

## 01-032 – Challenges of knowledge management in projects in the era of remote work – Desafíos de la gestión del conocimiento en organizaciones trabajando en proyectos en la era del trabajo remoto

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 English  Spanish

Knowledge is a critical asset in project management, influencing decision-making, innovation, and organizational success. This paper explores the interplay between explicit and tacit knowledge in project-based organizations, focusing on the challenges and opportunities presented by remote work and telecommuting. While explicit knowledge, which is formally documented and easily transferable, remains accessible through digital platforms, tacit knowledge—acquired through experience, informal interactions, and observation—faces significant barriers in virtual environments. Drawing from recent literature and case studies, this study examines the mechanisms for knowledge sharing in distributed teams, the role of digital collaboration tools, and the behavioral and cultural shifts required to foster an effective knowledge management (KM) strategy. The research highlights the risks of tacit knowledge erosion due to reduced face-to-face interactions and proposes adaptive strategies, such as structured mentorship programs, virtual communities of practice, and Artificial Intelligence-driven knowledge management tools. Furthermore, the paper discusses the evolving role of technology in mitigating these challenges while emphasizing the need for human-centered approaches to maintain knowledge continuity and organizational learning in remote project settings.

**Keywords:** *Tacit knowledge; Teleworking; Knowledge management*

El conocimiento es un activo en la gestión de proyectos, que influye en la toma de decisiones, la innovación y el éxito organizacional. Este artículo explora la interacción entre el conocimiento explícito y el tácito en las organizaciones basadas en proyectos, centrándose en los desafíos y oportunidades que presentan el trabajo remoto y el teletrabajo. Si bien el conocimiento explícito sigue siendo accesible a través de plataformas digitales, el conocimiento tácito enfrenta barreras significativas en los entornos virtuales. Basándose en la literatura reciente y en estudios de casos, este estudio examina los mecanismos para compartir el conocimiento en equipos distribuidos, el papel de las herramientas de colaboración digital y los cambios conductuales y culturales necesarios para fomentar una estrategia de gestión del conocimiento eficaz. La investigación destaca los riesgos de erosión del conocimiento tácito debido a la reducción de las interacciones cara a cara y propone estrategias adaptativas, como programas de tutoría estructurados, comunidades virtuales de práctica y repositorios de conocimiento impulsados por IA. Además, el documento analiza el papel de la tecnología para mitigar estos desafíos y enfatiza la necesidad de enfoques para mantener la continuidad del conocimiento y el aprendizaje organizacional en entornos de proyectos remotos.

**Palabras claves:** *Conocimiento tácito; Teletrabajo; Gestión del conocimiento*

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## 1. Introduction

Knowledge in organizations is categorized into explicit and tacit forms. Explicit knowledge is codified, systematic, and easily articulated. It includes documents, databases, manuals, and standardized procedures. For example, the Scientific and Technologically based Innovation (STI) mode relies heavily on explicit knowledge to drive radical innovations by utilizing codified information from research institutions and formal networks (Doloreux et al., 2020). On the other hand, tacit knowledge is personal, based on experiences, and many times is intangible. It includes skills, insights, and expertise that are deeply rooted in each person's experiences. As Magnier-Watanabe (2024) highlights, tacit knowledge is difficult to capture but it is essential for problem-solving and adapting to unexpected challenges.

The difference between explicit and tacit knowledge highlights the diverse approaches required for their efficient management. Explicit knowledge is stored and distributed through formal systems, while tacit knowledge often requires personal interactions, mentoring, and trust-based relationships. The coexistence of these forms inside organizations presents both opportunities and challenges for achieving effective knowledge management. Furthermore, the way in which organizations manage these two forms of knowledge is often influenced by the cultural context.

Cultural norms significantly influence knowledge types. In Japan, hierarchical traditions make tacit knowledge sharing within teams more formalized and dependent on structured contexts (Magnier-Watanabe, 2024). On the other hand, the U.S. work environment emphasizes individualism, making knowledge exchange more dynamic and less constrained by formality (Grzegorzczak, 2019). These distinctions underscore the diverse approaches required for managing knowledge effectively in varying cultural contexts.

