technologies fail to accommodate the different working styles and preferences of the two generations [S16].

Interactions between Generation X, Generation Y (millennials) and Generation Z require a delicate balance, leveraging each generation's different skill sets. With their deep expertise, Gen Xers can provide guidance and guidance and share institutional knowledge to improve collaboration and productivity in the workplace. During a time of significant technological advancements and globalization, Gen-Y introduces a dynamic aspect to intergenerational interactions. Their combination of enthusiasm, flexibility, and knowledge contributes to this transformative period. It is

crucial for organizations to comprehend and navigate the disparities in communication, collaboration, and productivity among different generations in order to establish a harmonious and flourishing work environment. By actively acknowledging these differences, companies can leverage the distinct capabilities of each generation, fostering a setting that promotes innovation, teamwork, and overall triumph [S1], [S3], [S16], [S17], [S18], [S19], [S20].

5. Conclusion and future directions

The suite of papers provides an excellent comprehensive understanding of the opportunities and dilemmas facing labor in the contemporary environment. In observing the intergenerational workplace dynamics between Generations X and Y, it underscores how critical it is to understand generational characteristics in crafting successful retention strategies. The current study offers primary data on the peculiarities of the technological behaviours and the organizational perceptions of Gen X, Gen Y, and Gen Z and stresses the necessity of recognizing the intergenerational differences that can contribute to the organizational improvement. The research thus demonstrates that while each generation has its own believes and practices pertaining technology uptake, communication and interactions. For example , Gen-X organization is typified by its stability and strictness of hierarchy, whereas Gen-Y employee demands consistent feedback and engaging tasks; Gen-Z, on the other hand, is motivated by personal development and uses hi-tech flexibility in communication.

The ignorance of such features may lead to ineffective management in organizations and hence the need to come up with better management strategies for each generation. This can have such effects as increased employee motivation, contentment and performance. For example, the provision of polycentric work patterns in relation to workplace relations as well as learning arrangements that are constant, would enhance the satisfaction of Gen Y and Gen Z whereas; prioritization of definite feedback procedures and formal career advancement would enhance the satisfaction of Gen X.

The study also underlines the need to incorporate multiple forms of communication that are appropriate to reach out every generation; while Gen-X's preferred communication is through emails and face-to-face meetings, Gen-Z prefers to use the instant messaging applications and social media to communicate. Thus, organizations can achieve improved communication, concerning all generational groups, with their members. The findings of the study are useful for the human resource managers and policymakers as a guide to establish a suitable working environment that meets the needs of the diverse employees within the different generations. This includes ensuring that training activities prefer learning modalities of the employees, as well as technology skills; thus, creating an environment that supports equality to aid all employees to serve efficiently.

This research contributes to the knowledge about generations in the sphere of technology take-up and behavior at work, offering the findings that enrich and refine the conceptual thinking, including the generational theory and technology acceptance theories. The study also contributes to fill the gap between sociology and organizational behavior since it presents organizational practical realities that can be

used to enhance managerial practices and organizational procedures. In this way, the present research helps to identify how each generational cohort prefers to work and what issues they may face, which in turn assists in establishing better ways to interact, cooperate, and manage people.

The findings of this study cannot be considered solely relevant to organizational practices and concerns. It provides a framework for future research to investigate how the generation narrative and the consequent behavior change with time and space in cross-sectional, sequential, cross-sectional/sequential studies; how cultural factors affect these interactions in cross-cultural studies; and the structural characteristics of the business sectors which underpin generation interactions in distinct sectors. Future study in this regard can help in achieving the objectives of this study more specifically and define strategies for the effective management of a diverse work force with generation gaps in the context of fast growing technologies. Thus, filling gaps between generations and making use of the strengths of each generation enable positive, efficient, and innovative approaches to work and to the organization's benefit as well as the employees' well-being.

