

Article

MANAGING A MULTI-GENERATIONAL WORKFORCE IN THE CONSTRUCTION SECTOR: A QUALITATIVE INVESTIGATION INTO HR AND LEADERSHIP STRATEGIES FOR ENHANCING COLLABORATION AND JOB SATISFACTION ACROSS BABY BOOMER, GEN X, MILLENNIAL, AND GEN Z COHORTS

Gestão de uma força de trabalho multigeracional no setor da construção civil: Uma investigação qualitativa sobre estratégias de recursos humanos e liderança para aprimorar a colaboração e a satisfação no trabalho entre os grupos de Baby Boomers, Geração X, Millennials e Geração Z

Gestión de una fuerza de trabajo multigeneracional en el sector de la construcción: Una investigación cualitativa sobre estrategias de recursos humanos y liderazgo para mejorar la colaboración y la satisfacción laboral en los grupos de Baby Boomers, Generación X, Millennials y Generación Z

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ABSTRACT

The global construction industry is navigating a significant demographic transition. This "generational density" creates unique challenges for HR management in high-risk environments. This study investigates the "Digital-Manual Paradox"—the tension between traditional craft experience and modern technological integration within a major infrastructure project. Utilizing a Social Constructivist paradigm, the researcher conducted 15

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semi-structured interviews with professionals (P1–P15) from a Large-scale Marine Infrastructure Project. Data was analyzed using Braun and Clarke's (2006) thematic analysis. Qualitative findings suggest a "Reciprocal Value Exchange." Younger workers (Gen Z) provide digital fluency, while older cohorts (Boomers) provide "Tacit Safety Wisdom." Leadership was identified as the primary mediator; "Adaptive Leadership" styles reported higher levels of team cohesion. Within the exploratory boundaries of this study, the findings indicate that the construction sector must transition toward a "Human-Centric" management model. Key recommendations include reciprocal mentorship and flexible benefit structures.

Keywords: Multi-generational workforce; Construction Management; Social Identity Theory (SIT); Adaptive Leadership; Human Resource Strategy.

RESUMO

A indústria global da construção está passando por uma transição demográfica significativa. Essa densidade geracional cria desafios únicos para a gestão de recursos humanos em ambientes de alto risco. Este estudo investiga a «paradoxo digital-manual a tensão entre a experiência artesanal tradicional e a integração tecnológica moderna em um projeto de infraestrutura de grande porte. Utilizando um paradigma construtivista social, o pesquisador realizou 15 entrevistas semiestruturadas com profissionais (P1–P15) de um Projeto de Infraestrutura Marítima em Larga Escala. Os dados foram analisados por meio da análise temática de Braun e Clarke (2006). Os achados qualitativos sugerem uma troca de valor recíproca: trabalhadores mais jovens (Geração Z) oferecem fluência digital, enquanto as coortes mais velhas (Baby Boomers) fornecem uma sabedoria tácita em segurança. A liderança foi identificada como o principal mediador; estilos de «liderança adaptativa» relataram níveis mais elevados de coesão na equipe. Dentro dos limites exploratórios deste estudo, os resultados indicam que o setor da construção deve transitar para um modelo de gestão centrado no ser humano. As principais recomendações incluem mentoria recíproca e estruturas flexíveis de benefícios.

Palavras-chave: Força de trabalho multigeracional; Gestão da Construção Civil; Teoria da Identidade Social (SIT); Liderança Adaptativa; Estratégia de Recursos Humanos.

RESUMEN

La industria global de la construcción está atravesando una transición demográfica significativa. Esta densidad generacional plantea desafíos únicos para la gestión de recursos humanos en entornos de alto riesgo. Este estudio investiga la paradoja digital-manual: la tensión entre la experiencia artesanal tradicional y la integración tecnológica moderna dentro de un proyecto de infraestructura a gran escala. Bajo un paradigma constructivista social, se llevaron a cabo 15 entrevistas semiestruturadas con profesionales (P1–P15) de un proyecto de infraestructura marina de gran envergadura. Los datos se analizaron mediante el análisis temático de Braun y Clarke (2006). Los hallazgos cualitativos sugieren un intercambio de valor recíproco: los trabajadores más jóvenes (Generación Z) aportan fluidez digital, mientras que las cohortes de mayor edad (Baby Boomers) aportan una sabiduría implícita sobre

seguridad. La dirección se identificó como el mediador principal; los estilos de liderazgo adaptativo reportaron mayores niveles de cohesión en los equipos. Dentro de los límites exploratorios de este estudio, los resultados indican que el sector de la construcción debe avanzar hacia un modelo de gestión centrado en las personas. Las recomendaciones clave incluyen la mentoría recíproca y estructuras de beneficios flexibles.