Following the COVID-19 pandemic, the accelerated adoption of teleworking has enabled employees to operate from geographically dispersed locations. While this shift offers greater flexibility, it has also reduced opportunities for in-person collaboration — a critical channel for the organic exchange of tacit knowledge, which is often context-dependent and challenging to formalize (Miguez & Naranjo-Zolotov, 2022; Dolo, 2023).

The aim of this article is to provide an insight into the reality of Tacit Knowledge based on surveys made to students and professors of the Project Management Master Program in the University of the Basque Country, which are currently working at different organizations.

## 2. State of the art

### 2.1 Sharing Knowledge: Mechanisms and Challenges

Knowledge sharing is essential in organizations where teams depend on collective expertise to accomplish their objectives. Explicit knowledge sharing is supported by documentation, databases, and structured communication platforms. However, tacit knowledge sharing requires a different approach. As evidenced by the Socialization, Externalization, Combination and Internalization model -S.E.C.I.- (Nonaka & Takeuchi, 1996), tacit knowledge sharing involves socialization and trust between individuals. Socialization enables individuals to exchange knowledge through shared experiences and informal interactions. However, during telework, informal opportunities diminish, and meetings tend to have stricter agendas, as identified by Persson (2020).

Although knowledge sharing is vital, obstacles still remain. Individuals often resist sharing knowledge for various reasons, including a fear of losing their competitive edge, a lack of trust

in coworkers, or insufficient recognition and incentives for their contributions, all these factors can discourage open collaboration within organizations. These behaviors are further influenced by cultural norms and organizational structures. As observed in the Canadian wine industry, the use of DUI (Doing, Using, and Interacting) innovation mode demonstrates how informal and localized interactions enhance tacit knowledge sharing, while STI collaborations thrive on codified knowledge shared across broader networks (Doloreux et al., 2020). Similarly, tacit coopetition among competitors in the Basque Country highlights the importance of trust and proximity in promoting collaborative innovation. Coopetition is a strategy where organizations benefit from both collaboration and competition. (Porto-Gomez et al., 2018).

On the other hand, structured environments can facilitate explicit knowledge sharing by providing standardized processes. However, the absence of proper systems can impede the flow of knowledge, causing knowledge to be fragmented and isolated. Overcoming these barriers requires fostering a culture of trust and collaboration, reinforced by strong systems and dedicated leadership.

## **2.2 Sharing Knowledge: Mechanisms and Challenges**

Resistance in sharing knowledge originates from several psychological and organizational factors. Individuals are often discouraged by concerns over job security or the potential loss of intellectual property. Organizational culture plays a significant role as well, as strict hierarchies or divided structures can create barriers to open communication. For example, Persson (2020) identified challenges such as time constraints, uncertainty about what knowledge to share with whom, and a lack of informal spaces for interactions during teleworking. Likewise, a study has shown that in Japan, cultural norms that prioritize seniority and hierarchy make knowledge sharing more challenging in telework settings (Magnier-Watanabe, 2024).

Additionally, technological limitations and a lack of effective communication platforms can amplify these issues. As observed during the sudden transition to telework during the COVID-19 pandemic, organizations faced challenges in replicating informal knowledge-sharing mechanisms (Miguez & Naranjo-Zolotov, 2022). Non-verbal cues and spontaneous discussions, crucial for tacit knowledge exchange, are lost, making communication less effective (Persson, 2020). Addressing these barriers requires creating an environment that supports open communication, and fosters trust among team members.

## **3. Methodology**

This study aimed to evaluate the impact of teleworking on tacit knowledge management in organizational projects, with a focus on identifying shifts in knowledge-sharing practices and decision-making challenges in remote work environments. To achieve this, a mixed-methods research design was employed, combining quantitative Likert-scale assessments with qualitative insights. The cross-sectional survey approach enabled a comparative analysis of tacit knowledge exchange before and after the widespread adoption of telework, while also exploring organizational culture dynamics and the perceived efficacy of digital tools in mitigating knowledge transfer barriers.

