A Method for Implementing Engaging Digital Workplaces Using Design Science Research

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Abstract

Technological advancements and the COVID-19 pandemic have accelerated digital transformation, bringing employees from different generations into online work environments. This shift highlights the need to understand the experiences of Generation Y (Millennials) and Z in digital workplaces. However, existing studies often overlook the diverse needs of a multigenerational workforce, leading to disengagement. In 2022, only 23% of employees were engaged, while 59% were "quietly quitting." This paper presents a framework to help organizations create engaging digital workplaces for a multigenerational workforce. Using Design Science Research (DSR), the study combined two Systematic Literature Reviews (SLRs), a phenomenological study, and a confirmatory study. Findings revealed the effectiveness of the proposed framework and method to support organizations implementing engaging digital workplaces, tailored for a multigenerational workforce, with future research recommended to explore broader factors affecting digital workplace engagement and different organizational contexts.

Keywords: Digital workplace, employee engagement, generational traits, Design Science Research.

1. Introduction

Digital workplace (DW) was first introduced in the late 1990s [30]. Initially, definitions focused only on technological aspects [31]. Köffer (2015) defines DW as "the collection of all of the digital tools provided by an organization to allow its employees to do their jobs [17]." Over time, the DW concept has evolved to highlight its sociotechnical nature, integrating people, processes, and technology [18]. Recent definitions describe DW as "the physical, cultural, and digital arrangements that simplify working life in complex, dynamic, and often unstructured working environments [31]." Adopting a holistic view is essential since virtual teams risk stagnation without technological tools facilitating social processes [16]. Building on these perspectives and to serve as common ground in the scope of our study, we use the following work definition: "**A digital workplace is an ensemble of people, business processes, and technology designed to enable work to be done seamlessly from any location, such as home, collaborative space, office, or other, without compromising efficiency or effectiveness**".

Research on DW performance reveals mixed results due to limited exploration of factors affecting employee perceptions [12]. Successful DW implementation involves overcoming challenges through appropriate tools, supportive leadership styles, aligning existing practices with digital paradigms [31], and accommodating a multigenerational

workforce's diverse needs and values [4]. Particularly Millennials and Gen Z, given their emphasis on flexibility and work-life balance, which are areas where the digital work environment can offer support [18]. Recognizing the crucial role of employee acceptance for successful implementation, it is relevant to create engaging DWs that align with employees' values. Given the substantial investments in digital transformation, understanding how to design effective DWs is vital [25].

In the remainder of the paper, we present the research context, followed by our research methodology. Then, the artifacts designed and validated in this study. Afterwards, we discuss the method's demonstration and evaluation, followed by a discussion of the findings. Lastly, we address the conclusions, limitations, and recommendations for future work.

2. Research Context

DW provides numerous organizational advantages, including cost and cycle-time reductions, enhanced flexibility, and improved decision-making [13]. They enable virtual teams to overcome geographic barriers, giving organizations access to a global talent pool while reducing commuting-related carbon emissions [28]. DW also fosters creativity and innovation [10]. For employees, benefits include reduced commuting time, increased autonomy, and better work-life balance [2]. However, DW also presents challenges. Although digitalization can lower operational costs, it often involves high initial investments [8]. Remote work may also blur personal and professional boundaries, leading to stress and isolation [17]. Besides, organizations face challenges such as security concerns, governance issues, and weakened team relationships [4].

Success in DW relies on trust, leadership, collaboration, knowledge sharing, autonomy, and effective communication [24]. Positive leadership, a supportive workplace climate, and cultural diversity are crucial for fostering engagement and productivity [5]. Generational differences may also play a significant role in DW. Gen X prioritizes financial stability and flexible work, Gen Y values meaningful work and team collaboration, and Gen Z seeks individualism, agility, and continuous learning [3]. Understanding these differences is vital for creating an engaging DW that aligns with organizational goals [15]. Building on the gaps and opportunities identified in the existing literature and considering the relevance of a digital environment for organizations, our research question is: **How can business services organizations implement engaging digital workplaces tailored for a multigenerational workforce?**

This research question delineates the scope of our study, which focuses on business services organizations due to our access to companies. It implies an exploration of the processes and strategies involved in creating DWs that are engaging for employees across different generations. The question refers to the development of the specific steps organizations can take to design and implement digital environments that cater to a multigenerational workforce's diverse needs and values. As such, DSR has emerged as the approach that ensures the development of a method with the desired scientific rigor.

3. Research Methodology

DSR follows core principles to ensure rigor and relevance, focusing on addressing significant issues, grounding research in theory and practice, and advancing knowledge through innovation [14]. Additionally, seven guidelines reinforce these principles, emphasizing the creation of artifacts, rigorous design and evaluation, and effective communication [14]. The DSRM process provides a structured approach with six steps: problem identification, defining solution objectives, designing and developing the artifact, demonstrating its application, evaluating effectiveness, and communicating findings [23]. These elements form a robust framework for solving complex organizational challenges.

