# The Determinants of Nursing Technological Readiness: A Systematic Review

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**Abstract:** *This systematic review synthesises evidence on the determinants of nursing technological readiness across educational and clinical settings. Technological readiness was operationalised as the combined capability, willingness, and contextual enablement of nursing students and practising nurses to understand, evaluate, accept, and use digital health technologies, nursing informatics systems, and artificial intelligence safely in education or care. A PRISMA-informed search and citation-verification process applied to the 2015-2025 eligibility window identified 59 eligible primary empirical studies, published between 2018 and 2025. Evidence was appraised using the Mixed Methods Appraisal Tool and design-specific Joanna Briggs Institute criteria, extracted into a structured ledger, and coded across fifteen recurrent determinants. Knowledge/Literacy, Attitudes, Education/Training, Prior Exposure, and Digital Skills received the greatest research attention, whereas Innovation Orientation, Social Influence, and Ease of Use were examined less frequently. Across the evidence base, higher Knowledge/Literacy, Digital Skills, Self-Efficacy, Perceived Usefulness, constructive Attitudes, and relevant Prior Exposure were generally associated with greater Technological Readiness. Anxiety/Resistance and unresolved Ethics/Privacy concerns constrained readiness, whereas Organisational Support and Infrastructure/Resources shaped whether individual capability translated into routine adoption. The synthesis integrates the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology, the Technology Readiness Index, and the Nonadoption, Abandonment, Scale-up, Spread, and Sustainability framework. It distinguishes student readiness from workforce readiness, separates frequency of examination from consistency of reported influence, and identifies priorities for longitudinal, multilevel, intervention, and measurement research.*

**Keywords:** nursing; technological readiness; artificial intelligence; digital health literacy; nursing informatics; technology adoption; systematic review.

## 1. Introduction

Digital technologies now mediate documentation, medication management, clinical decision support, remote care, patient education, surveillance, and professional learning. Nursing practice is therefore shaped not only by whether technologies are available, but also by whether students and practising nurses possess the competence, confidence, ethical judgement, and organisational support required to use them safely. Technological Readiness is often reduced to a favourable attitude or intention to use

a single system, although the nursing evidence encompasses artificial-intelligence literacy, digital health literacy, informatics competence, system confidence, behavioural intention, and sustained digital engagement. This review adopts a multidimensional definition: Technological Readiness is the state in which a nurse or nursing student has sufficient Knowledge/Literacy and Digital Skills; appraises Perceived Usefulness and Ease of Use realistically; demonstrates Self-Efficacy and constructive Attitudes; manages Anxiety/Resistance and Ethics/Privacy obligations; and is supported by Social Influence, Organisational Support, and Infrastructure/Resources. Age/Career, Education/Training, and Prior Exposure are treated as antecedent conditions, while Innovation Orientation is treated as an affective modifier rather than readiness itself. This distinction matters because confidence without competence may create safety risks, whereas competence without organisational support, interoperable systems, or protected learning time may not lead to adoption.

The literature is substantial but fragmented across populations and technology types. Studies of nursing students largely examine educational exposure, AI-related Attitudes, anxiety, and behavioural intention, whereas studies of practising nurses more often investigate digital health literacy, informatics competence, workflow compatibility, leadership, system usability, and governance. Findings cannot be transferred automatically between these groups because students usually encounter technology through curricula and simulation, while employed nurses must integrate it into accountable clinical practice. Four research questions guided the review: (1) which determinants of nursing Technological Readiness were examined in primary studies published from 2015 through 2025; (2) how can those determinants be organised within an integrated individual–technology–organisation framework; (3) which determinants were most frequently studied, and which showed the most consistent enabling or inhibiting relationships; and (4) which theoretical, methodological, measurement, population, contextual, and geographical gaps remain? Accordingly, the review aims to identify, classify, compare, and synthesise determinants while preserving differences between educational and workforce settings. The Technology Acceptance Model explains Perceived Usefulness and Ease of Use as proximal acceptance beliefs (Davis, 1989). The Unified Theory of Acceptance and Use of Technology extends this account through Social Influence and facilitating conditions (Venkatesh et al., 2003). The Technology Readiness Index addresses optimism, innovativeness, discomfort, and insecurity (Parasuraman, 2000). The NASSS framework clarifies why readiness may fail when technologies, adopters, organisations, and wider systems are misaligned (Greenhalgh et al., 2017).