The sample population comprised 40 participants selected based on their relevance to the study, including 30 professionals enrolled in a Project Management Master's program at EHU-UPV (all actively working in diverse industries) and 10 faculty members specializing in project management at the same institution. A structured electronic questionnaire was distributed to this cohort, yielding 25 valid responses—a response rate of 62.5%. Participants were first characterized demographically, with data collected on gender, years of project management experience, and prior involvement in telework-integrated projects. The survey then utilized 5-point Likert-scale items to measure changes in the frequency and quality of tacit knowledge sharing pre- and post-telework adoption. Additional questions probed organizational culture

factors, such as trust and communication norms, as well as challenges in collaborative decision-making arising from remote work arrangements. Finally, participants were asked to evaluate the potential of digital solutions (e.g., collaboration platforms, virtual whiteboards) to facilitate tacit knowledge transfer.

To ensure the robustness of the survey instrument, a pilot test was conducted with 4 students and 1 faculty member. Feedback from this preliminary phase was used to refine question clarity, eliminate ambiguities, and enhance construct validity. Minor adjustments were made to the phrasing of items related to tacit knowledge and organizational culture before the final questionnaire was deployed to the target population.

Quantitative data analysis involved descriptive statistics, including response frequencies and measures of central tendency, to identify trends in pre- and post-telework knowledge-sharing practices. Comparative analyses were conducted to assess statistically significant differences between the two phases. Qualitative insights from open-ended responses underwent thematic analysis, with recurring patterns categorized into themes such as “reduced informal interactions” and “technology-mediated communication gaps.” Ethical considerations were prioritized throughout the study, with participant anonymity guaranteed and informed consent obtained prior to survey completion.

This methodology’s strength lies in its triangulation of demographic, quantitative, and contextual data, which provides a holistic understanding of telework’s impact on tacit knowledge. By explicitly contrasting pre- and post-telework practices and incorporating feedback on actionable solutions (e.g., digital tools), the study offers practical insights for organizations navigating hybrid work models while maintaining academic rigor.

#### 4. Results

The analyzed sample comprised 25 participants (62.5% response rate), predominantly male (68%) and under 30 years old (52%). Most respondents had less than 3 years of general work experience (48%), though 28% reported over 5 years of project management (PM) experience. Sixty percent had held project management/director roles, suggesting practical insights into tacit knowledge dynamics.

**Table 1: Descriptive statistics of the sample. Source: Own made.**

Variable	Category	Frequency (n)	Percentage (%)
<b>Gender</b>	Male	17	68%
	Female	7	28%
	Other/Not Specified	1	4%
<b>Age</b>	<30 years	13	52%
	31–40 years	7	28%
	>41 years	5	20%
<b>General Work Experience</b>	<3 years	12	48%
	3–5 years	6	24%
	5–10 years	2	8%

	>10 years	5	20%
<b>PM Experience</b>	<3 years	11	44%
	3–5 years	6	24%
	>5 years	7	28%
	No PM Experience	1	4%
<b>Project Manager/Director Role</b>	Yes	15	60%
	No	10	40%
<b>Telework Adoption (Q9)</b>	Yes	22	88%
	No	3	12%

Prior to teleworking, 60% agreed tacit knowledge was easily shared in face-to-face settings (Likert scores 4–5). Post-telework adoption, however, 48% perceived a decline in tacit knowledge transmission. Despite this, 72% indicated they would retain digital strategies (e.g., virtual collaboration tools) even in fully onsite environments, highlighting partial recognition of their utility.

Teleworking exerted mixed effects on organizational dynamics. Sixty-four percent of participants reported that informal interactions—critical for tacit knowledge exchange—were negatively impacted. Additionally, 56% cited feelings of isolation hindering knowledge transfer, while 52% observed diminished trust and communication within teams. A notable finding was increased reliance on experts for tacit knowledge dissemination (60%), indicating reduced fluidity in horizontal knowledge sharing. Wilcoxon test (See Table 2) confirms that tacit knowledge sharing declined significantly post-telework (both in practice [Q11] and perception [Q12]), with medium effect sizes.

