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Reducing Cognitive Bias and Organizational Silence in UAE Oilfield Maintenance: The Role of Microlearning Interventions

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Abstract: ***Oilfield maintenance in the United Arab Emirates (UAE) is marked by high-stakes, time-sensitive decisions where human judgment plays a critical role. This study investigates how cognitive biases and organizational silence—two behavioral vulnerabilities—affect decision-making and safety communication among frontline oilfield personnel. Using qualitative data from interviews, field observations, and document analysis, the research identifies patterns of overconfidence, familiarity bias, and defensive silence that compromise procedural accuracy. The study further explores the role of microlearning interventions—short, contextualized training modules—in mitigating these issues. Findings suggest that microlearning enhances decision reflection, supports procedural recall, and fosters psychological safety, thereby enabling more accurate judgments and greater willingness to speak up. The research contributes to behavioral safety scholarship by proposing a conceptual framework that links microlearning to both cognitive recalibration and voice behavior in high-risk industrial settings. Implications for training design and organizational safety strategies are discussed.***
Keywords: Cognitive bias, organizational silence, microlearning, oilfield maintenance, behavioral safety, psychological safety, decision-making, UAE industrial workforce.

I. INTRODUCTION

Oilfield maintenance operations in the United Arab Emirates (UAE) are one of the key strategic structures of the country's energy industry. These operations' continuity and safety depend on timely and accurate decisions made by the maintenance engineers and the frontline managers. However, they are most frequently made when there is a lot at stake operationally and where there is substantial uncertainty, both of which conditions also apply when most decision errors that affect perceptions of risk, time pressure, and priority are most likely to occur. Nonetheless, many advanced technologies, like predictive maintenance and digitally adaptable dashboards, are used steadily, and the human is the primary decision-maker in maintenance planning, equipment failure actions, and shutdown possibilities. However, the matter of how psychological factors like overconfidence or confirmation bias impact real-time decision-making has not received much attention in the UAE oilfield environment. Another important behavioral issue associated with the oil field environment is organizational silence. The original research postulates that in hierarchical and safety-intensive workplaces, personnel may not report concerns, safety observations, or doubts regarding procedures because they believe that their input will be pointless, they will suffer negative consequences for speaking up, or because they have become conditioned to be disengaged. Recent development indicates that the quietness is not always due to the threat; it may be caused by the absence of psychological stimuli in the otherwise unexciting operational processes (Dilba and Meyer, 2024). In the UAE, where people work in multicultural teams at night shifts and in conditions of high stress, the lack of reporting or non-escalation of early signs may be due to cultural or organizational factors (Aruoren and Isiaka, 2023).

An increasing application of the above cognitive and communication-based weakness is the use of microlearning, which is brief, targeted, and online training sessions aimed at quickly imparting knowledge and enhancing proper practices. Microlearning is on the right track to becoming an enhancement in technical disciplines because there are various approaches and methods of its application. Al Aufi et al. (2023) have pointed out that the major petroleum operators in the UAE have used microlearning, podcasts, and digital 'TechTalks' in order to facilitate knowledge sharing at the point of need within the organization. This is in line with other studies, as Karlsen, Balsvik, and Rønnevik (2023) noted that microlearning platforms improve employee participation and access to procedural instructions, especially in time-sensitive positions.

For example, Sung, Leong, and Lee (2022) showed that via multimedia microlearning, learners' attention will be enhanced, as well as their ability to recall decisions made; this shows that it may be suitable for maintenance planning in frontline positions. Despite these advancements, the persistence of suboptimal decision-making and muted employee voice presents a critical vulnerability in maintenance reliability and safety assurance. Lack of specific behavioral interventions to treat cognitive distortion and silence behavior is one of the gaps in the operational improvement agenda in UAE oilfields (Hu et al., 2021; Nesvold and Bratvold, 2022). Although research has been conducted on cognitive bias in energy forecasting and organizational silence in hierarchical organizations, the combined research on these behavioral phenomena in the oilfield maintenance context has not been done, especially in the UAE. Besides, there is limited research exploring how digital microlearning formats can be used to overcome these behavioral challenges in safety-critical decision-making contexts in real-time (Kumar and Sen, 2025; Owusu-Agyeman, 2025).

This paper will examine how microlearning interventions can be used to reduce the role of cognitive bias and organizational silence in maintenance decision-making processes among the workers in UAE oilfields. This is aimed at producing empirically based knowledge that can be used to inform organizational training practices as well as behavioral safety models. The study is guided by the following research questions:

1) How do cognitive biases manifest in frontline decision-making among oilfield maintenance personnel?
2) What factors contribute to organizational silence in these contexts?
3) In what ways can microlearning be used to address or moderate these behavioral barriers?