We performed one cycle of DSR, instantiated by planning its six iterative phases, to achieve our main objective: developing a framework and method to support the implementation of an engaging DW tailored for a multigenerational workforce. Figure 1 highlights the steps performed during the phases Demonstrate and Evaluate.

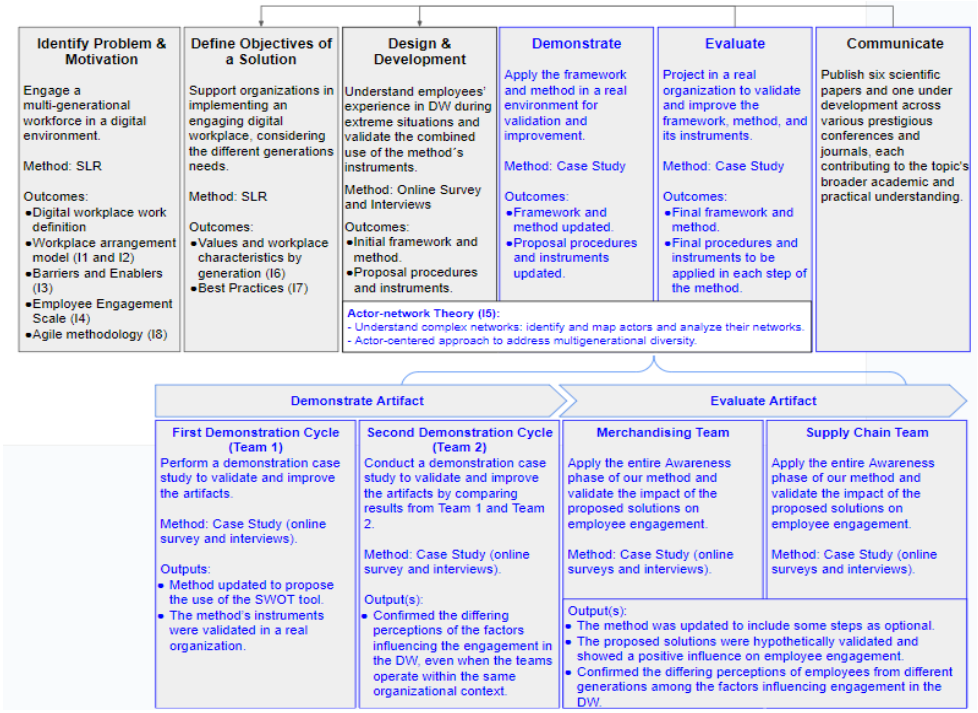

Fig. 1. DSRM Process Model, emphasizing the Demonstrate and Evaluate phases.

In the first two phases of our DSR project, we conducted two SLRs on DW, employee engagement, and generational traits, identifying a gap in addressing the diverse needs of a multigenerational workforce in DW [19; 20]. Building on the findings of the first SLR, we developed a working definition of Digital Work (DW) and identified several instruments for use in our artifacts. These included a workplace arrangement model, levels of virtuality, enterprise integration, barriers and enablers, and employee engagement scales. We also identified various individual, group, and organizational characteristics that influence employee engagement in digital work environments. However, only six studies specifically examined generational differences, highlighting a significant gap in understanding the generational impacts within digital work contexts. To address this, we conducted a second SLR focused on generational aspects. This second review allowed us to delineate generational differences in attitudes toward work, as well as in interests, values, and needs. Furthermore, we consolidated a backlog of best practices-validated by existing literature-designed to mitigate barriers and strengthen enablers in DW environments. This comprehensive analysis enhances our understanding of how generational differences shape employee perceptions and interactions within the digital workplace.

During the Design and Development phase, we conducted a longitudinal phenomenological study [20] and a subsequent confirmatory study [21]. The confirmatory study analyzed data collected from an online survey (N = 378) to validate our conceptual model, as well as the proposed instruments and metrics used in the development of our artifacts. The framework and method were developed to support organizations implementing engaging DW tailored to the needs and preferences of a multigenerational workforce through a multi-method approach. The feedback and insights gathered during the demonstration and evaluation phases were used to refine and enhance the proposed artifacts. The artifact evaluation follows the FEDS framework, a methodology for evaluation in DSR [29]. In the following section, we introduce our artifacts.

4. Framework and Method

We adapted an existing model for implementing DW [1], which includes three phases: Assess and Design, Build Platform, and Adopt, Innovate, Enhance, and Transform. We introduced a fourth phase for evaluating enhancements made in the previous stages to suit our purpose. We also advocate a cyclical approach, inspired by Deming's PDCA (Plan-

Do-Check-Act) cycle [7], to enable continuous improvement. Our framework is presented in Figure 2.