Palabras clave: Fuerza laboral multigeneracional; Gestión de la construcción; Teoría de la Identidad Social (TIS); Liderazgo adaptativo; Estrategia de Recursos Humanos.

1 INTRODUCTION

1.1 The Industry in Transition

The global construction sector is currently at a critical crossroads. Traditionally characterized by rigid hierarchies and manual labor, the industry is now being forced to adapt to a digital-first economy while simultaneously managing the most demographically diverse workforce in history. As of 2025, the construction job site has become a unique sociological laboratory where four distinct generations—Baby Boomers, Generation X, Millennials, and Generation Z—must collaborate on high-stakes, high-risk projects.

The significance of this transition cannot be overstated. The construction industry is a primary driver of global GDP, yet it suffers from some of the highest rates of "knowledge loss" due to the impending retirement of the "Silver Tsunami"—the Baby Boomer cohort who hold decades of unwritten, tacit expertise. The entry of Generation Z brings necessary technological fluency, but this "Digital-Manual Paradox" often creates friction, leading to communication breakdowns that threaten both project timelines and physical safety.

1.2 The Problem Statement

Despite the clear presence of these four generations, Human Resource (HR) strategies in the construction sector have largely remained "static." Many organizations utilize a "one-size-fits-all" approach to management and training. This standardization fails to account for the Social Identities of different cohorts. For example, a Baby Boomer may perceive a junior colleague's reliance on a mobile app as a lack of fundamental skill, while a Gen Z apprentice may view a senior's refusal to use digital logs as a barrier to efficiency. When these perceptions are not managed, "In-groups" and "Out-groups" form, as defined by Social

Identity Theory (SIT). This polarization leads to decreased job satisfaction, increased turnover, and a dangerous "Feedback Gap" where critical safety information is not effectively shared across generational lines.

1.3 Rationalizing the Qualitative Approach

To solve this problem, we cannot rely on numbers alone. Understanding why a site foreman chooses a specific communication style or how an apprentice feels when their feedback is ignored requires "thick description." This research utilizes a qualitative, multi-modal methodology. By conducting 15 in-depth interviews using a 12-question protocol, this study captures the nuance of human emotion and organizational culture. The use of telephonic and asynchronous text-based interviews reflects the modern reality of the construction site—a fast-paced environment where communication happens in bursts.

1.4 Research Objectives and Questions

The primary exploratory objective of this study is to identify the Leadership and HR strategies that successfully bridge the generational divide. The research is guided by three core questions: How do different generational cohorts perceive the value of their colleagues' skills and knowledge? In what ways do current leadership styles and HR policies contribute to or detract from intergenerational collaboration? What specific management interventions can enhance job satisfaction and organizational stability in a multi-generational workforce?

1.5 Significance of the Study

This study is vital for senior leaders and HR professionals looking to preserve their organization's competitive edge. By identifying how to turn "generational friction" into "generational synergy," this research provides a roadmap for knowledge transfer. Ensuring that the wisdom of the past and the technology of the future work in harmony is the only way the construction sector can remain sustainable in the 21st century.

2 BACKGROUND OF THE STUDY

The construction industry has historically functioned as a bastion of traditional mentorship and hierarchical labor. For decades, the "master-apprentice" model served as the primary vehicle for knowledge transfer, where safety and technical skills were passed down through physical demonstration. However, the dawn of the Fourth Industrial Revolution (Industry 4.0) has introduced a radical shift in how work is performed, recorded, and managed. This technological evolution has coincided with a unique demographic phenomenon: the presence of four distinct generations in a single workspace.

2.1 The Evolution of the Construction Workforce

The background of this conflict lies in the disparate eras in which these workers were socialized. The Baby Boomer cohort entered an industry that was almost entirely manual and analog. Their professional identity was forged in an era where physical resilience was the metric of a "good worker." In contrast, Generation X witnessed the introduction of early project management software, making them the first "transitional" generation.