Future research based on this literature survey could include longitudinal studies to track how generational attitudes and behaviors toward technology change over time, providing greater insights into the impact of technical breakthroughs and societal changes. Furthermore, broadening the study to include cross-cultural comparisons could highlight how cultural settings influence generational disparities in technology use and workplace dynamics, providing a more comprehensive understanding of these phenomena. Sector-specific assessments within industries such as healthcare, finance, and education may also be useful, as each sector has distinct technical needs and workplace cultures, offering personalized insights that can inspire industry-specific strategies and regulations.

Conflict of interest: The authors declare no conflict of interest.

References

Ahmad, H., & Ibrahim, B. (2015). Leadership and the Characteristic of Different Generational Cohort towards Job Satisfaction. Procedia - Social and Behavioral Sciences, 204, 14–18. https://doi.org/10.1016/j.sbspro.2015.08.104

Ahmad, M. A., & Tarmudi, S. M. (2012). Generational Differences in Satisfaction with E-Learning among Higher Learning Institution Staff. Procedia - Social and Behavioral Sciences, 67, 304–311. https://doi.org/10.1016/j.sbspro.2012.11.333

Arsalan, S. (2021). Technology Adoption Of Millennial Generations In Implementation Of Self Ordering Machine In Fast Food Restaurant. Turkish Journal of Computer and Mathematics Education, 12 (8), 556-560 https://doi.org/10.17762/TURCOMAT.V12I8.2834

Ateşgöz, K., & Ulukan, C. (2023). Online shopping attitudes of generations y and z (Turkish). Anadolu Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 24(1), 20–49. https://doi.org/10.53443/anadoluibfd.1183785

Beaven, M. (2014). Generational Differences in the Workplace: Thinking Outside the Boxes. Eastern Kentucky University.

Calvo-Porral, C., & Pesqueira-Sanchez, R. (2019). Generational differences in technology behaviour: comparing millennials and Generation X. Kybernetes, 49(11), 2755–2772. https://doi.org/10.1108/k-09-2019-0598

Çera, G., Khan, K. A., Lashi, F., et al. (2022). The role of generational cohorts in mobile banking adoption: evidence from South-Eastern Europe. International Journal of Services Technology and Management, 28(1/2), 24. https://doi.org/10.1504/ijstm.2022.123503

Chan, C. K. Y., & Lee, K. K. W. (2023). The AI generation gap: Are Gen Z students more interested in adopting generative AI such as ChatGPT in teaching and learning than their Gen X and millennial generation teachers? Smart Learning Environments, 10(1). https://doi.org/10.1186/s40561-023-00269-3

Connor, A. M., Buchan, J., & Petrova, K. (2009). Bridging the Research-Practice Gap in Requirements Engineering through Effective Teaching and Peer Learning. 2009 Sixth International Conference on Information Technology: New Generations. https://doi.org/10.1109/itng.2009.134

Crooks, C. L., Hogg, J. L., Martin, S. M., et al. (2020). Understanding Generational Factors in the Workplace: Current Considerations for Telework Practices and the Digital Native. 2020 IEEE International Professional Communication Conference (ProComm). https://doi.org/10.1109/procomm48883.2020.00033

Deloitte. (2022). Generational Z report 2022: Shaping the future of work and our world. Accessed: Aug. 02, 2024. [Online]. Available: https://www.deloitte.com/global/en/issues/work/genzmillennialsurvey-2022.html Dhewandrie, G. S. A., & Yuniawan, A. (2023). Exploring Factors Influencing Technology Adoption among Generation Y: A Study of MOOC Users. Jurnal Manajemen Dan Kewirausahaan, 11(1), 57–65. https://doi.org/10.26905/jmdk.v11i1.10202

Dwidienawati, D., Abdinagoro, S. B., Gandasari, D., et al. (2021). Do generation Y and Z really concern about environmental issues? IOP Conference Series: Earth and Environmental Science, 729(1), 012137. https://doi.org/10.1088/1755-1315/729/1/012137

Ermolayev, H. C. V., Mayr, M., Nikitchenko, A., et al. (editors). (2013). Information and Communication Technologies in Education, Research, and Industrial Applications. Springer International Publishing. https://doi.org/10.1007/978-3-319-03998-5

Fuchs, R. M., Morales, O., & Timana, J. (2022). Work–life balance and work values as antecedents of job embeddedness: the case of Generation Y. Academia Revista Latinoamericana de Administración, 35(4), 501–515. https://doi.org/10.1108/arla-01-2022-0015

Glenn, N. (2005). Cohort Analysis. SAGE Publications, Inc. https://doi.org/10.4135/9781412983662

Goessling, M. (2017). Attraction and Retention of Generations X, Y and Z in the Workplace. Murray State's Digital Commons.