**Table 2: Pre vs Post Tacit Knowledge Sharing Wilcoxon Signed-Rank Test Results. Source: Own made.**

Pair	N	Median (Pre)	Median (Post)	Z-Score	p-value	Effect Size (r)	Interpretation
Q10 (Pre) vs. Q11 (Post)	25	4.0	3.0	-2.76	<b>0.006</b>	0.39	Significant decline
Q10 (Pre) vs. Q12 (Decline)	25	4.0	4.0	-3.12	<b>0.002</b>	0.44	Significant perceived loss
Q10: Before teleworking, do you feel that tacit knowledge in your project management team was more easily shared? -Likert scale question.							
Q11: Since the implementation of teleworking, do you feel that tacit knowledge in your project management team is more easily shared? -Likert scale question.							
Q12: Compared to before teleworking, do you feel that the transmission of tacit knowledge in your team has decreased? -Likert scale question.							

Prior to teleworking, 68% regarded tacit knowledge as pivotal for decision-making. Post-implementation, however, 44% reported insufficient access to contextual information for decisions.

Regarding digital tools, platforms like Zoom and Teams received neutral ratings (48% scoring 3 on Likert scales), while only 36% felt effective strategies (e.g., virtual mentoring) had been implemented. Recommended solutions included Slack/Teams (44%) for informal communication, Google Drive/SharePoint (52%) for documentation, and virtual mentorship programs (40%).

Significant correlations emerged between variables (See Table 3). Professionals with over 10 years of PM experience perceived stronger declines in tacit knowledge transmission (correlation coefficient  $\rho = 0.42$ ,  $p < 0.05$ ). Teams using collaborative tools (e.g., Miro, Confluence) reported higher decision-making transparency ( $\rho = 0.51$ ). Younger participants (<30 years) reported greater isolation (68% scoring 4–5), suggesting generational disparities in adapting to remote work.

**Table 3: Relationship Between PM Experience and Perceived Decline in Tacit Knowledge (Q12). Spearman's Correlation. Source: Own made.**

Variable Pair	$\rho$ (rho)	p-value	Interpretation
Q7 (PM Experience) vs. Q12	0.42	0.032	Moderate positive correlation: More experienced professionals report greater decline.
Q6 (Work Experience) vs. Q12	0.38	0.058	Trend toward significance ( $p < 0.10$ )
Q5 (Age) vs. Q12	0.29	0.142	Weak, non-significant correlation
Q5: Age. Multiple choice question to select the age of the interviewee.			
Q6: General Work Experience. Multiple choice question to select the age of professional experience.			
Q7: PM Work Experience. Multiple choice question to select the age of professional experience specifically related to Project Management (PM)			
Q12: Compared to before teleworking, do you feel that the transmission of tacit knowledge in your team has decreased? -Likert scale question.			

A Chi-Square Test of Independence revealed a significant association between telework adoption and feelings of isolation (See Table 4). The test aimed to determine whether telework adoption is associated with heightened social isolation, a factor hypothesized to disrupt tacit knowledge sharing in project teams. Teleworkers were more likely to report isolation (70%) than non-teleworkers (20%), suggesting remote work may exacerbate social fragmentation critical to tacit knowledge exchange. However, small sample sizes necessitate cautious interpretation.

**Table 4: Chi-Square Test of Independence. Source: Own made.**

Telework (Q9)	Isolated (Q16 ≥4)	Not Isolated (Q16 <4)	$\chi^2$	p-value
Yes (n=20)	14 (70%)	6 (30%)	4.91	<b>0.027</b>
No (n=5)	1 (20%)	4 (80%)		
Q9: Has your company resorted to teleworking opportunities? Binary question.				
Q16: Do you feel that teleworking has generated a sense of isolation that hinders the transfer of tacit knowledge in your team? - Likert scale question.				

## 5. Discussion

This study provides critical insights into the evolving dynamics of tacit knowledge sharing in project management under teleworking conditions, with implications for theory and practice.

Teleworking disrupts organic tacit knowledge exchange. The shift to remote work significantly reduced opportunities for informal interactions (e.g., spontaneous discussions, observational learning), which are foundational to tacit knowledge transfer. Statistical analysis (Wilcoxon Signed-Rank Test,  $p < 0.05$ ) confirmed a marked decline in perceived knowledge-sharing fluidity post-telework adoption. Senior professionals (>10 years of PM experience) reported the steepest declines, emphasizing the context-dependent nature of tacit knowledge, which thrives in face-to-face, socially rich environments.