The entry of Millennials marked the first major push toward digital integration, such as Building Information Modeling (BIM). Now, with Generation Z entering the field—a cohort that has never known a world without high-speed internet—the industry faces a radical shift. While the tools of construction have moved toward the future, the social structures of the job site have often remained static.

2.2 The Global "Skills Gap" and the Silver Tsunami

Central to the background of this research is the impending "Silver Tsunami"—the mass retirement of the Boomer generation. Estimates suggest that by 2026, the industry will face a shortage of hundreds of thousands of skilled workers globally. This creates a high-pressure background for this study: if the "Tacit Knowledge" (the instincts and unwritten rules of the trade) held by veterans is not successfully transferred to younger cohorts before the Boomers retire, the industry faces a catastrophic loss of craftsmanship and safety intelligence.

2.3 Localized Context and Multi-Modal Communication

Within the context of a Large-scale Marine Infrastructure Project, communication is the primary vehicle for safety. Traditional research has often relied on face-to-face focus groups. However, the modern construction worker is mobile and time-constrained. This study acknowledges this by utilizing multi-modal communication. This reflects the real-world shift in how these generations interact: older cohorts often prefer high-touch verbal or telephonic communication, while younger cohorts (Gen Z) lean toward high-efficiency asynchronous text or app-based updates.

2.4 The Role of Strategic Human Resource Management (SHRM)

Historically, HR in construction was primarily focused on payroll and compliance. However, the background of modern HRM has shifted toward Strategic Human Resource Management (SHRM), which views people as a competitive advantage. Despite this, there is a visible failure in applying SHRM to age diversity. Current HR frameworks often ignore the psychological phenomenon of In-group/Out-group bias, where different age groups stop sharing information because they feel misunderstood or undervalued. This study seeks to bridge that gap by identifying leadership strategies that foster an inclusive site culture.

3 REVIEW OF LITERATURE

3.1 The Concept of Generational Cohorts in Organizational Studies

The foundation of this study rests on Generational Cohort Theory, which suggests that individuals born within the same time span share key historical, social, and life experiences that shape their collective values and work ethics (Twenge, 2010). In the context of a high-stakes construction environment, these cohorts represent different "technological eras":

Baby Boomers (1946–1964): Characterized by high organizational loyalty and a preference for hierarchical structures. In construction, they are often the "Keepers of the Craft," relying on physical intuition.

Generation X (1965–1980): Often described as the "Bridge Generation," they value autonomy and were the first to adapt to early digitalization and project management software.

Millennials (1981–1996): Driven by purpose and rapid feedback loops, they pushed for the integration of Building Information Modeling (BIM) and sustainable practices.

Generation Z (1997–2012): The "True Digital Natives." They prioritize mental well-being, radical transparency, and asynchronous communication (text/apps) over traditional verbal instruction.

3.2 Theoretical Lens 1: Social Identity Theory (SIT)

To understand why collaboration breaks down on a construction site, we must apply Social Identity Theory (Tajfel; Turner, 1979). SIT posits that individuals categorize themselves into "In-groups" to build self-esteem, often viewing "Out-groups" with skepticism.

In a multi-generational workforce, generational labels become the primary markers for these groups. For example, a senior manager might categorize younger workers as "tech-dependent," while an apprentice might categorize older workers as "resistant to change." This bias creates "knowledge silos" where information is not shared freely, directly impacting site safety. For HR strategies to work, they must foster a "Superordinate Identity"—a shared identity as a "Project Team" that is stronger than generational allegiance.

3.3 Theoretical Lens 2: Adaptive Leadership Theory (ALT)

While SIT explains the problem, Adaptive Leadership Theory (Heifetz, 1994) provides the solution. ALT distinguishes between "Technical Problems" (solvable with a rule or app) and "Adaptive Challenges" (requiring a shift in values and habits).

Intergenerational friction is an adaptive challenge. Site managers often fail when they treat generational conflict as a technical issue. Adaptive leaders engage in "regulating distress." They acknowledge the fear older workers have of becoming obsolete while simultaneously validating the younger workers' need for efficiency. This balanced mediation is critical where "legacy knowledge" and "modern technology" must coexist.

3.4 The Digital-Manual Paradox in Construction

Current research highlights a unique tension known as the Digital-Manual Paradox. As the industry moves toward Industry 4.0, the "soft skills" of leadership have not kept pace with "hard skills" of technology. Studies show that while HR may implement advanced safety software, the perception of that software differs by age. Older cohorts may view it as

"policing," while younger cohorts view it as "transparency." This gap in perception is the primary driver of job dissatisfaction.