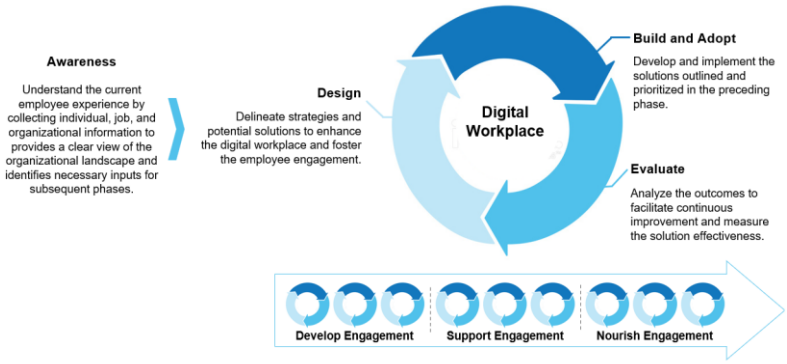

Fig. 2. Framework to support the implementation of an engaging digital workplace.

Furthermore, the proposed method includes detailed procedures for applying the framework in a real organization. Figure 3 illustrates Phase 1 – Awareness.

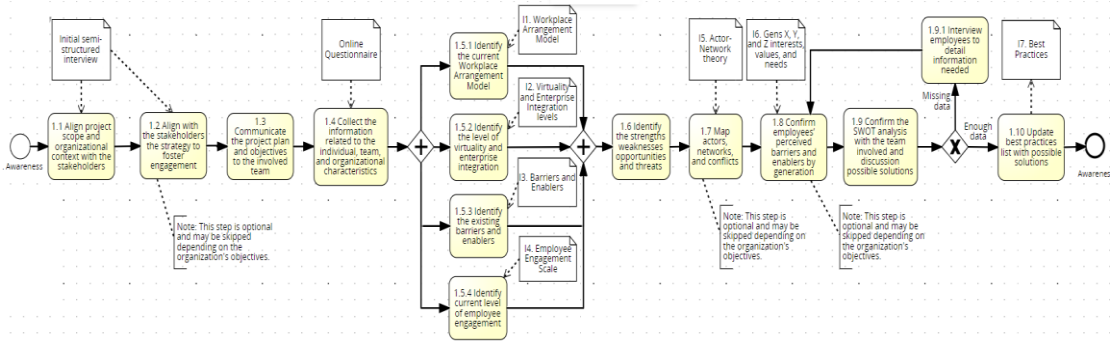

Fig. 3. Method – Phase 1 - Awareness.

The Awareness phase starts aligning the project scope with stakeholders and involves conducting semi-structured interviews. These interviews are essential for gathering insights and ensuring that the project objectives align with the broader goals of the organization. In this phase, stakeholders actively contribute to shaping the strategy to foster engagement. After setting up this foundation, the project plan and its objectives are communicated clearly to the entire team, fostering transparency and ensuring that everyone understands their roles and responsibilities. Then, an online questionnaire is distributed to collect essential input regarding individual, team, and organizational characteristics. The data gathered is then analyzed using appropriate tools depending on the dataset size, such as IBM SPSS for larger datasets or spreadsheets for smaller ones.

After concluding the Awareness phase, a comprehensive understanding of the team's context and the factors influencing this group of employees in a digital work environment becomes apparent. This information serves as the foundation for executing the following phases. The number of cycles undertaken can be adjusted based on team availability or the achievement of the desired objectives. Figure 4 illustrates Phase 2 – Design.

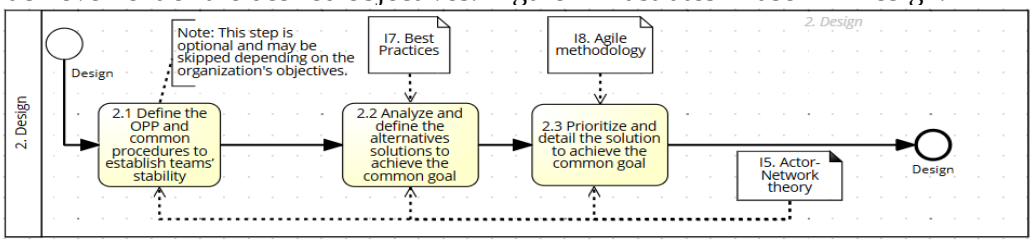

Fig. 4. Method – Phase 2 - Design.

In Phase 2 - Design, the team focuses on defining key actions to enhance engagement by addressing the conflicts or barriers identified in the previous phase. This phase begins with establishing the Obligatory Passage Point (OPP) and common procedures, grounded in Actor-Network Theory (ANT), to create a stable team foundation. Next, the team analyzes and identifies alternative solutions to achieve a shared goal, utilizing ANT and

Best Practices as guiding frameworks. Finally, the team prioritizes and details the chosen solution, drawing on ANT and Agile methodology to ensure alignment with the common objective. After concluding the Design phase, the team will be able to develop and implement the prioritized solution. Figure 5 illustrates Phase 3 – Build and Adopt.