This research contributes to the literature by linking microlearning with behavioral outcomes—cognitive bias reduction and enhanced employee voice—in complex, high-risk industrial settings. It provides actionable recommendations for behavioral safety strategies in oil and gas organizations operating in multicultural, high-stress environments such as the UAE.

II. LITERATURE REVIEW

This section critically evaluates the theoretical and empirical scholarship on cognitive bias, organizational silence, and microlearning in high-risk industrial settings, with a particular focus on oilfield operations in the UAE. It provides the intellectual scaffolding for assessing how targeted digital interventions—specifically microlearning—may improve decision accuracy and communication in safety-critical environments.

A. Cognitive Bias in High-Stakes Industrial Decisions

Cognitive biases are systematic judgment errors that are caused by heuristic processing, and they tend to be aggravated when time constraints and uncertainty are involved- both of which are common in oilfield maintenance. Hu et al. (2021) single out perceptual errors concerning environmental and economic expectations in the decision-making process regarding shale gas. Nesvold and Bratvold (2022, 2023) empirically show that in a Norwegian context, oil production forecasts are often subject to the bias of optimism and overprecision. To address these biases, they propose reference class forecasting to be adopted. As Zarchi et al. (2021) observe, studying the decision-makers in the Iranian oil sector, these biases are not only cognitive but also socio-political narratives embedded in them.

Although these studies are geographically different, they all lead to the same issue, namely, the susceptibility of technical decision-making to psychological bias. In the UAE oilfields, where decisions tend to be centralized and culturally stratified, the effects of these distortions may be compounded especially when intuitive decision-making is institutionalized to a point of operational pressure. Furthermore, researchers have stressed that microlearning could be used not only as a source of knowledge but as a bias-distracting mechanism. According to Alias and Razak (2025), the delivery of content in microlearning in segments and context enhances the reduction of cognitive overload and interruption of automatic heuristic reactions. This is in line with the framing intervention suggested by Nesvold and Bratvold (2023) who suggest the introduction of decision prompts and feedback loops into the learning processes. When applied to UAE oilfields, the microlearning platforms can be used to simulate the decision branches under uncertainty, providing structured thoughts that reduce the use of overconfidence and availability heuristics.

B. Organization Silence and Psychological Disengagement

Organizational silence is a behavioral threat whereby employees intentionally conceal information. Aruoren and Isiaka (2023) disclose that the perceived organizational support mediates between silence and commitment in petroleum organizations, and that Dilba and Meyer (2024) note that silence can be a result of motivational boredom and not punitive threat. The multicultural teams that make up most of the UAE oilfield workforce operating in isolated settings are unique triggers of disengagement. Silence is not necessarily reactive; it may be habituated, invisible, and systemic, especially when vertical structures discourage dissent.

It has been found that silence not only stifles risk communication but also innovation, learning, and accountability. Organizational safety can be high, but the lack of psychological safety still exposes organizations to systemic failures. Greater granularity of silence shows that it is a multidimensional concept, which is divided into acquiescent, defensive, and prosocial (Nafei, 2016). The perceived risks are not the only factors that affect these types of silence, as socio-cultural norms and emotional climate influence them as well (Sulphey, 2020).

Defensive silence is institutionalized in the UAE multicultural oilfields, which have deference to authority and fear of job insecurity, discouraging upward feedback. Durrah et al. (2023) also note that organizational cynicism and isolation strengthen disengagement, which leads to accumulating emotional exhaustion and job frustration. These circumstances outline the necessity of creating psychologically safe reporting conditions. Further, the silence in high-risk industries also has a downstream impact on the quality of decisions, which indirectly increases the impact of cognitive biases. The lack of dissent or anomaly of operations by frontline employees leaves decision-makers with incomplete information or confirmatory information-fueling confirmation bias and status quo bias. Such suppressed voice behavior and distorted cognition interaction has been identified as a safety-critical research topic but has not been studied in the oilfield (Sulphey, 2020; Durrah et al., 2023). The overlap of the two failures in behavior indicates a compounded risk that needs dual-focused interventions- dealing with both silence and heuristic judgment patterns using inclusive and real-time learning processes.

C. Microlearning in Technical Disciplines

Microlearning is brief and task-focused training that is generally provided digitally and on demand. Al Aufi et al. (2023) report the effective introduction of digital TechTalks and microlearning modules in petroleum companies in the UAE. Karlsen et al. (2023) and Sung et al. (2022) support the fact that these platforms can increase procedural memory and compliance with tasks. Kumar and Sen (2025) list such strategic learning clusters as user engagement and content design, which can be well aligned with frontline operations. Owusu-Agyeman (2025) associates microlearning with green skill development as it is being used in behavioral change, rather than knowledge delivery.