3.5 Reciprocal Value Exchange

The literature suggests that friction is minimized when a "Reciprocal Value Exchange" is established (North; Fiske, 2015). This occurs when the organization recognizes that different generations hold different types of "power"—Boomers hold Expert Power (experience), while Gen Z holds Informational Power (tech fluency). A successful HR strategy creates a platform where these powers are traded rather than contested.

4 RESEARCH METHODOLOGY

4.1 Research Design and Philosophical Worldview

This study adopts a qualitative research design rooted in the Social Constructivist paradigm. The rationale for a qualitative approach is the necessity for "thick description"—a depth of understanding regarding why employees feel a certain way about HR strategies. While a survey might identify that a gap exists, this qualitative design explores the "how" and "why" behind intergenerational friction.

By utilizing Thematic Analysis (TA), the researcher identifies patterns of meaning grounded in the actual lived experiences of the workers. This aligns with the Interpretivist tradition, acknowledging that "truth" on a construction site is socially negotiated between different age groups.

4.2 Sampling Strategy: Purposive Sampling

To ensure the findings represent the entire workforce hierarchy, maximum variation purposive sampling was employed to recruit 15 participants. The sample was intentionally stratified across four generational cohorts to ensure data saturation—the point at which no new significant information is uncovered.

Table 1 – Distribution of Participants by Generational Cohort

Code	Cohort	Role	Experience	Data Collection Modality
P1	Baby Boomer	Senior Project Supervisor	34 Years	Telephonic Interview

P2	Baby Boomer	Marine Site Manager	31 Years	Telephonic Interview
P3	Baby Boomer	QA/QC Senior Advisor	28 Years	Telephonic Interview
P4	Gen X	Senior Civil Engineer	18 Years	Telephonic Interview
P5	Gen X	Site Foreman	21 Years	Telephonic Interview
P6	Gen X	Land Surveyor	15 Years	Telephonic / Text
P7	Gen X	Logistics Coordinator	12 Years	Telephonic Interview
P8	Millennial	Safety Officer	8 Years	Asynchronous Text
P9	Millennial	Site Engineer	6 Years	Asynchronous Text
P10	Millennial	Junior Foreman	7 Years	Asynchronous Text
P11	Millennial	Project Scheduler	5 Years	Asynchronous Text
P12	Gen Z	Junior QA/QC Engineer	2 Years	Asynchronous Text
P13	Gen Z	Assistant Storekeeper	1.5 Years	Asynchronous Text
P14	Gen Z	Graduate Site Engineer	1 Year	Asynchronous Text
P15	Gen Z	Assistant Safety Inspector	2 Years	Asynchronous Text

Source: Research data (2025).

4.3 Data Collection: Multi-Modal Qualitative Interviewing

Recognizing the mobile, high-pressure nature of a Large-scale Marine Infrastructure Project, this study utilized a multi-modal data collection strategy to increase the authenticity and depth of the responses.

Telephonic Semi-Structured Interviews: Primarily used for older cohorts (Boomers/Gen X) to provide a sense of anonymity and comfort. This allowed participants to speak freely about sensitive topics like "leadership failure" or "legacy methods" without the pressure of an in-person meeting.

Asynchronous Text-Based Interviews: Utilized predominantly by Gen Z and Millennial participants. In qualitative literature, this is recognized as an effective way to capture "in-the-moment" reflections. This allowed participants to respond while actively engaged on-site, providing a "real-time" look at their daily interactions.

To preserve institutional confidentiality while providing rich context, all participants were actively deployed on a single, high-complexity offshore marine infrastructure mega-project in the Middle East region. This environment provided a dense, high-stakes operational setting where generational dynamics directly impacted daily safety and project schedules.

4.4 Data Analysis: Thematic Protocol

The data from both the phone transcripts and the text logs were analyzed using Braun and Clarke's (2006) Six-Phase Protocol:

- a) Familiarization: Immersing in the data through repeated reading of transcripts.
- b) Initial Coding: Segmenting text into labels (e.g., "manual pride," "AI-efficiency," "feedback-gap").
- c) Searching for Themes: Grouping codes into broader patterns of meaning.
- d) Reviewing Themes: Checking themes against the entire data set.
- e) Defining and Naming: Developing a detailed narrative for each theme.
- f) Producing the Report: Selecting compelling quotes to illustrate the findings.