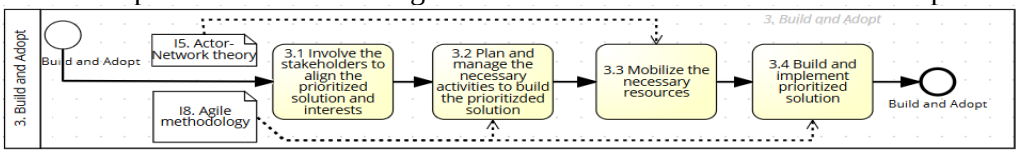

Fig. 5. Method – Phase 3 – Build and Adopt.

In Phase 3 - Build and Adopt, the team develops and implements the prioritized solution from the previous phase. This starts by engaging stakeholders to ensure alignment of the solution with their interests. Next, activities are planned and managed using Agile methodology to support the structured building of the solution. Required resources are then mobilized, guided by the Actor-Network Theory to support effective coordination. Finally, prioritized solutions are built and implemented, utilizing Agile methodology for a responsive, iterative approach. After that, the stakeholders may decide if it is necessary to run more cycles of phases 2 and 3 before collecting the results and proceeding with the evaluation phase. Figure 6 illustrates Phase 4 – Evaluate.

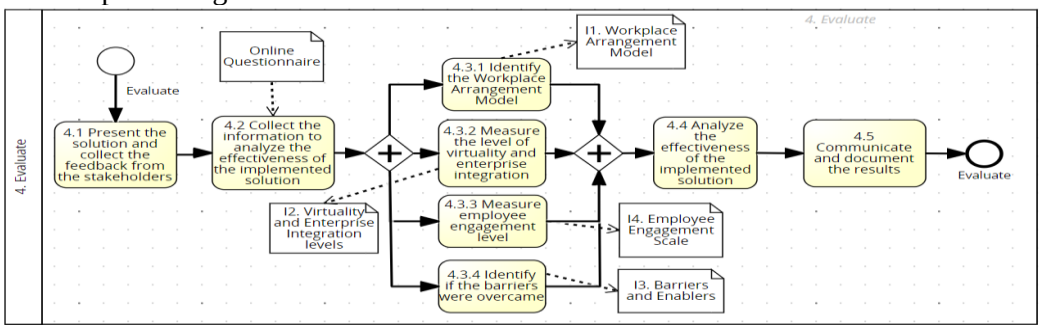

Fig. 6. Method – Phase 4 – Evaluate.

In Phase 4 - Evaluate, the team assesses and analyses the outcomes to enable continuous improvement of the DW. This phase monitors key metrics, such as employee engagement, technology usage maturity, and enterprise integration, to measure the effectiveness of the implemented solutions. We propose using Employee Engagement Scale (EES) adapted with four additional Gallup Q12 questions to include individual needs as the measurement tool. The EES comprises 12 questions, with 4 of them dedicated to each dimension (cognitive, emotional, and behavioral) [26]. The Gallup proprietary Q12 survey comprises twelve elements influencing employee engagement that considers basic needs, individual needs, teamwork needs, and personal growth to measure employee engagement [11]. We propose using the EES adapted with some of the Gallup Q12 questions to include individual needs as the measurement tool. The completed questionnaire can be provided under request. Following the measurement and analysis of outcomes (Steps 4.3 and 4.4), the results are communicated to participants and stakeholders, and the lessons learned are systematically documented. Data collection is facilitated through online questionnaires, and appropriate analysis tools, such as IBM SPSS or spreadsheets, are used based on dataset size. The effectiveness is evaluated, and results are communicated and recorded in the corporate knowledge database for future reference.

We adopted and adapted scales already validated in the literature to ensure precise measurement of theoretical constructs. The questionnaire encompassed Generation Cohort, Barriers and Enablers, Predecessors of a successful digital workplace, Organizational Attractiveness, Interaction Approach, Enterprise Integration and Technological Tools, and EES. Participants were asked to rate the predecessors and employee engagement using a 5-point Likert-type scale ranging from 'excellent/strongly agree' to 'very poor/strongly disagree.' Barriers and enablers, organizational attractiveness, enterprise integration level, and technological tools usage were assessed using a 3-point Likert-type scale ('agree,' 'neutral,' 'disagree,' or 'high,' 'neutral,' 'low').

Building upon the results from Phase 4 - Evaluate, stakeholders can determine whether to proceed with the project to continuously enhance the implementation of engaging DWs. This decision-making process is contingent upon various factors, including resource availability, organizational priorities, and the effectiveness of previous cycles. By deliberating on the analysis's outcomes and evaluating the organization's current state, stakeholders can make informed decisions regarding the necessity and feasibility of initiating subsequent cycles. It's crucial to align the strategy with the organization's development stage and stakeholders. Engagement is cultivated through three key strategies: Developing Engagement, which involves clarifying goals, roles, and tasks and facilitating face-to-face meetings; Supporting Engagement, which emphasizes open communication, progress updates, and peer support; and Nourishing Engagement, which includes reflecting on lessons learned, celebrating achievements, and fostering a sense of community to maintain motivation in DW [22].

The Appendix presents information regarding the instruments developed in the DSR project to support a framework and method.