## 2. Methodology

A PRISMA-informed systematic review was undertaken to identify, appraise, and synthesise primary empirical evidence concerning determinants of nursing Technological Readiness. The reporting sequence followed PRISMA 2020 principles for identification, screening, eligibility, and inclusion (Page et al., 2021). The review is described as PRISMA-informed rather than fully PRISMA-compliant because complete, reproducible export logs were unavailable for all searched sources. The eligibility window comprised the eleven complete calendar years from 1 January 2015 through 31 December 2025. English-language, peer-reviewed primary empirical journal articles were eligible when they examined nursing students, registered nurses, nurse practitioners, nurse leaders, educators, or a clearly separable nursing sample and directly assessed at least one determinant of Technological Readiness. Eligible outcomes included AI readiness, digital health literacy, eHealth literacy, nursing-informatics competence, technology-acceptance intention, readiness to support patient-facing technology, digital client work, or digital dedication. Reviews, conceptual articles, editorials, protocols, and non-empirical guidance were used only for conceptual framing or citation tracing and

were not included in the empirical synthesis. Studies were excluded when nursing data were inseparable, technology was mentioned without an analysed readiness outcome, full text or essential metadata could not be verified, or the report fell outside the date, language, and publication-type limits.

Searches and bibliographic verification were completed on 25 July 2026 using MEDLINE via PubMed, Europe PMC, and OpenAlex, supplemented by backward and forward citation tracing and direct publisher and DOI verification. Search concepts combined nurse*, nursing student*, registered nurse*, nurse leader*, or nursing faculty with technolog* read*, digital read*, digital competenc*, digital health literacy, eHealth literacy, nursing informatics, artificial intelligence, AI literacy, accept*, adoption, intention to use, self-efficacy, anxiety, barrier*, facilitator*, determinant*, and factor*. Search syntax was adapted to each public index. The candidate ledger was initially seeded from a recent systematic review of attitudes, literacy, readiness, and adoption intentions in nursing (El Arab et al., 2025). It was then supplemented by a recent evidence map of nurses' digital health literacy (Ye et al., 2026). Targeted title, DOI, and citation searches were subsequently used to update the ledger. This approach supported recovery of primary studies while preventing secondary sources from being counted as empirical evidence. Across all sources, 254 records were identified, 48 duplicates were removed, and 206 unique records underwent title and abstract screening. After 107 exclusions, 99 reports were assessed in full. Forty full-text reports were excluded for the reasons shown in Figure 1, leaving 59 distinct eligible empirical studies. Bibliographic fields were reconciled against DOI, PubMed, publisher, or official repository records. The final set comprised 48 cross-sectional studies, eight qualitative studies, one quasi-experimental study, one longitudinal study, and one multicountry e-Delphi study.