Most importantly, microlearning is a pedagogical innovation, as well as a behavioral modulator. Simulations, spaced repetition, and feedback loops it promote cognitive recalibration and a reflective decision-making process to be reflective. Inclusive learning in language and literacy levels is facilitated by this flexibility in the case of varied UAE teams. Loh (2021) points out that microlearning is not just a format of delivery but a strategic training method that is aimed at addressing the needs of the workforce in terms of adaptability. It is based on the adult learning theory and is modular, which is why it applies to any dynamic, shift-based workplace with the help of a mobile-first infrastructure. Al Aufi et al. (2023) report that the PDO used digital TechTalks and on-demand learning resources, which increased the accuracy of tasks and adherence to safety objectively. Their well-organized training center illustrates how microlearning could assist in maintaining the knowledge base, as well as in developing the culture of constant improvement. In addition, the usefulness of microlearning in a dynamic environment can be justified due to the implementation of the cognitive load theory and experiential learning models, on which microlearning is grounded. It shares small modules that minimize extraneous load and ensure that most processing is germane, which is optimal in timed tasks such as maintaining oilfields (Alias and Razak 2025). Such a form may as well be applied in an iterative process, i.e., the experiential cycle of concrete experience, reflective observation, and active experimentation of Kolb. Such is the emphasis placed on the points of microlearning as an approach to training measures that are not only convenient but also cognitively streamlined. These lessons have major roles in easing its usage beyond the skill refiner, to interventions that would address judgment and communication inadequacies.

D. Behavioral Safety and Procedural Use

Behavioral safety programs unlike compliance-based programs, are designed to modify cognitive and interpersonal processes. Aderamo et al. (2024) have proposed a proactive safety model that includes three personal qualities, such as peer accountability, life-long learning, and managerial modeling, which can be related to the structure of micro learning. According to Peres and Hendricks (2024), the Interactive Behavior Triad (IBT) is valid, and adherence to the procedures is a complex consultation of the experience, the presence of tasks, and the information of the situation.

These models highlight that training is not a virtue, and it should be integrated into situational awareness and responsive to the variability of workers. According to the literature, behavioral reinforcement, combined with microlearning, can be used to achieve sustainable safety compliance.

E. Digital Innovation in Safety Culture

Dodoo et al. (2024) categorize safety innovations into wearable tech, AR/VR systems, and AI-based analytics—each contributing to a culture of anticipatory safety. Ozobu et al. (2023) propose an AI-driven model for occupational disease prediction in high-risk sectors. Although these technologies are transformative, they often require substantial infrastructural investment.

By contrast, microlearning offers a scalable, cost-effective medium that can deliver real-time procedural updates, behavior prompts, and safety drills. It serves as an agile layer of reinforcement within the broader ecosystem of digital safety strategies.

F. Theoretical Foundation

The study is grounded in two complementary frameworks: Behavioral Decision Theory and Psychological Safety Theory. The former, rooted in the seminal works of Kahneman and Tversky (1979), explains how heuristics impair rational decision-making under uncertainty. Their findings on prospect theory have been widely adopted in understanding risk-prone environments such as the oil and gas sector. In this study, cognitive bias is defined as a systematic deviation from normative decision standards, driven by heuristics such as availability, anchoring, and overconfidence (Kahneman and Tversky, 1979).

Organizational silence is conceptualized as the conscious suppression of relevant knowledge, ideas, or concerns by employees, shaped by individual fear, cultural norms, and systemic disincentives (Sulphey, 2020; Nafei, 2016). These definitions inform the coding strategy for the qualitative data analysis and guide the interpretation of observed communication and decision behaviors. The latter, developed by Edmondson (1999), elucidates the social dynamics that facilitate or hinder open communication in teams. Psychological safety—defined as a shared belief that the team is safe for interpersonal risk-taking—is critical in hierarchical and culturally diverse environments like UAE oilfields. Supporting evidence from Newman et al. (2017) affirms that psychological safety is associated with error reporting, proactive behavior, and innovation.

Together, these theoretical perspectives and empirical findings establish a compelling rationale for examining microlearning not just as an instructional tool, but as a mechanism for behavioral change. However, few studies have bridged these literatures—integrating behavioral science with digital pedagogy in safety-critical settings like UAE oilfields. This gap underlines the need for research that empirically investigates how microlearning may disrupt bias-laden judgments and enable voice behavior among frontline personnel. This interaction is captured in Figure 1, which outlines the pathway through which microlearning may transform cognitive and communicative behavior in technical settings.