Grelle, K., Shrestha, N., Ximenes, M., et al. (2023). The Generation Gap Revisited: Generational Differences in Mental Health, Maladaptive Coping Behaviors, and Pandemic-Related Concerns During the Initial COVID-19 Pandemic. Journal of Adult Development, 30(4), 381–392. https://doi.org/10.1007/s10804-023-09442-x

Grenčíková, A., & Vojtovič, S. (2017). Relationship of generations X, Y, Z with new communication technologies. Problems and Perspectives in Management. https://doi.org/10.21511/PPM.15(SI).2017.09

Helou, S. E., Li, N., & Gillet, D. (2010). The 3A Interaction Model: Towards Bridging the Gap between Formal and Informal Learning. In: 2010 Third International Conference on Advances in Computer-Human Interactions. https://doi.org/10.1109/achi.2010.38

Hilsen, A. I., & Ennals, R. (2007). Virtual Links: intergenerational learning and experience sharing across age divides and distances. AI & SOCIETY, 23(1), 33–40. https://doi.org/10.1007/s00146-007-0166-6

Horck, J. (2010). The gender perspective in maritime education and training. WMU Journal of Maritime Affairs, 9(1), 93–119. https://doi.org/10.1007/bf03195168

Kamil, A. (2020). Digital Divide: Promoting Unequal Access To Distance Learning At The University Of Indonesia. Available online: https://www.researchgate.net/publication/343696910_DIGITAL_DIVIDE_PROMOTING_UNEQUAL_ACCESS_TO_DISTANCE_LEARNING_AT_THE_UNIVERSITY_OF_INDONESIA (accessed on 3 March 2024).

Karanfiloğlu, M., Sağlam, M., & Topsumer, F. (2022). Advertisement Perception and Generations: Comparison between X, Y, and Z Generations. İletişim Kuram ve Araştırma Dergisi, 2022(58), 38–56. https://doi.org/10.47998/ikad.1057266

Latkovikj, M. T. (2020). How Millennials, Gen Z, and Technology Are Changing the Workplace Design? Available online: https://www.academia.edu/80052246/How_Millennials_Gen_Z_and_Technology_Are_Changing_the_Workplace_Design (accessed on 3 March 2024).

Latkovikj, M. T., Popovska, M. B., & Popovski, V. (2016). Work Values and Preferences of the New Workforce: HRM Implications for Macedonian Millennial Generation. Journal of Advanced Management Science, 312–319. https://doi.org/10.12720/joams.4.4.312-319

Lyons, S., & Kuron, L. (2013). Generational differences in the workplace: A review of the evidence and directions for future research. Journal of Organizational Behavior, 35(S1), S139–S157. Portico. https://doi.org/10.1002/job.1913

Mahmoud, A. B., Fuxman, L., Mohr, I., et al. (2020). "We aren't your reincarnation!" workplace motivation across X, Y and Z generations. International Journal of Manpower, 42(1), 193–209. https://doi.org/10.1108/ijm-09-2019-0448

Matumul, C., & Güloğlu, B. (2023). Personality Traits, Interpersonal Conflict Resolution Strategies and Coping Skills Among X, Y, Z Generations. Türk Psikolojik Danışma ve Rehberlik Dergisi, 13(68), 75–91. https://doi.org/10.17066/tpdrd.1211929c

McHenry, W. K., & Ash, S. R. (2013). Knowledge Management and Collaboration: Generation X vs. Generation Y. Available online: https://www.semanticscholar.org/paper/Knowledge-Management-and-Collaboration%3A-Generation-McHenry-Ash/217349dfbc9bbef30090f3b597cadb81e456ee41 (accessed on 3 March 2024).