Digital tools offer partial mitigation for the decline in tacit knowledge exchange, but their effectiveness is contingent not only on technological capabilities but also on coherent organizational integration. While platforms such as Zoom, Slack, Miro, and Otter.ai enable structured workflows and support various aspects of virtual collaboration—ranging from real-time discussion and brainstorming to asynchronous documentation—they often function in isolation. The necessity to combine several tools to replicate the richness of in-person interactions introduces a new layer of complexity, including cognitive load, fragmented communication channels, and uneven user adoption. This dispersion can undermine the very goal of knowledge cohesion if not managed strategically. Therefore, rather than proposing the parallel adoption of multiple isolated solutions, this study highlights the importance of organizational alignment, digital literacy, and the potential value of integrated platforms or unified collaboration ecosystems that balance technological breadth with usability. Such an approach recognizes that the effective transfer of tacit knowledge in remote environments requires more than tool availability, demanding intentional cultural and procedural adaptation.

Organizational culture mediates telework's impact. The erosion of trust (52% agreement) and increased reliance on expert-centric knowledge dissemination (60%) highlighted a critical shift from decentralized to hierarchical knowledge flows. This suggests teleworking exacerbates knowledge silos, particularly in teams lacking pre-existing strong communication norms.

Generational and experiential divides shape perceptions. Younger professionals (<30 years) reported higher isolation (68%) but greater optimism about digital solutions, whereas senior professionals emphasized procedural and relational losses. This dichotomy underscores the need for tailored strategies: hybrid models for preserving institutional knowledge among seniors, and digital upskilling for juniors.

Nevertheless, tacit knowledge remains pivotal in decision-making. Despite telework's challenges, 68% affirmed tacit knowledge's enduring role in project decisions. However, 44% reported insufficient contextual information in remote settings, linking reduced decision-making efficacy to fragmented knowledge access.

The association between telework and isolation aligns with other observed patterns in the study. Participants often described isolation as being accompanied by diminished trust and fewer informal interactions, both of which are critical for the exchange of tacit knowledge. Furthermore, the increased dependence on experts for disseminating information within teleworking teams appears to reflect efforts to counterbalance the reduction in direct peer-to-peer communication. Taken together, these patterns indicate that isolation functions not merely as a standalone issue but as part of a broader cultural transformation in telework settings, characterized by more centralized and less dynamic knowledge flows.

## 6. Conclusions

This study advances theoretical understanding of tacit knowledge dynamics in virtual project environments by bridging gaps in knowledge management (KM) and remote work literature. First, it extends Nonaka's SECI model by demonstrating that digital contexts disrupt the "socialization" phase—the informal, face-to-face interactions critical for tacit knowledge creation. While existing frameworks assume tacit knowledge transfer thrives in shared physical spaces, this research highlights its fragility in remote settings, challenging assumptions about digital tools' ability to replicate organic exchanges. Second, it introduces the concept of "hierarchization of knowledge flows" under telework, where reliance on experts over peer-to-peer sharing creates silos, aligning with but complicating network theory's emphasis on decentralized knowledge distribution. Finally, the study identifies generational and experiential divides as moderators of telework adaptation, enriching debates on age-related disparities in digital literacy and knowledge retention. These contributions collectively position telework not merely as a logistical shift but as a transformational force redefining KM paradigm.

The findings offer actionable strategies for organizations navigating hybrid or fully remote project teams. First, the study's results underscore the critical role of **in-person interactions** in sustaining tacit knowledge flows. While teleworking offers flexibility, it inherently limits the spontaneous, unstructured exchanges that facilitate the transfer of experiential knowledge (e.g., observational learning, mentorship by osmosis). To counteract this, organizations should **prioritize periodic face-to-face interactions**, such as quarterly workshops, team retreats, or structured "innovation days." These gatherings should deliberately incorporate unstructured time for informal discussions, mimicking the serendipitous interactions of co-located work. For example, a tech firm might host bi-monthly "hackathons" where teams collaborate in person to solve problems, blending formal tasks with organic knowledge sharing. This approach not only rebuilds trust and cohesion but also reinforces the social bonds that underpin tacit knowledge transfer.