5. Demonstration of the Artifacts

The demonstration phase of this DSR project was carried out within a global financial organization comprising approximately 200 employees across multiple countries. The company operates under a flexible hybrid work model, and the demonstration focused on two distinct IT teams selected based on the organization's availability. The researcher, who held a managerial role within the company, leveraged their established relationships with IT and Human Resources stakeholders, facilitating the demonstration and initial validation of the artifacts. To minimize bias, topics related to leadership and its influence on employee engagement were intentionally excluded from the initial demonstration with the first team. The process began with an alignment meeting on May 30, 2023, between the IT and Human Resources directors, where project goals and resources were discussed (step 1.1). The researcher's familiarity with the organization made step 1.2 was unnecessary, as they already had insight into the organization's initiatives to foster engagement. This allowed them to define the Support and Nourishing Engagement strategies within this specific context.

5.1. Demonstration Cycle (Team 1)

The first demonstration cycle involved an IT team of eight employees with varied expertise. It started with an alignment meeting on June 13, 2023, to outline research objectives and ensure participant anonymity. It consists of step 1.3 Communicate the project plan and objectives to the team involved.' We used LimeSurvey to perform step '1.4 Collect input information regarding individual, team, and organizational characteristics' and conducted an online survey from June 13 to September 14, 2023. It achieved a 100% response rate. An individual interview was conducted on August 4 to gather additional information regarding the efficacy and user experience of the virtual onboarding process, thus providing valuable qualitative insights complementing the quantitative survey data (step 1.9). The findings were formally presented to key stakeholders on October 24, 2023, and a follow-up workshop was held on January 18, 2024, to share the research general findings and guidelines with all employees.

Team 1 consists of members from Generations Y and Z, all located in Brazil. A quarter of the team lives far from the office, and their direct manager, who is also the researcher, meets with them twice a year in person. Data analysis showed that team members prefer in-person meetings for celebrations, customer meetings, training, and team-building activities. The analysis from the survey indicated that the most important factor for organizational attractiveness is work-life balance, followed by competitive wages and opportunities for career progression.

The analysis identified this team working in a DW arrangement model, considering the high virtuality and enterprise integration levels, with an average enterprise integration score of 2.73 (out of 3) and a virtuality level of 2.54 (out of 3). Key barriers included a lack of resources, workspace conditions, and information overload, while enablers

consisted of clear roles, measurable goals, and access to adequate tools. Employee engagement was generally high, averaging 4.2 out of 5, though one participant reported being disengaged. It consists of step 1.5 of the method.

A SWOT analysis was elaborated to identify strengths, weaknesses, opportunities, and threats related to the team's workplace experience (step 1.6). The analysis led to a mapping of involved actors and existing conflicts, with no major conflicts being identified (step 1.7). Comparisons with existing literature confirmed that several barriers and enablers were consistent across generations, while some discrepancies regarding workspace conditions and feelings of isolation were noted (step 1.8). The final SWOT was confirmed with the team in an online dynamic session on September 29, 2023, which led to the addition of new strengths, weaknesses, and opportunities. The team proposed twelve actions associated with SWOT analysis to improve the digital work environment. That could positively influence their experience in a DW. It consists of steps 1.9 and 1.10 of the method and marks the completion of the first phase (Awareness) of the project. Future discussions of these proposed actions were planned during Agile ceremonies, continuing the team's internal improvement processes.

5.2. Demonstration Cycle (Team 2)

The demonstration cycle involved a second IT team of nine participants operating under a hybrid work model and managed by two leaders. An alignment meeting on November 6, 2023, introduced the research objectives and steps, with the researcher ensuring data anonymity (step 1.3). An online survey was distributed on November 8 using LimeSurvey (step 1.4), achieving a 78% response rate by January 22, 2024, after reminders and extensions were issued due to the holiday season. Data analysis identified workplace characteristics, barriers, enablers, and employee engagement levels, followed by a SWOT analysis session on February 20, 2024. Formal feedback was provided to the IT managers on March 18, 2024, to guide improvements based on the findings.

Team 2 is formed by three generations (X, Y, and Z), primarily from Generation Y, all based in Brazil. To ensure participant anonymity, identifying questions related to personal demographics were removed from the questionnaire. The results suggested that team members who infrequently visit the office should aim for in-person meetings at least once a month, with key in-person activities identified as conflict management, celebrations, feedback, and team building. The most important factors for organizational attractiveness were competitive wages, followed by work-life balance and benefits.

Data analysis revealed the team's enterprise integration level at 2.73 (out of 3) and a virtuality level of 2.39. The workplace arrangement model highlighted that the team operates within a digital environment characterized by high virtuality and enterprise integration. Barriers such as poor team relationships and workspace conditions were identified, while clear goals and access to appropriate tools were recognized as significant enablers. The team exhibited a good engagement level of 4.09 out of 5, with most members demonstrating high engagement. It consists of step 1.5 of the method.