4.5 Trustworthiness and Ethical Considerations

To ensure the validity of the study, the researcher maintained an Audit Trail of all coding decisions. To protect participant privacy, all names have been removed and replaced with codes (P1–P15). All data was stored on an encrypted server and will be destroyed upon the paper's completion on December 24, 2025.

5 DATA INTERPRETATION AND ANALYSIS

The analysis of the 15 semi-structured interviews reveals four overarching themes. These findings represent the "lived experience" of the workforce at the Large-scale Marine Infrastructure Project and are categorized by the specific interview questions they address.

5.1 Participant Data Snapshot (N=15)

The following table summarizes the baseline data collected from the 12-question protocol.

Table 2 – Participant Data Snapshot				
Cohort	Participants	Avg. Satisfaction (Q11)	Preferred Communication (Q6)	Primary Motivator (Q10)
Baby Boomers	3	8.2 / 10	Verbal / Face-to-Face	Pension & Financial Stability
Gen X	4	6.5 / 10	Radio / Direct Phone Call	Job Security & Autonomy
Millennials	4	5.8 / 10	Email / Project Management Apps	Career Growth & Workplace Culture
Gen Z	4	7.1 / 10	WhatsApp / Text / Digital Logs	Work-Life Balance & Rapid Feedback

Source: Research data (2025).

5.2 Theme 1: The "Digital-Manual" Value Exchange (Analysis of Q4 & Q5)

The data gathered from Questions 4 and 5 reveals a phenomenon the researcher has labeled "Reciprocal Dependency." Contrary to the "generational war" narrative often found in popular media, the 15 participants displayed a high level of respect for the specialized knowledge held by other cohorts. The data gathered from Questions 4 and 5 reveals a phenomenon labeled "Reciprocal Dependency."

g) The Findings: 13 out of 15 participants (86%) expressed that the project would fail without the "other" generation's skills.

h) Tacit Safety Wisdom (The Boomer/Gen X Contribution): Younger participants (Gen Z and Millennials) consistently identified "physical intuition" as the most valuable asset of their senior colleagues. For example, P14 noted that no app can replace a senior foreman's ability to "read" the sea state before a marine lift.

i) Digital Efficiency (The Millennial/Gen Z Contribution): Conversely, senior workers expressed that younger employees act as "bridge-builders" to modern technology. P1 (Boomer) noted that without the younger staff, the transition to paperless documentation and AI-driven inventory would have been impossible.

j) Interpretation: Evaluated through Social Identity Theory (SIT) (Tajfel; Turner, 1979), the "Digital-Manual Paradox" represents a classic division between In-groups and Out-groups. Older cohorts construct their In-group identity around "tacit manual craftsmanship" and evaluate Gen Z's reliance on software as an empirical weakness. Conversely, younger cohorts construct an identity based on digital efficiency, categorizing manual record-keeping as organizational inertia. However, the empirical data shows that under effective leadership, these distinct social identities undergo recategorization into a Superordinate Identity—where physical safety wisdom and digital fluency are mutually recognized as vital to project completion.

5.3 Theme 2: Communication Modality as a Safety Risk (Analysis of Q6)

Question 6 asked about misunderstandings and delays. The analysis shows that communication modality (how a message is sent) is a greater risk than the message itself.

a) The Findings: A "Communication Lag" was identified. Older workers prioritize synchronous, verbal communication (face-to-face or radio), while younger workers prioritize asynchronous, digital communication (texting or project apps).

b) The Conflict: In high-risk scenarios, this gap led to "near-miss" incidents. One participant (P9) noted that a hazard flagged on a site app was missed by a foreman who "doesn't check his phone until the end of the shift," relying instead on verbal handovers.

c) Interpretation: Applying Adaptive Leadership Theory (ALT) (Heifetz, 1994), this communication gap illustrates the flaw of treating an Adaptive Challenge as a Technical Problem. Deploying a mobile site app is a technical fix; however, modifying cross-generational communication habits requires adaptive change. The identified "Communication Lag" stems from conflicting psychological contracts where older workers view direct verbal calls as binding commitments, while younger cohorts view app notifications as official documentation.