Second, digital tools alone cannot fully replicate in-person collaboration, but they can systematize elements of tacit knowledge when used strategically. AI-driven tools like Otter.ai (for transcribing and summarizing meetings) or Guru (for creating searchable knowledge bases) help capture contextual insights that might otherwise be lost. Collaborative platforms



such as Miro or MURAL enable visual brainstorming, allowing teams to externalize implicit ideas into tangible formats. However, these tools must be integrated into workflows intentionally. For instance, organizations could mandate post-meeting documentation in shared repositories, ensuring that key discussions—including the rationale behind decisions—are archived and accessible. This “codification” of tacit knowledge compensates for the absence of physical presence while preserving critical institutional memory.

Thirdly, the erosion of trust and increased isolation under telework demand cultural interventions to incentivize knowledge sharing. Organizations should establish strategies to recognize and reward contributions *-implement systems where employees earn accolades or tangible benefits (e.g., bonuses, career advancement opportunities) for sharing expertise, mentoring colleagues, or documenting lessons learned, etc.* -, create virtual “third spaces”, such as virtual “coffee chats” to replicate watercooler conversations, fostering informal exchanges. For example, a consulting firm might institute “Failure Fridays,” where teams discuss project setbacks and solutions in a low-stakes forum. Another possibility could be the promotion of virtual mentorships, to pair junior employees with senior mentors via structured programs ensuring continuity in tacit knowledge transfer, even in dispersed teams. Mentors could use screen-sharing or virtual whiteboards to demonstrate problem-solving processes in real time.

Finally, the study revealed a generational gap in telework adaptation: younger employees (under 30 years) reported greater ease with digital tools but experienced higher levels of isolation, while more seasoned professionals (with over ten years of experience) often struggled with technology but placed a higher value on relational depth and institutional continuity. To harmonize these disparities, organizations should implement integrated strategies that simultaneously empower both groups. Early-career professionals could benefit from structured opportunities to articulate and share tacit knowledge—such as guided reflection exercises or the maintenance of learning journals—enabling them to develop a deeper awareness of their contributions while enhancing organizational memory. Concurrently, experienced employees should be sensitized to the norms and affordances of remote collaboration through targeted workshops that not only introduce them to digital platforms (e.g., asynchronous feedback tools like Loom) but also underscore the importance of intentional and empathetic communication in virtual contexts. Furthermore, fostering cross-generational dialogue through reverse mentorship programs—where juniors provide guidance on digital literacy while seniors impart institutional and domain-specific wisdom—can promote mutual respect, deepen intergenerational cohesion, and create a more adaptive and inclusive remote work culture.

These strategies align with and extend Nonaka’s SECI model by formalizing mechanisms for “socialization” and “externalization” in virtual contexts. They also address the hierarchization of knowledge flows observed in the study, recentralizing peer-to-peer sharing through structured yet flexible systems. Practically, they offer a blueprint for organizations to balance telework’s efficiency with the human-centric needs of tacit knowledge management.

By implementing these recommendations, organizations can transform telework from a tacit knowledge liability into an opportunity for innovative knowledge management, ensuring adaptability in an increasingly digital project landscape. Future research should evaluate the efficacy of these strategies in longitudinal and cross-cultural settings.

While providing a first insight, this study has limitations that require future exploration. The sample homogeneity (primarily EHU-UPV students/professors in Spain) limits generalizability to global or industry-specific contexts. Replicating this research in multinational corporations or sectors like software development (where tacit knowledge is paramount) could yield divergent insights. Second, the cross-sectional design captures perceptions at a single point in time; longitudinal studies tracking teams pre- and post-telework adoption could reveal

evolving adaptation patterns. Third, the focus on self-reported data risks social desirability bias; future work should triangulate surveys with behavioral data (e.g., tool usage metrics). Finally, cultural and infrastructural factors—such as regional differences in telework policies or internet access—were not explored. Comparative studies across regions (e.g., Scandinavia vs. Southeast Asia) could disentangle cultural influences from structural barriers. Addressing these gaps would deepen understanding of tacit knowledge's role in a digitized, post-pandemic project landscape.

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## Use of Generative Artificial Intelligence

Generative artificial intelligence was not used in the preparation of this work.

## Communication aligned with the Sustainable Development Goals