Murray, A. (2011). Mind the gap: technology, millennial leadership and the cross-generational workforce. The Australian Library Journal, 60(1), 54–65. https://doi.org/10.1080/00049670.2011.10722556

Murray, K., Toulson, P., & Legg, S. (2011). Generational cohorts' expectations in the workplace: A study of New Zealanders. Asia Pacific Journal of Human Resources, 49(4), 476–493. https://doi.org/10.1177/1038411111423188

Nagarajan, N. R., & Sixsmith, A. (2021). Policy Initiatives to Address the Challenges of an Older Population in the Workforce. Ageing International, 48(1), 41–77. https://doi.org/10.1007/s12126-021-09442-w

Novianto, O., & Puspasari, D. (2012). Knowledge Management System's Implementation in a Company with Different Generations: A Case Study. Procedia - Social and Behavioral Sciences, 65, 942–947. https://doi.org/10.1016/j.sbspro.2012.11.224

Parab, V., Mahadik, R., & Tripathi, D. (2022). The Generation and Technology Gap. Indian Business Case Studies Volume VII, 15–22. https://doi.org/10.1093/oso/9780192869432.003.0003

Puiu, S., Demyen, S., Tănase, A.-C., et al. (2022). Assessing the Adoption of Mobile Technology for Commerce by Generation Z. Electronics, 11(6), 866. https://doi.org/10.3390/electronics11060866

Pustovoyt, Yu. A., Pel, V. C., & Koba, S. M. (2022). Generational theories about the factors of socio-political dynamics. Reconstruction of the theoretical field. LOCUS: People, Society, Culture, Meaning, 13(2), 144–158. https://doi.org/10.31862/2500-2988-2022-13-2-144-158

Raslie, H. (2021). Gen Y and Gen Z Communication Style. Studies of Applied Economics, 39(1). https://doi.org/10.25115/eea.v39i1.4268

Schroth, H. (2019). Are You Ready for Gen Z in the Workplace? California Management Review, 61(3), 5–18. https://doi.org/10.1177/0008125619841006

Sharma, P., & Pandit, R. (2021). Workplace expectations of different generations-a review of literature. Yŏksa wa hyŏnsil Quarterly Review of Korean History.

Soutar, G., McNeil, M. M., & Molster, C. (1994). The impact of the work environment on ethical decision making: Some Australian evidence. Journal of Business Ethics, 13(5), 327–339. https://doi.org/10.1007/bf00871761

Statnickė, G., Savanevičienė, A., & Šakys, I. (2019). The Relationship Between Work Engagement of Different Generations and Mobile Learning. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 67(6), 1627–1642. https://doi.org/10.11118/actaun201967061627

Syaifa Tania. (2022). Generational Differences in Interpreting Digital Advertising Practices by Influencers on Social Media (Indonesian). LONTAR: Jurnal Ilmu Komunikasi, 10(1), 54–63. https://doi.org/10.30656/lontar.v10i1.4247

To, S. M., & Tam, H. L. (2013). Generational Differences in Work Values, Perceived Job Rewards, and Job Satisfaction of Chinese Female Migrant Workers: Implications for Social Policy and Social Services. Social Indicators Research, 118(3), 1315–1332. https://doi.org/10.1007/s11205-013-0470-0

Waworuntu, E. C., Kainde, S. J. R., & Mandagi, D. W. (2022). Work-Life Balance, Job Satisfaction and Performance Among Millennial and Gen Z Employees: A Systematic Review. Society, 10(2), 384–398. https://doi.org/10.33019/society.v10i2.464

Weerarathne, R. S., Walpola, M. D. C. P., Piyasiri, A. D. W. D., et al. (2022). 'Leave or remain': intentions of Gen X and Y employees. Quality & Quantity, 57(3), 2249–2268. https://doi.org/10.1007/s11135-022-01456-z

Wilson, D. A. (2018). Accepting the future: Comparing the adoption of technology by age cohorts. Available online: https://soar.wichita.edu/server/api/core/bitstreams/962dc188-f356-4245-aa61-a78087d44c07/content (accessed on 3 March 2024).