

Mapping Digital Qur'an Studies: A Scoping Review of Evidence and Gaps

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ABSTRACT: *Digital Qur'an studies now include Qur'anic natural language processing, semantic search, question answering, mobile recitation and memorisation tools, user-experience research, and digital manuscript preservation. This scoping review maps the available evidence and identifies methodological and governance gaps across this heterogeneous field. Following PRISMA-ScR and JBI-informed scoping review logic, traceable scholarly records were screened from open publisher records, ACL Anthology, DOI-resolvable journal pages, and the five cornerstone references supplied for revision. The evidence clusters into four domains: computational Qur'anic resources, learning applications, digital philology, and user experience or religious-content governance. Computational studies show the strongest signs of maturity because they provide reusable corpora, annotated resources, semantic-search models, and shared question-answering benchmarks. In contrast, mobile learning and memorisation studies show practical innovation but rely mainly on prototype testing, expert review, user acceptance, and small-scale usability designs. Digital manuscript studies extend the field from application development to preservation, public access, and philological infrastructure. The review concludes that digital Qur'an studies should be treated as an emerging evidence landscape rather than a mature intervention field. Future work should prioritise validated learning outcomes, transparent source attribution, scholar-supervised AI governance, multilingual accessibility, privacy protection, and interoperability among corpora, applications, and manuscript repositories.*

Kajian Al-Qur'an digital kini mencakup pemrosesan bahasa alami Al-Qur'an, pencarian semantik, sistem tanya-jawab, aplikasi tilawah dan hafalan, penelitian pengalaman pengguna, serta preservasi manuskrip digital. Scoping review ini memetakan lanskap bukti dan mengidentifikasi kesenjangan metodologis serta tata kelola pada bidang yang heterogen tersebut. Dengan mengikuti logika PRISMA-ScR dan JBI, artikel menyeleksi rekam ilmiah yang dapat ditelusuri melalui sumber penerbit terbuka, ACL Anthology, laman jurnal berbasis DOI, dan lima rujukan utama yang dilampirkan. Bukti terkonsentrasi pada empat ranah: sumber daya komputasional Al-Qur'an, aplikasi pembelajaran, filologi digital, dan pengalaman pengguna

atau otoritas konten keagamaan. Literatur komputasional paling matang karena menghasilkan korpus, anotasi, model pencarian semantik, dan tolok ukur tanya-jawab. Sebaliknya, studi aplikasi pembelajaran dan hafalan masih banyak bertumpu pada prototipe, penilaian pakar, penerimaan pengguna, dan uji kegunaan berskala kecil. Artikel menyimpulkan bahwa kajian Al-Qur'an digital merupakan lanskap bukti yang sedang berkembang dan memerlukan validasi, tata kelola ilmiah-keagamaan, akses multibahasa, perlindungan privasi, serta interoperabilitas sistem.

Keywords: *Digital Qur'an; Qur'anic NLP; Qur'an Applications; Digital Philology; Scoping Review.*

I. INTRODUCTION

Digital engagement with the Qur'an has moved beyond simple online access to encompass corpus annotation, semantic retrieval, question answering, mobile memorisation, tajwid support, digital manuscripts, and AI-mediated religious learning. The term "digital Qur'an studies" is used here to mean the scholarly study, design, evaluation, preservation, and governance of digital systems that mediate access to, analysis of, learning from, or interaction with the Qur'an. This definition deliberately includes computational, pedagogical, philological, and user-experience evidence rather than reducing the field to one technology or one disciplinary tradition.

A scoping review is methodologically appropriate because the evidence base is broad, uneven, and still conceptually unsettled. Scoping reviews are designed to map the range and nature of evidence, clarify concepts, and identify research gaps rather than estimate pooled effectiveness (Arksey & O'malley, 2005). Methodological refinements emphasise transparent question development, charting, and stakeholder-oriented interpretation (Levac et al., 2010), while contemporary guidance distinguishes scoping reviews from intervention-effectiveness syntheses (Munn et al., 2018). The title, question, eligibility criteria, and evidence map in this article were therefore aligned with JBI scoping review logic and PRISMA-ScR reporting expectations (Peters et al., 2020) ;(Tricco et al., 2018).