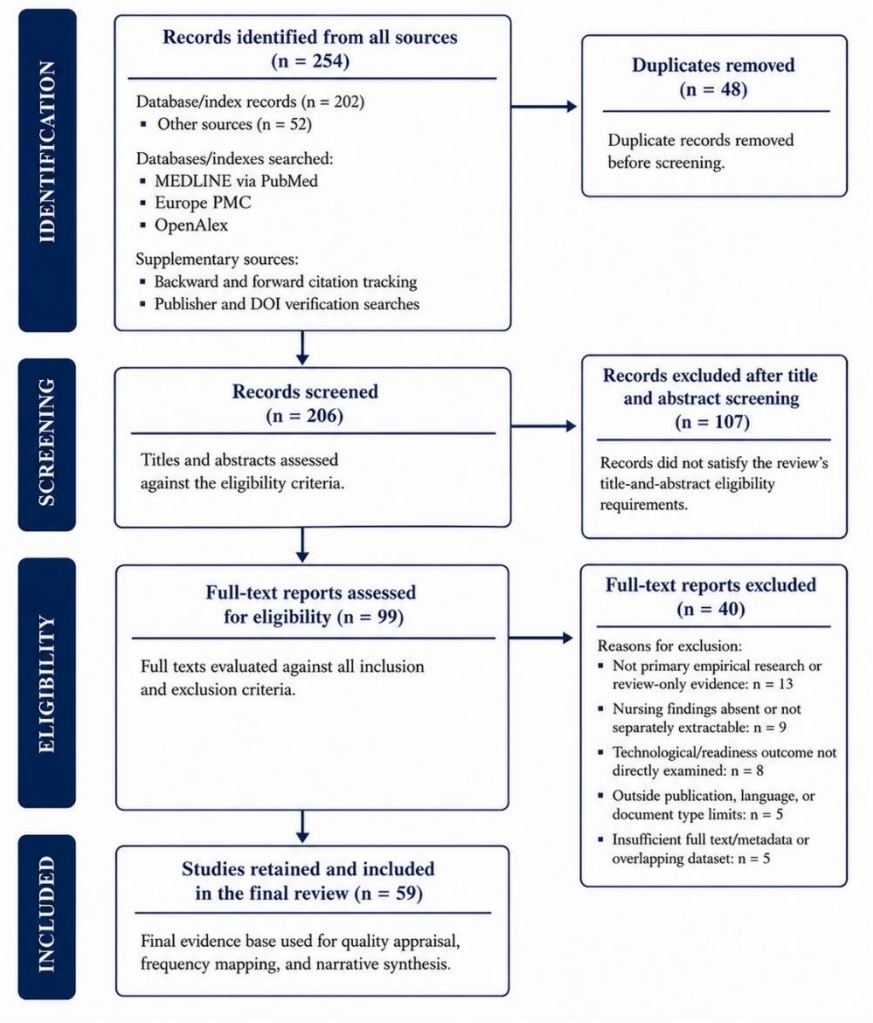


Figure 1: The Systematic Review Process

Figure 1 presents the reconciled study-selection pathway. Of 254 records identified, 48 duplicates were removed, leaving 206 records for title and abstract screening. Excluding 107 records at that stage yielded 99 full-text reports for eligibility assessment. Forty reports were excluded because they were not primary empirical evidence, did not provide extractable nursing findings, did not directly examine Technological Readiness, fell outside the publication limits, or lacked sufficient full text or independently verifiable metadata. The remaining 59 studies formed the evidence base for quality appraisal, data extraction, determinant coding, frequency mapping, and narrative synthesis. The flow counts were reconciled at each stage: 254 − 48 = 206; 206 − 107 = 99; and 99 − 40 = 59, with the five full-text exclusion categories summing to 40.

Methodological quality was evaluated using the Mixed Methods Appraisal Tool, version 2018, as the common appraisal framework, supplemented by design-specific Joanna Briggs Institute criteria for analytical cross-sectional, qualitative, quasi-experimental, and longitudinal evidence (Hong et al., 2018). Appraisal informed the interpretive weight assigned to each study rather than serving as an automatic exclusion threshold. Data extraction recorded population, setting, design, sample, technology domain, readiness construct, determinant definition, direction of association, analytical method, limitations, and bibliographic verification. Determinant labels were developed inductively

by comparing the terminology and operational measures used across the included studies. Closely equivalent concepts were consolidated, whereas conceptually distinct constructs were retained. Fifteen determinants met the recurrence and relevance threshold: Age/Career, Education/Training, Knowledge/Literacy, Digital Skills, Prior Exposure, Self-Efficacy, Perceived Usefulness, Ease of Use, Attitudes, Anxiety/Resistance, Ethics/Privacy, Innovation Orientation, Social Influence, Organisational Support, and Infrastructure/Resources. Each matrix checkmark indicates substantive measurement, testing, evaluation, or central qualitative analysis; background mentions were not coded. Frequency mapping described research attention rather than causal magnitude, and a structured narrative synthesis compared the direction and consistency of findings across populations and technology domains. Meta-analysis was not undertaken because the populations, technologies, instruments, outcomes, and designs were too heterogeneous for defensible pooling.

## 3. Conceptual and Analytical Synthesis

The synthesis first distinguishes technological capability, willingness, and enablement in nursing. Knowledge/Literacy and Digital Skills describe what a person understands and can do; Self-Efficacy, Attitudes, Anxiety/Resistance, and Innovation Orientation describe confidence and affective orientation; Perceived Usefulness and Ease of Use describe technology appraisal; and Organisational Support and Infrastructure/Resources shape whether capability and willingness can become routine practice. Technological Readiness is therefore neither a single personality trait nor merely a score on an acceptance scale. The evidence includes students whose readiness is shaped by curricula and supervised exposure, as well as practising nurses whose readiness is tested by workload, interoperability, accountability, privacy, and patient-safety obligations. Keeping these populations analytically distinct prevents educational enthusiasm from being interpreted as evidence of clinical implementation readiness.

The synthesis then integrates the fifteen determinants into four connected domains. The antecedent domain comprises Age/Career, Education/Training, and Prior Exposure. The capability domain comprises Knowledge/Literacy, Digital Skills, and Self-Efficacy. The acceptance and ethical domain comprises Perceived Usefulness, Ease of Use, Attitudes, Anxiety/Resistance, Ethics/Privacy, and Innovation Orientation. The contextual domain comprises Social Influence, Organisational Support, and Infrastructure/Resources. This organisation extends technology-acceptance theory by retaining competence and ethics as independent requirements. It also extends individual readiness models by treating the work system as a core component rather than a peripheral influence. For example, longitudinal EHR evidence indicates that user experience changes after implementation (Kayser et al., 2022). Qualitative AI evidence shows that favourable Attitudes can coexist with concerns about accountability, privacy, human judgement, and system reliability (Ramadan et al., 2024).