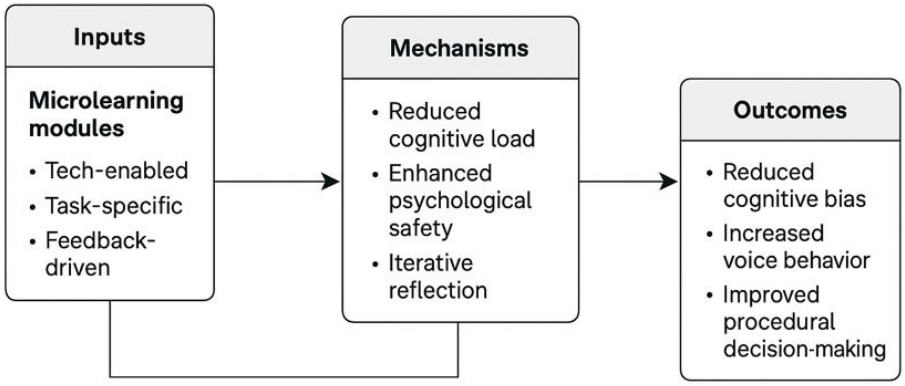

Fig. 1 Conceptual framework illustrating how microlearning may influence cognitive bias and organizational silence in oilfield maintenance decisions

G. Gaps in the Current Research

Despite its promise, the literature lacks integrated studies exploring how microlearning influences cognitive bias or organizational silence in operational environments. Most evaluations focus on learning outcomes (e.g., retention, engagement) rather than behavioral effects (e.g., voice behavior, decision correction). Empirical studies examining microlearning's role in high-risk, multicultural settings such as UAE oilfields are notably scarce. These gaps are summarized in Table 1, which outlines areas where current research fails to link microlearning to measurable behavioral improvements.

TABLE I
KEY EMPIRICAL GAPS IN THE LITERATURE LINKING MICRO-LEARNING TO SAFETY BEHAVIOUR OUTCOMES

Focus Area	**Representative Studies**	**Identified Empirical Gap**
Microlearning → Cognitive Bias	Nesvold and Bratvold (2023); Hu et al. (2021)	Absence of studies examining how microlearning interrupts heuristic-driven decision errors in technical settings.
Organizational Silence → Voice Behavior	Aruoren and Isiaka (2023); Dilba and Meyer (2024)	Limited evaluation of how digital learning formats foster upward communication in hierarchical, high-risk workforces.
Procedural Training → Decision Accuracy	Peres and Hendricks (2024); Karlsen et al. (2023)	Lack of evidence connecting procedural microlearning use with actual frontline decision precision or task outcomes.

III.METHODOLOGY

A. Research Design

This study adopts a qualitative, exploratory design, appropriate for investigating complex, under-theorized behavioral phenomena such as cognitive bias and organizational silence in high-risk environments (Creswell and Poth, 2018). Given the paucity of empirical research in UAE oilfield contexts and the need to surface context-specific meanings and interpretations, a constructivist epistemological stance was adopted. This approach enables an in-depth exploration of how frontline maintenance personnel perceive, enact, and navigate psychological barriers during operational decision-making. It also aligns with calls for methodological pluralism in safety-critical research (Dekker, 2014).

B. Sampling Strategy

A purposive sampling technique was employed to ensure participant relevance and contextual depth (Patton, 2015). The target population comprised technical and supervisory personnel working in upstream oilfield maintenance operations in Abu Dhabi and Sharjah. Inclusion criteria prioritized individuals with direct involvement in routine or emergency maintenance decision-making and a minimum of two years of field experience. The final sample is anticipated to consist of 15–25 participants, balancing thematic saturation and feasibility constraints (Guest, Bunce, and Johnson, 2006). Participants are expected to include equipment engineers, shutdown coordinators, safety advisors, and maintenance supervisors to ensure triangulation across hierarchical layers.

C. Data Collection

Data were collected using three complementary methods: semi-structured interviews, non-participant field observations, and document analysis. The interviews served as the primary instrument and lasted between 45 and 60 minutes, conducted using a flexible interview guide that explored participants' experiences of cognitive judgment under uncertainty, their motivations for withholding or voicing safety-related concerns, and their perceptions of digital learning interventions. Interviews were conducted on-site in English. Each session was audio-recorded with consent and transcribed verbatim to ensure data integrity. Field observations were conducted in various shifts when routine maintenance was being conducted and pre-task safety briefings were being conducted. These were real time actions like decision points, nonverbal communication and adherence to procedures. The observations sessions and the field notes were to be standardized by using the standard templates and extended to the full observation logs within 24 hours of the observation session.

With regard to the internal safety reports and training manuals, an analysis of the document was done, and the content of the microlearning modules where access control was allowed. The same materials were used to contextualize the behavioral expectations and training strategies of the organization to provide other levels of understanding that could be used in triangulation. The data would be gathered within a period of four weeks and during the day shift and the night shift to show how the operations differ. To record the context and position of the participants and new discoveries of the analysis, detailed memos were kept during the process. The participants could also be reached on the site HR and safety departments, where all the procedures were followed with high levels of confidentiality. The combination of these three sources of data facilitated the achievement of a high degree of contextualization and increased the validity of the research findings.