A SWOT analysis was developed based on the data, incorporating strengths, weaknesses, opportunities, and threats relevant to the team's workplace experience (step 1.6). This analysis informed the mapping of involved actors and networks, revealing no major conflicts (step 1.7). Comparative analysis with existing literature confirmed several barriers and enablers relevant across generations, although individual generation differences could not be analyzed due to anonymity (step 1.8). The SWOT analysis was confirmed with the team during an online session on February 20, 2024, using the Miro platform for interaction. Participants proposed new items for the SWOT, including strengths in openness to technology and opportunities for development. Following discussions, the team identified key action items related to enhancing their DW experience, including improving communication channels and standardizing processes. This led to updates in the best practices list and the prioritization of specific actions to be implemented as part of their internal continuous improvement process. It consists of steps 1.9 and 1.10 of the method and marks the completion of the first phase (Awareness) of the project. The demonstration concluded with a focus on awareness and the continuity of

the proposed actions, which were discussed with the team's leaders for further development and implementation.

5.3. Findings from the Demonstration

The demonstration results revealed both similarities and differences between the two IT teams working in a hybrid environment. While both teams faced common barriers, their proposed solutions varied due to distinct challenges, emphasizing the need for organizations to offer flexible alternatives, as suggested in our method. This indicates that even teams within the same organization, despite sharing a common context, face unique challenges and needs, underscoring the importance of the Awareness phase. Both teams valued in-person activities such as celebrations and training but expressed a preference for hybrid work. They indicated they would only switch to full-time office work for a 20-30% salary increase, highlighting the importance of the DW in reducing turnover. Participants also noted that working from home boosted productivity, while the office environment presented concentration challenges. This underscores the need to consider both office and home settings when designing and implementing DW solutions.

The method employed was effective in a real-world context by providing an approach that identified and supported the teams to address multiple factors influencing their engagement in DW. While some teams may need additional clarification on Agile methodologies, those already familiar with Agile practices understand the value of collaborative discussions to identify, prioritize, and refine solutions iteratively. The demonstration focused only on the Awareness phase, though the proposed actions were prioritized and added to each team's backlog for implementation based on available capacity and resources. Participants positively received the use of the SWOT tool, which enhanced the artifact by incorporating it into step 1.9. This addition enriched the dynamics of the assessments, facilitating discussion of findings from the data analysis.

6. Evaluation of the Artifacts

The evaluation was conducted at a major food retail company in Portugal, employing a hybrid work model with over 38,000 staff. The objective was to evaluate Phase 1: Awareness of our method, collaborating with two teams: Merchandising (nine members) and Supply Chain (ten members). The teams were selected based on the companies' availability. We initiated an alignment meeting on March 15, 2024, and an initial interview with the managers, which revealed a lack of ongoing employee engagement initiatives (step 1.1). This led us to adopt the Develop and Support strategy (step 1.2). Communication of project details occurred on April 10, 2024 (step 1.3), followed by an online survey launched on April 11 until May 20, 2024 (step 1.4). The Merchandising team achieved a 100% response rate, while the Supply Chain team had an 80% response. Data analysis from May 20 to May 22, 2024, identified the Workplace Arrangement Model, barriers, enablers, and employee engagement levels (steps 1.5.1 to 1.8), culminating in a SWOT analysis session on May 23, 2024, which provided insights into the artifact's capabilities (step 1.9). Subsequently, the best practices list was updated (step 1.10), and a second online survey conducted from June 3 to 18, 2024, aimed to hypothetically assess the proposed practices' impact on employee engagement, with findings presented to team managers on July 8, 2024.

6.1. Merchandising Team

Phase 1, Awareness, focused on identifying the general characteristics of participants, tasks, teams, and the organization. Results indicated a preference among team members for reduced in-person meetings, especially for those attending the office more than twice a week, highlighting a trend influenced by previous remote work habits that allow for increased focus. In-person activities deemed most critical by the team included celebrations, feedback, and conflict management. Financial incentives and competitive salaries emerged as the top factors for organizational attractiveness, with many employees expressing that they would only consider job offers without flexible work arrangements if the financial benefit was significantly higher than their current salaries.

The analysis revealed a workplace arrangement model based on levels of virtuality and enterprise integration, with the latter scoring 2.65 (out of 3). It indicates that the team operates within a DW arrangement characterized by high enterprise integration and moderate virtuality. Barriers identified included inadequate information, poor management, and work overload, while enablers were found to be clear goals, appropriate tools, and task anticipation. Employee engagement levels averaged 3.92 (out of 5), with low scores in recognition and personal connection to the organization's mission. It consists of step 1.5 of the method.

A SWOT analysis was developed to identify strengths, weaknesses, opportunities, and threats, guiding the proposal of eight solutions aimed at enhancing team dynamics and addressing barriers (step 1.6). Generational differences were noted, particularly in preferences for feedback and conflict management, with Generation Z valuing in-person interactions more than Generation Y. Both generations emphasized the importance of clarity in roles and financial incentives, while Generation Y showed less relevance for flexible work arrangements (step 1.8). Following a dynamic online session to confirm the SWOT findings, actions were proposed to improve employee experience in a digital environment (step 1.9), with a second survey measuring potential engagement improvements from these proposed actions. Results indicated a projected increase in engagement from 3.92 to 4.02, particularly emphasizing the impact of organizational engagement factors.