The synthesis also separates frequency of examination from evidence of influence. The most frequently coded determinants were Knowledge/Literacy in 44 studies (74.6%), Attitudes in 36 (61.0%), and Education/Training and Prior Exposure in 34 each (57.6%). Digital Skills appeared in 26 studies (44.1%); Age/Career, Perceived Usefulness, and Infrastructure/Resources in 23 each (39.0%); Organisational Support in 22 (37.3%); and Self-Efficacy and Anxiety/Resistance in 21 each (35.6%). Less frequently examined determinants were Ease of Use and Ethics/Privacy in 15 studies each (25.4%), Social Influence in 9 (15.3%), and Innovation Orientation in 3 (5.1%). These frequencies show where research attention was concentrated; they do not establish that frequently studied determinants have larger causal effects. Most evidence was cross-sectional and self-reported, so directionality remains uncertain. Nevertheless, convergence across technology domains supports

a layered interpretation: competence and constructive acceptance are important, but adoption remains fragile when anxiety, ethical uncertainty, weak implementation support, or unsuitable systems persist. Table 1 presents the study-level coding on which these frequencies are based.

Table 1: Study-Level Determinant Coding Matrix

| No. | Author(s) and Year | Age/Career | Education/Training | Knowledge/Literacy | Digital Skills | Prior Exposure | Self-Efficacy | Perceived Usefulness | Ease of Use | Attitudes | Anxiety/Resistance | Ethics/Privacy | Innovation Orientation | Social Influence | Organisational Support | Infrastructure/Resources | Technological Readiness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Cho et al. (2018) | | | ✓ | ✓ | | ✓ | | | | | | | ✓ | | | ✓ |
| 2 | Tiase et al. (2018) | | | ✓ | ✓ | | ✓ | | | ✓ | | | | | | | ✓ |
| 3 | Shiferaw and Mehari (2019) | ✓ | ✓ | ✓ | | ✓ | | | | | | | | | | ✓ | ✓ |
| 4 | Do et al. (2020) | ✓ | ✓ | ✓ | | ✓ | | | | | | | | | | | ✓ |
| 5 | Gartrell et al. (2020) | | | ✓ | ✓ | | ✓ | | | | | | | ✓ | | | ✓ |
| 6 | Kritsotakis et al. (2021) | | | ✓ | | | | | | | | | | ✓ | ✓ | ✓ | ✓ |
| 7 | Kayser et al. (2022) | | ✓ | ✓ | ✓ | ✓ | | | ✓ | | | | | | ✓ | ✓ | ✓ |
| 8 | Kwak et al. (2022a) | | | | | | ✓ | | | ✓ | ✓ | ✓ | | | | | ✓ |
| 9 | Kwak et al. (2022b) | | | | | ✓ | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ |
| 10 | Tesfa et al. (2022) | ✓ | ✓ | ✓ | | ✓ | | | | | | | | | | ✓ | ✓ |
| 11 | Yoğurtcu and Ozturk (2022) | | | ✓ | ✓ | | ✓ | | | | | | | ✓ | | | ✓ |
| 12 | Efthymiou et al. (2023) | | ✓ | ✓ | ✓ | | | | | | | ✓ | | | ✓ | | ✓ |
| 13 | Hussein Mohamed et al. (2023) | | ✓ | ✓ | ✓ | | ✓ | | | ✓ | | | | | | | ✓ |
| 14 | Labrague et al. (2023) | | | | | ✓ | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | ✓ |
| 15 | Lukić et al. (2023) | | ✓ | ✓ | | ✓ | | | | ✓ | ✓ | | | | | | ✓ |
| 16 | Palshof et al. (2023) | | | ✓ | ✓ | ✓ | | | | | | | | | | | ✓ |
| 17 | Sabra et al. (2023) | | | ✓ | | ✓ | | ✓ | | ✓ | | | | | | ✓ | ✓ |
| 18 | Shudayfat et al. (2023) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | ✓ | ✓ |
| 19 | Tanaka et al. (2023) | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | ✓ |
| 20 | Yuan et al. (2023) | | ✓ | ✓ | ✓ | | | | | ✓ | | | | | | | ✓ |
| 21 | Abou Hashish and Alnajjar (2024) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | | | | | | | ✓ |
| 22 | Ahmed et al. (2024) | | | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | | | | ✓ |
| 23 | Al Omari et al. (2024) | ✓ | ✓ | ✓ | | ✓ | | ✓ | | ✓ | | | | | | | ✓ |
| 24 | Alruwaili et al. (2024) | ✓ | ✓ | ✓ | | ✓ | | | | ✓ | | | | | | | ✓ |
| 25 | Atalla et al. (2024) | | | | | | | ✓ | | ✓ | | ✓ | ✓ | | | | ✓ |
| 26 | Cho and Seo (2024) | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ |
| 27 | Demir-Kaymak et al. (2024) | ✓ | ✓ | | | ✓ | ✓ | | | | ✓ | | | | | | ✓ |
| 28 | Kainiemi et al. (2024) | ✓ | | | ✓ | ✓ | ✓ | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 29 | Ramadan et al. (2024) | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 30 | Rony et al. (2024a) | | | ✓ | | | | | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |

| No. | Author(s) and Year | Age/Career | Education/Training | Knowledge/Literacy | Digital Skills | Prior Exposure | Self-Efficacy | Perceived Usefulness | Ease of Use | Attitudes | Anxiety/Resistance | Ethics/Privacy | Innovation Orientation | Social Influence | Organisational Support | Infrastructure/Resources | Technological Readiness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | Rony et al. (2024b) | | | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | | | ✓ | ✓ | ✓ |
| 32 | Rony et al. (2024c) | | | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 33 | Summers et al. (2024) | | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ |
| 34 | Tuncer and Tuncer (2024) | ✓ | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ |
| 35 | Yalcinkaya et al. (2024) | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | | | | | ✓ |
| 36 | Zhao et al. (2024) | | | ✓ | ✓ | | ✓ | | | | ✓ | | | | | | ✓ |
| 37 | Zuo et al. (2024) | | | ✓ | | | ✓ | | | | ✓ | | | | | | ✓ |
| 38 | Ünal and Avcı (2024) | ✓ | | | | ✓ | ✓ | | | | ✓ | | | | | | ✓ |
| 39 | Akca Sumengen et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | | | | | | ✓ |
| 40 | Alenazi and Alhalal (2025) | | | | | ✓ | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ |
| 41 | Almagharbeh et al. (2025) | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 42 | Al-Qudah et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | ✓ | ✓ | ✓ |
| 43 | Alruwaili et al. (2025) | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 44 | Chen et al. (2025a) | | ✓ | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 45 | Chen et al. (2025b) | | | ✓ | | | | ✓ | | ✓ | | ✓ | | | | | ✓ |
| 46 | Comparcini et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | | | | ✓ | | ✓ |
| 47 | El-Sayed et al. (2025) | | ✓ | ✓ | ✓ | | ✓ | | | | | | ✓ | | | | ✓ |
| 48 | Hamad et al. (2025) | | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ |
| 49 | Jalal et al. (2025) | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | | | ✓ | ✓ | ✓ |
| 50 | Kahraman et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | ✓ |
| 51 | Kotp et al. (2025) | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | | | | ✓ | ✓ | ✓ |
| 52 | Mariano et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | | | | ✓ | | ✓ |
| 53 | Oweidat et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | | ✓ | ✓ | ✓ |
| 54 | Ramadan et al. (2025) | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ |
| 55 | Salama et al. (2025) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | ✓ | | | | | ✓ |
| 56 | Sarman and Tuncay (2025) | ✓ | ✓ | | | ✓ | | | | ✓ | ✓ | | | | | | ✓ |
| 57 | Tsiara et al. (2025) | ✓ | | | | | | | | ✓ | ✓ | | ✓ | | | | ✓ |
| 58 | Virtanen et al. (2025) | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ |
| 59 | Şimşek et al. (2025) | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | | | | | | ✓ |

Table 1 shows that the evidence base is concentrated on individual capability and acceptance. Knowledge/Literacy and Attitudes appear across both student and workforce studies, while Education/Training and Prior Exposure connect formal learning with familiarity gained through use. Digital Skills and Self-Efficacy are prominent in informatics and digital-health studies, whereas Perceived Usefulness and Ease of Use are more visible in acceptance-model studies. Anxiety/Resistance and Ethics/Privacy are especially salient in AI research. Organisational Support and Infrastructure/Resources are particularly prominent in qualitative and workforce studies, indicating that readiness is partly produced by the environment in which nurses are expected to act.