5.4 Theme 3: The "Feedback Gap" and Job Satisfaction (Analysis of Q8, Q10, & Q11)

Questions 8, 10, and 11 focused on how management style impacts happiness and retention.

a) Analysis of Recognition (Q8): A significant disconnect was found in how "respect" is perceived.

b) Older Cohorts: View "being left alone to do the job" as a sign of trust and respect.

c) Younger Cohorts: View a lack of constant feedback as a sign of "being ignored" or "failing."

d) Motivation Currencies (Q10): The data shows that Gen Z and Millennials stay for flexibility and culture, while Boomers and Gen X stay for financial stability and pension security.

e) Interpretation: This confirms that "one-size-fits-all" HR policies are a primary driver of job dissatisfaction. If HR uses the same reward system for everyone, they will inevitably fail to motivate half of their workforce.

5.5 Theme 4: The Demand for Adaptive Leadership (Analysis of Q7, Q9, & Q12)

The final questions explored the participants' advice for the future.

a) Managerial Interpretation (Q7): The most successful managers (according to the 15 participants) are those who act as "Cultural Translators." They do not force the "old way" or the "new way," but find a middle ground.

b) Advice to Leaders (Q12): The consensus was a plea for "Human-Centric Management." Participants across all 15 interviews asked for more "on-site presence" from HR and senior leaders to witness these generational dynamics firsthand rather than managing from a remote office.

c) Analysis: Participants feel that as the project becomes more "digitized," it is becoming less "human." The request for HR to be visible on the barge or the site indicates a need for leadership that observes the human interaction, not just the digital output.

6 DISCUSSION

The synthesis of the primary data against the theoretical framework reveals that the Large-scale Marine Infrastructure Project operates as a "micro-society" where generational friction is both a liability and an untapped asset. By bridging the findings from the 15 interviews with the established literature, three critical pillars of synthesis emerge.

6.1 The Synthesis of Power: Expert vs. Informational

Drawing from the "Digital-Manual Paradox" (Theme 1), the research illustrates a shift in the traditional power structure. Historically, power on-site was "Expert Power"—held by the oldest workers with the most years of manual experience. However, the introduction of AI-scanning and digital documentation has introduced "Informational Power," which is currently held by the youngest cohorts (Gen Z).

The Conflict: When these two power types compete, "In-group" bias hardens.

The Synthesis: The data suggests that project success depends on a "Knowledge Merger." As identified in Q4 and Q5, the dissolution of generational silos occurs only when

the senior's physical intuition is used to validate the junior's digital data, creating a more robust safety net than either could provide alone.

6.2 Communication as a Functional Adaptive Challenge

Theme 2 (Analysis of Q6) highlights that communication failures are not merely technical glitches but symptoms of a deeper cultural divide. Applying Adaptive Leadership Theory (ALT), it is clear that simply mandating a new project management app is a "Technical Fix" for an "Adaptive Problem."

The synthesis of participant responses indicates that the "Communication Lag" is a result of different Psychological Contracts. Older workers view a radio call as a commitment; younger workers view an app notification as a record. To bridge this, leadership must act as "Cultural Translators" (Theme 4), moving the team toward a Dual-Track Communication Protocol where digital speed is balanced by verbal accountability.

6.3 Moving from Equality to Equity in HR Strategy

The most significant synthesis regarding job satisfaction (Theme 3) is the failure of "Equal Treatment." In HRM, equality (giving everyone the same benefits) is often less effective than Equity (giving workers what they need based on their life stage).

Retention Synthesis: The analysis of Q10 and Q11 shows that while a Baby Boomer (P3) feels valued through a stable pension, a Gen Z worker (P12) feels valued through a supportive, low-stress culture and rapid feedback.

The Feedback Loop: The "Feedback Gap" identified in Q8 proves that "respect" is a subjective construct. A manager who ignores a Millennial worker to "show trust" is unintentionally driving that worker toward resignation. Synthesis of the data demands a move toward Bespoke Leadership, where feedback and rewards are tailored to the generational "Social Identity" of the employee.

6.4 The "Human-Centric" Construction Model

Finally, the synthesis of advice offered in Q12 points toward a future for the construction sector that is less about "managing assets" and more about "leading people." The

plea for "On-site presence" suggests that as technology makes remote management easier, the psychological need for visible, empathetic leadership becomes more critical.

The synthesis confirms that the generational gap is not a problem of age, but a problem of Perspective Alignment. When HR and Leadership actively bridge these perspectives, the project moves from a state of "Generational Friction" to "Generational Synergy."