6.2. Supply Chain Team

The Awareness phase focused on various characteristics related to participants, tasks, teams, and organizational context. The majority of team members (62.5%) were satisfied with the frequency of in-person meetings, while 37.5% preferred a reduction in these visits. In-person activities considered most relevant included training sessions, conflict management, feedback discussions, and team meetings. Regarding organizational attractiveness, competitive salaries were deemed the most important factor, followed by work-life balance and quality training programs. The analysis also revealed a high level of enterprise integration at 2.77 (out of 3) and a moderate level of virtuality.

The investigation identified key barriers and enablers impacting workplace experience. The primary barrier was work overload, followed by a lack of resources. Enablers included adequate tools, clear objectives, and defined roles. Employee engagement was assessed, resulting in an average score of 4.02 out of 5. It consists of step 1.5 of the method.

A SWOT analysis was developed to summarize main results from data analysis, with collaboration identified as a weakness and communication as a potential threat (step 1.6). We identified variations across individuals but not significantly differing by generation. Notably, Generation Z exhibited high trust in colleagues and placed less emphasis on barriers, while Generation Y prioritized governance and clarity in roles (step 1.7). Following the SWOT analysis, potential solutions were discussed during a team dynamic session conducted online (step 1.9). The team confirmed and refined the SWOT findings, ultimately updating the list of best practices to enhance employee experience in a digital work environment (step 1.10). A subsequent online survey was conducted to evaluate the effectiveness of the proposed actions, revealing a decrease in engagement levels from 4.02 to 3.78. This decline was attributed to employee turnover. The initial assessment of employee engagement took place in March 2024, when the team had remained stable for three months with zero turnover. By June 2024, during the second engagement assessment, the team experienced a 4% turnover rate, which exacerbated previously identified workload-related issues.

6.3. Findings from the Evaluation Phase

We employed the Framework for Evaluation in Design Science (FEDS) to evaluate our artifact [29]. It consisted of four steps: defining evaluation objectives, selecting strategies, identifying properties to evaluate, and designing evaluation episodes. The evaluation process began by outlining objectives related to accuracy, risk reduction,

uncertainty, ethics, and efficiency [29]. We measured accuracy qualitatively by collecting feedback from participants and their managers regarding the method's application and its outcomes. Additionally, we gathered quantitative data from a simulated Evaluation Phase, assessing the EES using a hypothetical scenario that implemented the proposed solutions from the Awareness Phase. Ethical considerations ensure participants face no disadvantages, and efficiency balances objectives with resource constraints. The goal was to assess whether the developed artifacts support organizations in implementing engaging DWs, with validation occurring during the Demonstrate and Evaluate phases. The chosen evaluation strategy, "Human Risk & Effectiveness," focuses on real-world, naturalistic assessments of long-term effectiveness. Next, relevant properties for evaluation were identified, detailing instruments and procedures. Lastly, specific evaluation episodes were designed and organized by setting (artificial or naturalistic) and timing (formative or summative). The evaluation occurred in one round of DSR using iterative cycles in which we gathered quantitative and qualitative data for triangulation, expanding knowledge, and validating results [9]. This iterative process provided valuable feedback for refining subsequent evaluation cycles.

The artifacts achieved their objectives through structured phases and systematic evaluation, providing insights into employee engagement and organizational challenges. For the study, as the objective of the evaluation of the real organization was to apply only Phase 1 - Awareness, we measured the effectiveness of the proposed actions, phase 4 of the method, by measuring employee engagement levels based on hypothetical scenarios of implementing practices identified as relevant to the teams. It consisted of an online survey that hypothetically assessed the impact of the proposed practices on employee engagement levels. Furthermore, the participants provided positive feedback, noting that "a comprehensive discussion about the work environment was valuable and something [they] should do more often." (Participant from the 1º Demonstration Cycle). They found the method easy to apply, describing it as "a broader form of retrospective section that went beyond focusing solely on tasks." (Participant from the 2º Demonstration Cycle). They were impressed by "the detail and relevance of the information presented," (Managers from Evaluation Cycle), recognizing its importance for improving management practices. Additionally, they appreciated having an impartial facilitator, as this allowed insights to emerge that "might not have surfaced through direct questioning." (Manager from Evaluation Cycle). The insights from the evaluation process offered actionable recommendations for enhancing employee engagement in DWs. The assessment highlighted the method's robustness in addressing complex organizational dynamics, offering practical strategies for organizational improvement based on empirical data and systematic evaluation.