Social Influence and Innovation Orientation remain comparatively underexamined. Because each checkmark denotes substantive examination rather than direction, quality, or effect size, the matrix should be interpreted as a map of scholarly coverage rather than a hierarchy of influence.

## 4. Discussion

Knowledge/Literacy, Digital Skills, and Self-Efficacy form the central capability cluster. Digital health literacy studies consistently indicate that nurses require more than basic device operation: they must locate, evaluate, interpret, and apply digital information, communicate it to patients, and recognise unreliable sources. Among hospital nurses, eHealth literacy was associated with health-promoting behaviours (Cho et al., 2018). A separate nursing study linked eHealth literacy with performance quality (Gartrell et al., 2020). Health-education experience and confidence in online health information were also associated with eHealth literacy (Tanaka et al., 2023). Together, these findings suggest that literacy develops through purposeful practice rather than passive access. In a resource-limited setting, internet use and educational factors were associated with eHealth literacy among health-care professionals (Shiferaw & Mehari, 2019). During the COVID-19 lockdown, eHealth literacy among health-care workers was examined alongside health literacy and preventive practices (Do et al., 2020). Another resource-limited study identified demographic, educational, and internet-related factors associated with eHealth literacy (Tesfa et al., 2022). Hospital-based evidence from Jordan likewise documented variation in nurses' digital health literacy (Shudayfat et al., 2023). Mixed samples and self-report measures nevertheless limit the precision of cross-study interpretation. Nursing-informatics evidence extends this capability domain: professional experience, system-use frequency, and informatics training are associated with stronger competence, while competence is related to clinical decision-making (Al-Qudah et al., 2025). University nursing students demonstrated measurable but uneven digital-transformation, health-literacy, and AI competencies (Abou Hashish & Alnajjar, 2024). Perioperative nurses also showed identifiable variation in AI literacy (Kahraman et al., 2025). Nursing-student AI literacy was examined alongside attitudes toward AI (Akca Sumengen et al., 2025). AI literacy and an innovation mindset were positively related to career and talent self-efficacy among nursing students (El-Sayed et al., 2025). The educational implication is that factual AI awareness is insufficient without data appraisal, workflow application, uncertainty recognition, and supervised performance.

Perceived Usefulness, Ease of Use, and Attitudes constitute the proximal acceptance cluster. Performance expectancy and related UTAUT constructs predicted nursing students' intention to use AI-based healthcare technology (Kwak et al., 2022b). Positive attitudes and perceived utilisation were associated with intention to adopt AI in nursing practice (Labrague et al., 2023). Acceptance attitude and anxiety mediated the relationship between AI perception and intention to use it (Cho & Seo, 2024). A later UTAUT-based study similarly identified determinants of AI usage intention among nursing students (Alenazi & Alhalal, 2025). Across 10 Arab countries, knowledge, attitudes, perception, and demographic factors were associated with nursing students' intention to use AI (Al Omari et al., 2024). A single-country study likewise examined nursing students' attitudes and readiness for AI (Yalcinkaya et al., 2024). Perceived usability was also related to nursing students' attitudes and perceptions of AI in healthcare (Hamad et al., 2025). Substantial variation by educational exposure and context nevertheless remains. Nurses reported potential clinical value for AI in healthcare delivery (Sabra et al., 2023). Perceptions of ChatGPT use varied according to nurses' general attitudes toward AI (Tuncer & Tuncer, 2024). Nurses also perceived AI-driven monitoring as potentially useful for infection-prevention compliance (Jalal et al., 2025). Nurse leaders associated AI readiness with the perceived benefits of predictive analytics (Kotp et al., 2025). Across these

applications, Perceived Usefulness remains conditional on workflow fit and reliable outputs. Jordanian nurses described AI as an assistive resource while preserving the importance of professional judgement (Almagharbeh et al., 2025). Neonatal nurses likewise emphasised human oversight when using generative AI in high-risk decision-making (Alruwaili et al., 2025). Favourable Attitudes should therefore not be equated with uncritical acceptance; mature readiness combines openness with calibrated scepticism.