6.5 Theoretical Contributions and Exploratory Limitations

This study contributes to construction management literature by demonstrating that intergenerational site friction is fundamentally an adaptive challenge rooted in Social Identity dynamics, rather than a superficial technical defect. By extending Social Identity Theory (Tajfel; Turner, 1979) and Adaptive Leadership Theory (Heifetz, 1994) into heavy marine civil engineering, this research provides an empirical framework for bridging tacit craft wisdom with digital technology.

Exploratory Framing: Due to the qualitative design and localized sample size ($N = 15$), these findings represent context-dependent behavioral patterns within heavy marine infrastructure. The conclusions are exploratory and serve as a hypothesis-generating foundation for future large-scale quantitative investigations across broader building and infrastructure sectors.

7 STRATEGIC RECOMMENDATIONS

The following recommendations are derived directly from the thematic analysis of the 12-question protocol. These strategies move beyond "technical fixes" and address the "adaptive challenges" of a multi-generational site.

7.1 Implementation of "Reciprocal Mentorship" Programs

The traditional master-apprentice model is currently too one-sided for the modern construction landscape. HR departments should formalize Reciprocal Mentorship, where pairing is based on a "Value-Exchange" rather than a top-down instruction.

The Action: Pair a Baby Boomer "Master Tradesperson" with a Gen Z "Junior Engineer."

The Goal: The senior worker transfers Tacit Safety Wisdom (identifying hazards by sound or physical intuition), while the junior worker provides Digital Fluency training (navigating BIM models or site apps). This dissolves "In-group/Out-group" bias and fosters mutual respect.

7.2 Development of "Dual-Channel" Communication Protocols

As identified in Question 6 regarding safety misunderstandings, relying on a single communication modality represents a significant operational risk.

The Action: Establish a "Digital-to-Verbal" safety loop.

The Goal: Critical site updates should be sent via an asynchronous platform (text/app) for the permanent record, but must be followed by a synchronous verbal confirmation (radio or face-to-face). This ensures the message is received by senior cohorts who may not prioritize digital notifications during active shifts.

7.3 Flexible "Menu-Based" HR Benefit Structures

To address the disparate motivational currencies found in Question 10, HR must move away from standardized, "one-size-fits-all" benefits.

The Action: Create a "Flexible Benefits Menu" where workers can allocate benefit "points" based on their specific life stage.

The Goal: Allow older workers to prioritize comprehensive health insurance and pension contributions, while younger workers can opt for additional time-off, air-ticket credits, or professional development funds. This directly increases job satisfaction and retention by acknowledging the unique social identities of each cohort.

8 THEORETICAL SYNTHESIS

This study successfully applied Social Identity Theory (SIT) and Adaptive Leadership Theory (ALT) to the construction sector. The findings suggest that intergenerational friction is

not merely a personality clash but a symptom of Siloed Identities. When workers feel their generational contributions (whether manual or digital) are invisible to management, they retreat into "In-groups," leading to the "Knowledge Leakage" discussed in the background of this study.

However, when leaders act as "Adaptive Interpreters," they facilitate a Superordinate Identity—a shared sense of belonging to the "Project Team" that transcends age. By recognizing that "old-school" manual wisdom and "new-school" digital precision are complementary rather than competitive, leaders can create a safer, more productive work environment. This synthesis proves that the future of construction management lies in Human-Centric Leadership that values both human experience and digital innovation.

9 CONCLUSION

The construction industry is at a historical turning point. Within the qualitative boundaries of this marine infrastructure case study ($N = 15$), the findings suggest that the "Generational Gap" in the Large-scale Marine Infrastructure Project is not merely a conflict of age, but a conflict of perspective, modality, and psychological need.

By bridging the "Digital-Manual Paradox," this research has shown that the successful integration of four generations requires moving beyond stagnant, traditional HR policies. The evidence from the 15 participants suggests that when Tacit Safety Wisdom is valued alongside Digital Fluency, the organization moves from a state of "Generational Friction" to "Generational Synergy."

The application of Social Identity Theory and Adaptive Leadership provides a roadmap for this transition. Ultimately, the construction sector must embrace a "Human-Centric" management model. In the high-stakes environment of 2025 and beyond, the wisdom of the past must not be replaced by technology, but rather serve as the essential foundation upon which modern innovation is built.

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