D. Data Analysis

To apply the thematic analysis, the six steps suggested by Braun and Clarke (2006) were followed, which is the most adequate to determine the patterned meanings of the exploratory qualitative data. The interviews were transcribed and the field notes consolidated; this was followed by the data being read severally so that the data became immersive and familiar. Primary coding was performed in NVivo and applied inductively with the help of narratives of research participants and deductively with the help of conceptual framework of the research such themes as cognitive distortion, silence behavior, and training responses. Codes such as "non-escalation of anomalies," "intuitive decision under stress," and "repetition of unsafe routines" emerged and were clustered into higher-order themes.

These thematic clusters were then reviewed to assess internal coherence and consistency across participant roles and organizational contexts. Each theme was defined in relation to the study's constructs—such as overconfidence bias, defensive silence, or reflective microlearning—and linked back to the behavioral safety literature.

The final thematic map served as the foundation for narrative construction, wherein themes were contextualized and interpreted in light of both empirical observation and theoretical scaffolding.

Trustworthiness and Rigour: The study applied Lincoln and Guba's (1985) criteria for trustworthiness—credibility, transferability, dependability, and confirmability—to ensure the rigor of its qualitative procedures. Credibility was enhanced through prolonged engagement with participants and triangulation across interviews, field observations, and organizational documents. Participants were invited to verify the accuracy of key interpretations through member checking. Transferability was supported by offering detailed descriptions of the operational, cultural, and organizational setting of the UAE oilfield maintenance environment. Dependability was maintained through a transparent audit trail, documenting coding processes, theme development, and analytic memos. Confirmability was ensured by practicing researcher reflexivity and bracketing potential biases in a field journal throughout the study. Furthermore, peer debriefing was employed to review thematic interpretations and assess consistency with the original data. These collective strategies reinforced the validity and transparency of the findings and enhanced confidence in their analytical robustness.

E. Ethical Approval

This study received ethical clearance from the Institutional Research Ethics Committee (Reference No: BAHSS2 01331). All participants were informed of the study aims, expected time commitment, and their rights, and gave written consent before participation. Confidentiality and anonymity were ensured throughout.

IV. RESULTS

This study investigated the behavioral dimensions of frontline decision-making in the UAE oilfield maintenance by exploring three research questions: (1) How do cognitive biases manifest among frontline maintenance personnel? (2) What are the drivers of organizational silence in safety-critical operations? (3) How can microlearning interventions influence or mitigate these behavioral vulnerabilities?

Using qualitative analysis of 22 semi-structured interviews, five field observation sessions, and supporting internal safety documents, three major themes were identified: (A) Cognitive Distortions Under Operational Pressure, (B) Institutionalized Silence and Communication Breakdown, and (C) Behavioral Impact of Microlearning Exposure. Table II provides aligned quotes and behavioral summaries per theme to illustrate these patterns.

TABLE II
HEMATIC SYNTHESIS OF BEHAVIORAL PATTERNS IN OILFIELD MAINTENANCE CONTEXT

Theme	Behavioral Manifestation	Representative Quotes	Analytical Interpretation
A. Cognitive Distortions Under Operational Pressure	Frequent reliance on intuition over protocol; decisions made under urgency without verification. Skipping of logs and data points due to familiarity with past cases.	*"We usually go with what worked last time; there's no time to rethink everything when a pump's failing."* *"Sometimes we skip the logbook. If the machine looks okay and we've seen it before, we trust our eyes."*	Illustrates availability and overconfidence bias. Routine decision contexts desensitize workers to uncertainty. Lack of deliberation increases error likelihood. Bias is normalized under operational pressure.
B. Institutionalized Silence and Communication Breakdown	Withholding of concerns during safety meetings, especially by junior and expatriate workers. Passive compliance with instructions despite confusion or safety doubts.	*"Even if I report a small issue, it's usually ignored. So now, I just do my job and stay quiet."* *"In our culture, you don't question a senior unless asked. We wait for instructions."*	Defensive silence becomes embedded due to repeated negative reinforcement or cultural hierarchy. Organizational procedures nominally encourage voice but do not translate into practice. Silence serves as a psychological self-protection mechanism.
C. Behavioral Impact of Microlearning Exposure	Increased procedural recall, more confident communication, and pre-task verification. Use of training clips and safety prompts as mental scaffolds.	*"Before we start a task now, I watch the clip on pressure valve alignment—it's quick and helpful."* *"The reminders help me slow down. I caught a mistake last week because I remembered the checklist from the training video."*	Microlearning functions as both a cognitive and social enabler. It lowers the activation cost of safety voice and reinforces procedural accuracy through repeatable, non-threatening exposure. Over time, it shapes safer behavioral norms.