7. Conclusions

In the demonstration and evaluation phases of the DSR project, the artifacts developed were improved and validated to support organizations in creating engaging DWs for multigenerational teams. The demonstration showed that while two IT teams in a hybrid setting faced common barriers, their unique challenges required different solutions, highlighting the need for adaptable organizational support and the importance of the Awareness phase. Both teams valued hybrid work and performed the SWOT analysis (step 1.9) with ease to collaborate with discussions to identify, prioritize, and iteratively refine the proposed solutions. During the evaluation phase, the managers recognized that an external facilitator enhances open discussions. Limitations included the lack of exploration into social, and cultural factors, a narrow focus on Gen Z, and the samples of Brazilian and Portuguese employees in finance or tech sectors, affecting generalizability.

To create a compelling digital work environment that fosters employee engagement and accommodates a diverse workforce, organizations should implement a continuous engagement improvement process, regularly measuring engagement levels and adapting the approach to their context. To address the unique characteristics and needs of each organization and team, it is important to tailor recommendations to the specific context. This may involve overcoming challenges like isolation and anxiety by encouraging

physical activities and social events, offering flexible work hours to support work-life balance, improving communication through adaptable methods and suitable tools, and promoting occasional in-person interactions to build trust. Additionally, organizations should recognize diverse needs by engaging Generation Z through role alignment, providing flexible training options, tailoring engagement strategies to different generations, and implementing a flexible recognition system with both tangible and intangible rewards. The artifacts addressed our research question by supporting organizations in identifying and addressing several factors that influence the engagement of employees from different generations in DW, by accommodating the individual needs and making it scalable across virtual or hybrid work environments. Furthermore, the feedback from participants and managers confirmed its practical utility and relevance.

Business services organizations can implement engaging DWs for a multigenerational workforce by adopting a flexible, inclusive framework that considers varying work preferences, technological skills, and communication styles. The proposed framework combines Agile methodologies with tailored assessment tools, such as SWOT analysis, to gather and prioritize feedback from different age groups. The method involves iterative phases—starting with an Awareness phase to understand unique team needs and continuing with collaborative refinement to implement solutions in alignment with organizational capacity and resources. This approach ensures DW solutions are adaptable and meet diverse generational needs, boosting engagement and productivity. Future research should investigate generational engagement influenced by demographic and cultural factors, study emerging technologies like AI on engagement, and validate the framework across diverse sectors and organizational contexts.

Acknowledgements

This work is partially financed through national funds by FCT - Fundação para a Ciência e a Tecnologia, I.P., in the framework of the Project UIDB/00326/2025 and UIDP/00326/2025.

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Appendix

This Appendix presents a brief description of the eight instruments proposed to support the implementation of our framework and method. Actor-Network Theory (I5) and Agile Methodology (I8) are existing tools that were not developed within the context of this study. Detailed information can be provided under request.

Workplace Arrangement Model (I1): it categorizes workplaces by virtuality and enterprise integration levels, identifying four types: **physical workplace** (low virtuality, high integration), **remote work** (low virtuality, low integration), **virtual workplace** (high virtuality, low integration), and **DW** (high virtuality, high integration). This framework helps organizations choose the best structure based on their digital maturity and operational needs.

Virtuality and Enterprise Integration Levels (I2): virtuality in workplace models includes geographic distance, in-person interaction frequency, and technology use, assessed through an adaptation of Urwiler and Frolick's IT Value Hierarchy [27]. Enterprise integration enhances collaboration by connecting systems and processes. Measured through a proposed rubric, these factors together define an organization's workplace arrangement model.

Barriers and Enablers (I3): A SLR on DW and employee engagement consolidated the known barriers and enablers in a DW. A phenomenological study identified three crisis-specific barriers-anxiety, disrupted work routines, and work-life balance challenges-especially relevant during crises like COVID-19.

Employee Engagement Scale (I4): Employee engagement, a positive psychological state involving cognitive, emotional, and behavioral energy [26], is assessed using the Employee Engagement Scale (EES) and Gallup's Q12 items [11]. These tools are used during the Awareness phase and at each framework cycle's end to track engagement shifts. Data is gathered via a 5-point Likert scale and analyzed through factor analysis or score thresholds.

Actor-network Theory (I5): It is applied in three framework phases: Awareness, mapping actors, networks, and conflicts through questionnaires, interviews, and documents; Design, using ANT and SWOT analysis to define the OPP and resolve conflicts; and Build and Adopt, evaluating solutions and mobilizing resources to align with organizational goals for an effective digital workplace.

Generations X, Y, and Z's interests, values, and needs (I6): To enhance best practices and address barriers in the DW, insights from the second SLR and a confirmatory study on generational values (X, Y, Z) were used to identify key barriers and enablers. This data supports the Awareness phase, ensuring survey findings align with generational perspectives (step 1.8), with detailed information available upon request.

Best Practices (I7): To align with organizational engagement strategies, Instrument I6 was enhanced with three tailored approaches: Develop, Support, and Nourish Engagement. During the Awareness and Design phases, barriers, enablers, SWOT analysis, and best practices are reviewed to ensure strategic alignment.

Agile Methodology (I8): Distributed software engineering faces communication and collaboration challenges, often from cultural differences and time zones. Agile practices and frameworks like SAFe, LeSS, and DAD help address these, with structured activities ensuring alignment and continuous improvement [6].