Anxiety/Resistance and Ethics/Privacy explain why cognitive capability does not automatically produce readiness. AI ethics awareness, attitude, anxiety, and self-efficacy jointly influenced nursing students' behavioural intentions (Kwak et al., 2022a). Neonatal nurses' AI anxiety was assessed in relation to readiness (Ünal & Avcı, 2024). Greater readiness for medical AI was associated with lower AI anxiety among nursing and midwifery students (Demir-Kaymak et al., 2024). Nursing students' attitudes toward AI were also examined alongside their anxiety levels (Sarman & Tuncay, 2025). First-year nursing students reported mixed attitudes and concerns about AI (Lukić et al., 2023). Students also identified academic-integrity risks, professional displacement, and possible loss of human connection in relation to generative AI (Summers et al., 2024). Nurses expressed concern that AI could threaten aspects of the nursing role (Ahmed et al., 2024). Privacy and ethical concerns were prominent barriers to AI adoption (Rony et al., 2024a). Nurse practitioners' perceptions and attitudes further reflected uncertainty about healthcare adoption (Rony et al., 2024b). Nursing professionals also raised concerns about bias, accountability, and possible dehumanisation in future care (Rony et al., 2024c). Ethical awareness may also strengthen the relationship between AI perception and innovative work behaviour, indicating that ethics education can enable rather than merely constrain adoption (Atalla et al., 2024). Technology trust and perceived value further mediate the relationship between eHealth literacy and AI Attitudes (Chen et al., 2025b). The appropriate response is therefore not to suppress anxiety, but to distinguish remediable unfamiliarity from justified concern and to provide transparent governance, data protection, escalation procedures, and clear human accountability.

Age/Career, Education/Training, and Prior Exposure modify readiness but do not support a simple 'digital native' explanation. An awareness-and-attitudes study found variation according to demographic and professional characteristics (Alruwaili et al., 2024). A Saudi study likewise reported differences in AI knowledge, attitudes, and practices across nurses, faculty, and students (Mariano et al., 2025). Among nurses, AI knowledge, attitudes, practices, and perceived barriers were associated with intent to stay (Oweidat et al., 2025). These results indicate that age, role, experience, and prior AI use do not operate uniformly across contexts. Education can produce meaningful change: a quasi-experimental programme improved nurses' AI knowledge and Attitudes, supporting structured and repeated learning rather than one-off awareness sessions (Hussein Mohamed et al., 2023). Longitudinal EHR evidence indicates that system experience and literacy change after implementation, although the short follow-up prevents conclusions about sustained competence (Kayser et al., 2022). Among Finnish nurses, later career stage was associated with lower digital dedication, but continuing EHR training attenuated that disparity, suggesting that career effects are modifiable rather than fixed (Virtanen et al., 2025). Digital client work was also associated with dedication, collegial support, work setting, and information-security skills (Kainiemi et al., 2024). Training should therefore be role-specific, practice-based, repeated after system updates, and adapted to different career stages without stereotyping older nurses as incapable or younger nurses as automatically competent.

Social Influence, Organisational Support, and Infrastructure/Resources shape whether individual readiness can be enacted. A supportive nursing practice environment and collegial relationships are associated with stronger digital health literacy (Kritsotakis et al., 2021). EHR implementation studies

show that usability, access, and organisational learning conditions shape experience over time (Kayser et al., 2022). Chinese nursing professionals identified organisational and implementation conditions as central to AI-driven nursing science (Chen et al., 2025a). Registered nurses described leadership, training, technical assistance, policy clarity, infrastructure, workload, connectivity, and governance as facilitators or barriers to adoption (Ramadan et al., 2024). Jordanian nurses likewise emphasised organisational support and resource adequacy when discussing AI in practice (Almagharbeh et al., 2025). Nurse leaders report greater readiness when predictive analytics are perceived as useful and implementation conditions are credible (Kotp et al., 2025). The e-Delphi curriculum for health and eHealth literacy illustrates the value of an explicit organisational learning architecture, although its effectiveness requires empirical testing (Efthymiou et al., 2023). These findings align with NASSS: adoption problems cannot be resolved solely by changing users when the technology, workflow, organisation, or wider policy system remains unstable.

The integrated evidence supports a conditional pathway rather than a universal readiness score. Education/Training and Prior Exposure may increase Knowledge/Literacy and Digital Skills; capability may strengthen Self-Efficacy and improve appraisal of Perceived Usefulness and Ease of Use; and these factors may support constructive Attitudes and intention. Anxiety/Resistance and Ethics/Privacy concerns can interrupt this pathway, while Social Influence, Organisational Support, and Infrastructure/Resources shape whether intention becomes safe and sustained use. Personality traits may influence nursing students' attitudes toward AI, but this line of evidence remains limited (Tsiara et al., 2025). An innovation mindset was positively associated with career and talent self-efficacy among nursing students (El-Sayed et al., 2025). Innovation Orientation should therefore not substitute for competence or governance. Digital health literacy mediated the relationship between information anxiety and nursing core competence (Zhao et al., 2024). Separate path-analysis evidence linked perceived stress with anxiety among infectious-disease nurses (Zuo et al., 2024). Together, these findings illustrate that readiness-related constructs can operate as both outcomes and mechanisms. eHealth literacy was associated with palliative-care knowledge, attitudes, and practice among nurses (Yuan et al., 2023). It was also associated with health-promoting behaviours among Turkish hospital nurses (Yoğurtcu & Ozturk, 2022). Among neonatal nurses, eHealth literacy was linked with technology-mediated clinical practice patterns (Ramadan et al., 2025). The evidence therefore favours multilevel models that treat Technological Readiness as dynamic, technology-specific, and context-dependent.