A. Cognitive Distortions Under Operational Pressure

Frontline personnel frequently described decision-making as instinctive and constrained by urgency. Time-sensitive operations, particularly during emergency shutdowns and high-priority repair tasks, were commonly executed with minimal deliberation. Thematic coding revealed overconfidence bias, confirmation bias, and the use of mental shortcuts.

Many participants admitted to relying on experience-based assumptions rather than systematically reviewing logs, metrics, or procedural checklists. One senior technician explained, *"When you're on the night shift and the compressor starts acting up, you don't pull up manuals—you go with what you've done before."* Another shared, *"We look for the obvious signs. If it's not leaking or vibrating, we assume it's okay."*

This approach, while efficient in routine cases, led to blind spots. Several incidents were reported where equipment faults went undetected due to familiarity bias—assuming that known behavior indicated normalcy. Observations supported this, with multiple instances of visual inspection taking precedence over sensor verification or procedural cross-checks.

Moreover, status quo bias emerged when personnel defaulted to legacy maintenance plans despite updates in digital dashboards. One supervisor noted, *"I know the new system shows alerts, but I trust the old interval schedules more. They've worked fine for years."* These findings underscore how operational pressure interacts with cognitive biases, reinforcing decision-making based on intuition rather than evidence.

B. Institutionalized Silence and Communication Breakdown

Organizational silence was found to be a pervasive phenomenon, shaped by cultural dynamics, power distance, and communication norms. While companies had official reporting protocols, actual voice behavior was suppressed by structural and interpersonal barriers.

Junior staff, particularly expatriates, expressed strong hesitation to question supervisors or escalate anomalies. A technician from South Asia shared, *"Even if I see something wrong, I hesitate. If I'm wrong, it'll be blamed on me. If I'm right, maybe it's still ignored."* Others cited prior experiences of reporting near-misses with no follow-up action, which led to disengagement.

During field observations, toolbox talks and safety briefings were found to be one-directional, with minimal employee input. In one session, a team was instructed about a procedural change, yet when probed later, most workers admitted they did not understand the change but had not asked questions. One respondent remarked, *"I didn't ask because it's better to keep quiet. Too many questions, and they think you're slow."*

Silence also stemmed from cultural deference to authority, particularly in multicultural teams where employees from collectivist backgrounds avoided conflict. A recurring theme was that speaking up was viewed as disrespectful or unnecessary unless specifically invited. As one engineer noted, *"If something is really wrong, I'll say it quietly to a friend. But I won't bring it up in the open. It's just not done here."*

C. Behavioural Impact of Microlearning Exposure

Microlearning emerged as a tangible intervention for shifting behavioral patterns—both cognitive and communicative. Among participants who had regular access to microlearning content (short training videos, digital simulations, and scenario-based checklists), the data revealed a measurable change in task behavior and voice confidence.

Workers described these tools as *"bite-sized," "accessible," and "non-judgmental."* Unlike traditional training sessions, microlearning allowed asynchronous access and could be reviewed multiple times. One technician shared, *"Before starting a complex valve job, I play the microlearning clip on my tablet. It reminds me of the steps clearly."*

Another participant commented, *"The quiz at the end helps me reflect. Even if I get something wrong, no one sees it—it's between me and the device. That takes the pressure off."*

Importantly, exposure to behavioral prompts within microlearning content—such as reminders to report anomalies or videos showing positive peer intervention—encouraged employees to speak up. One crew member reported, *"I watched a short video where someone stopped a job because they spotted a mistake. It made me realize it's okay to do that. I did the same last week."*

Observations further confirmed that crews who had access to microlearning platforms showed higher procedural adherence and more frequent peer-to-peer checks. In one case, a junior staff member challenged a skipped step during a pre-shutdown checklist and cited the training module as their reference point.

Supervisors also noted that microlearning encouraged autonomy. *"They don't wait for me to explain everything. They've seen it already. And they're more confident to raise concerns,"* one shift lead noted.

Overall, microlearning acted as both a cognitive and cultural catalyst—reducing reliance on memory, interrupting bias-prone routines, and legitimizing safety voice through repeated exposure to behavioral models.

V. DISCUSSION

The article discussed the potential of microlearning interventions to manipulate two behavioral weaknesses: cognitive bias and organizational silence among oilfield maintenance workers in the UAE. These results confirm that these behavior risks are entrenched within extremely stressful, multicultural and hierarchical situations where the imperative to act is typically prioritized over consideration and concern.

The empirical evidence showed that the members of the front line staffing were forced to make decisions based on intuitive decision-making models, when they felt time pressure, resulting in the overconfidence effect, familiarity effect, and selective attention to past experiences. These biases correspond with the cognitive biases of the Behavioral Decision Theory (Kahneman and Tversky, 1979), especially regarding uncertainty. Since the respondents themselves confirmed that they were not using logbooks or consulting diagnostic tools, the findings resonated with the report by Kerins (2021) that time pressure tends to be the foundation of shortcuts in the mind of industrial safety users. At the same time, it was also observed that organizational silence particularly between junior and expatriate employees was a proven impediment to upward communication. Although it was formally reported, some participants felt that it was risky, meaningless, and disrespectful to their culture to elevate their voices. It justifies the typology of defensive silence proposed by Aruoren and Isiaka (2023).

Sulphey (2020) confirms that silence may be, in fact, a tradition and not a threat. These observations can be gathered into the paper and recorded: the interplay of silence and prejudice, where the effect of incomplete information and distorted perception reinforces itself: incomplete information and distorted perception feed each other in real time.

Microlearning was defined as an effective behavioral intervention that can promote the quality of choices and climate in communication. The employees that had gone through the task-related interaction modules stated that it helped them have a better recall of the procedure, reflection of the situation, and speaking up. It supports the typology of defensive silence as put forward by Aruoren and Isiaka (2023). Sulphey (2020) affirms that silence may indeed result from a tradition rather than a threat. The paper is able to build up these observations, recording the interplay of silence and prejudice, where the effect of incomplete information and biased perception is compounded: incomplete information and distorted perception are mutually reinforcing in real time.

Microlearning was identified as an effective behavioral intervention that can promote the quality of decisions and climate in communication. Employees who did the task-related interaction modules indicated that it enhanced their ability to recall the procedure, reflect on the situation, and speak up. These results can be related to the findings of Alias and Razak (2025), who discovered that microlearning can be used to manage cognitive load and promote reflective processing. Similarly, Newman, Donohue, and Eva (2017) demonstrated that psychological safety is positively associated with voice behavior, suggesting that structured digital learning can contribute to this safety climate by modeling open communication norms and reducing interpersonal risk. The conceptual framework presented in Figure 1 was empirically supported. It proposes that microlearning operates through three behavioral mechanisms: reduced cognitive load, enhanced psychological safety, and iterative reflection. These mechanisms translate into observable outcomes—namely, a decline in heuristic-driven errors, an increase in proactive voice behavior, and better alignment with safety procedures. Importantly, this framework bridges two domains often treated separately in the literature: cognitive psychology and organizational behavior. It suggests that learning interventions need not be limited to knowledge transfer; they can shape behavioral norms in situ. This study also contributes to the emerging literature that views training as a behavioral scaffold rather than a compliance tool. While previous research (e.g., Karlsen et al., 2023; Peres and Hendricks, 2024) has emphasized the role of microlearning in task compliance and memory retention, the current findings suggest deeper behavioral shifts are possible when training is designed to target judgment and communication flaws. However, some limitations apply. The exploratory design limits generalizability, and the study did not include longitudinal follow-up to assess the durability of behavioral change. Additionally, while observational triangulation added depth, it is possible that participants altered their behavior due to the researcher's presence (the Hawthorne effect). Future studies should test this framework quantitatively, exploring the effects of microlearning on error rates, reporting frequency, and other measurable safety indicators over time.

In sum, this study provides grounded evidence that microlearning can play a dual role in industrial settings: reducing cognitive distortions in decision-making and fostering a climate of psychological safety conducive to upward communication. When strategically deployed, microlearning becomes more than a delivery method—it is a behavioral intervention embedded in daily operational rhythms.

VI. CONCLUSION AND IMPLICATIONS

This study examined how microlearning interventions may reduce cognitive bias and organizational silence in the context of UAE oilfield maintenance operations. Drawing on qualitative data from frontline workers, supervisors, and safety advisors, the research found that two behavioral vulnerabilities—intuitive, heuristic-driven decision-making and institutionalized silence—undermine safety reliability and procedural accuracy. These vulnerabilities are often reinforced by time pressure, cultural hierarchy, and operational norms that discourage upward voice.

The findings suggest that microlearning, when implemented as part of daily workflows and designed with behavioral intent, can play a significant role in enhancing both decision quality and safety communication. Specifically, task-specific digital modules were associated with reduced reliance on overconfident judgments and increased willingness among workers to raise safety concerns. These improvements align with cognitive load theory, psychological safety principles, and prior research emphasizing the need for adaptive, modular training in dynamic environments.

Practically, this study offers several implications for oil and gas organizations:

1) *Behavioral Framing of Training:* Microlearning should be developed not just to transmit procedural content but to influence behavioral habits. This includes embedding decision prompts, voice modeling, and bias-interrupting scenarios.
2) *Integration into Safety Ecosystems*: Microlearning modules should be integrated into shift routines, pre-task briefings, and mobile systems to reinforce learning at the point of need.
3) Support for Psychological Safety: Training tools should highlight and normalize voice behaviors—especially in multicultural teams—by reducing the perceived risk of speaking up.