## 5. Research Gaps and Future Research Directions

The evidence base is substantial but methodologically constrained, and the review itself also has limitations. Cross-sectional self-report designs account for 48 of the 59 studies, restricting causal and temporal inference. Measures vary across AI literacy, eHealth literacy, informatics competence, general Attitudes, readiness, anxiety, behavioural intention, and digital dedication, and many instruments were developed for general populations or single technologies. Objective performance, observed use, error recognition, safe escalation, and sustained adoption are rarely measured. Student samples are geographically concentrated and often drawn from single institutions, while workforce studies frequently represent one hospital, specialty, or country. Population categories are sometimes combined, obscuring differences among students, educators, nurse leaders, and bedside nurses. Innovation Orientation, Social Influence, and Ease of Use receive comparatively little direct investigation, and few studies test interactions among individual capability, ethical confidence, workflow, leadership, and infrastructure. The review was limited to English-language publications, and its PRISMA classification is constrained by the absence of complete export logs for all searched

sources; public-index searching and citation-seeded retrieval were documented transparently, but full replication across subscription databases was not possible.

Future research should prioritise longitudinal cohorts, repeated-measures implementation studies, pragmatic trials, and natural experiments that follow readiness before training, through implementation, and during routine use. Core outcome sets should distinguish Knowledge/Literacy, Digital Skills, Self-Efficacy, Attitudes, intention, actual use, safe performance, and sustained adoption. Instruments should be nursing-specific, technology-sensitive, psychometrically validated across languages, and capable of measuring Ethics/Privacy reasoning and appropriate non-use. Multilevel models should test whether Organisational Support and Infrastructure/Resources mediate or moderate the effects of Education/Training, Prior Exposure, and Self-Efficacy. Comparative work should include underrepresented regions, rural and resource-constrained settings, older and later-career nurses, nursing assistants, community and long-term-care nurses, educators, managers, and students at different programme stages. Intervention studies should report content, dose, facilitator competence, fidelity, workload protection, costs, equity, and unintended consequences. Research should also compare readiness across technologies rather than assume that competence with EHRs transfers automatically to AI, robotics, remote monitoring, or generative systems. Finally, qualitative and participatory designs should involve nurses in system design and governance so that readiness initiatives improve technologies and organisations as well as individuals.

## 6. Conclusion

This systematic review integrated 59 primary empirical studies identified within the 2015–2025 eligibility window and published between 2018 and 2025, organising fifteen determinants of nursing Technological Readiness within a multilevel framework. The most consistent enabling associations involved Knowledge/Literacy, Digital Skills, Self-Efficacy, Perceived Usefulness, constructive Attitudes, Education/Training, and relevant Prior Exposure. Anxiety/Resistance and unresolved Ethics/Privacy concerns generally constrained readiness. Social Influence, Organisational Support, and Infrastructure/Resources shaped whether personal capability and intention could be translated into safe practice. Age/Career differences were reported in several studies but were neither uniform nor immutable; targeted continuing training and supportive systems may reduce disparities. Innovation Orientation was potentially enabling but underexamined. The evidence also indicates that student readiness and workforce readiness are related but not interchangeable. The central implication is that nursing Technological Readiness should be developed as a multilevel system property rather than treated as an individual deficit. Curricula and professional development should combine conceptual knowledge, hands-on practice, critical appraisal, data ethics, privacy, uncertainty management, and role-specific workflow application. Organisations should provide protected learning time, responsive technical support, interoperable and usable systems, clear accountability, and nurse participation in design and implementation. Leadership should monitor readiness over time and distinguish enthusiasm from demonstrated safe competence. For scholarship, the priority is longitudinal, multilevel, comparative, and intervention-focused evidence using nursing-specific measures and observed outcomes. By integrating capability, acceptance, ethics, and enabling context, this review provides a structured basis for educational planning, workforce development, implementation governance, and future empirical models of technology-enabled nursing.

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