From a theoretical standpoint, the study contributes to a growing body of literature that intersects behavioral safety, digital learning design, and organizational psychology. It demonstrates that microlearning, when thoughtfully designed, has the potential to function not merely as a learning format but as a behavioral intervention strategy.

Future research should expand on these findings by exploring the longitudinal impact of microlearning on incident rates, error reduction, and sustained safety climate improvement. Quantitative studies incorporating behavioral indicators and pre/post evaluations would provide deeper insights into the efficacy and scalability of such interventions across industrial contexts.

In conclusion, this study positions microlearning as a viable, low-barrier solution to high-impact behavioral challenges in industrial safety—providing a pathway for organizations to foster smarter decisions and safer communication on the frontline.

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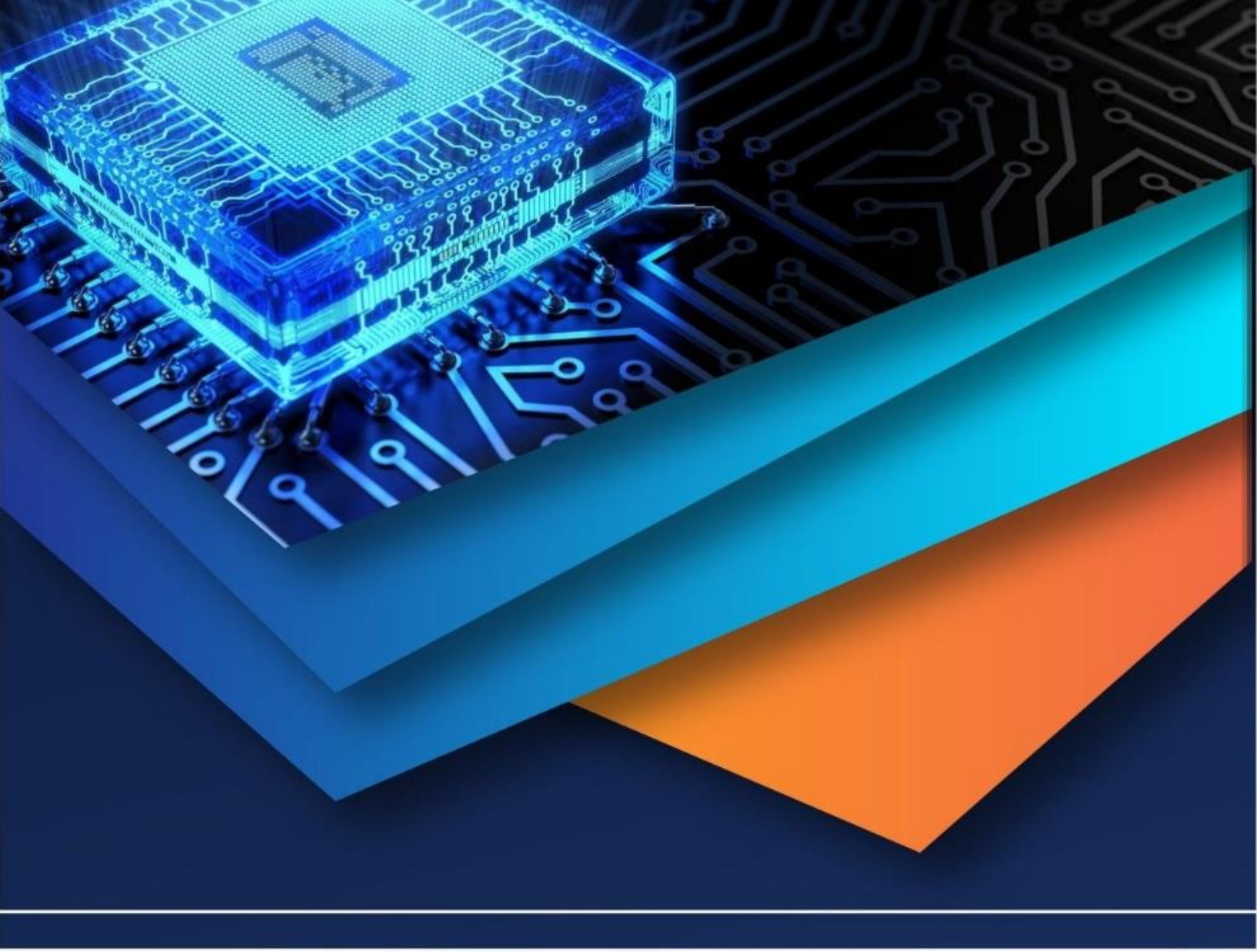

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