The manuscript's novelty is its integrative framing. Previous studies often sit in separate domains: Qur'anic corpora and Arabic NLP; mobile Qur'an learning and memorisation; manuscript digitisation; or user experience and trust. Yet the same religious text is being mediated by all these systems. Figure 2 is cited here in advance because it frames the review's central claim: digital Qur'an studies should be mapped as an evidence landscape in which computational resources, learning applications, digital manuscripts, and governance questions interact. Table 1 and Table 2 later operationalise this claim by charting the main evidence objects and cross-domain gaps.

II. METHOD

The review followed a scoping design informed by PRISMA-ScR and JBI guidance. The population and context included Qur'an readers, learners, teachers, huffaz, researchers, manuscript scholars, application users, and computational linguistics communities. The concept was direct digital mediation of the Qur'an, including corpora, NLP, semantic search, question answering, memorisation, recitation, tajwid, manuscripts, digital philology, usability, and AI-supported religious learning. Eligible records were scholarly articles, conference papers, data papers, or traceable preprints with sufficient bibliographic metadata and a Qur'an-specific digital evidence object.

Search terms combined English and Indonesian variants: "digital Qur'an", "digital Quran", "Qur'an application", "Quran application", "Qur'anic NLP", "Quranic corpus", "Quranic ontology", "Quran question answering", "Quran memorization", "tajwid application", "Qur'anic manuscript digitization", "digital philology", and "Quranic digital humanities". The search was executed against traceable open sources and publisher records, including ACL Anthology, DOI-resolvable journal pages, open-access journal platforms, and the attached cornerstone references. Figure 1 reports the revised search and screening flow and is cited twice because it defines the evidentiary boundary of the manuscript. Figure 1 also preserves an editorial limitation: authenticated Scopus and Web of Science exports should be rerun before final submission so that database-specific counts can replace open-source traceability counts.

Screening used title, abstract, full-text availability where supplied, DOI or official-record traceability, and direct relevance to the Qur'an as a digital object. Exclusion criteria were generic Islamic education technology without a Qur'an-specific component, theological writing without digital methods, unverifiable bibliographic metadata, and records unable to support the claims for which they would be cited. Charting fields were author/year, domain, digital object or method, design or evidence type, key contribution, and limitation. Table 1 is cited here because it presents the condensed extraction matrix; Table 2 is cited here because it translates the charted evidence into a publication-facing research agenda.

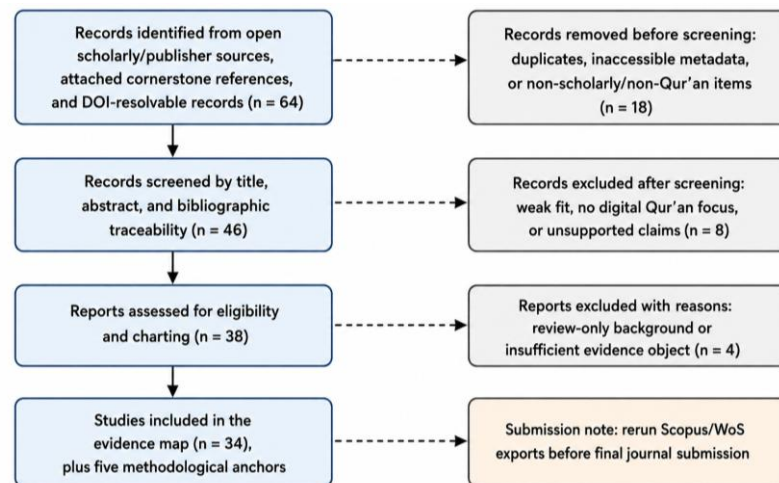


Figure 1. Search and screening flow for the revised scoping map.

III. RESULT AND DISCUSSION

The revised evidence map retained 34 topic-relevant studies plus five methodological anchors. The strongest concentration of evidence appears in computational Qur'anic resources, where corpora, annotation schemes, semantic retrieval, and shared question-answering tasks have created reusable infrastructure. The Quranic Arabic Corpus demonstrates the importance of morphology, part-of-speech tagging, and syntactic analysis for Classical Arabic (Dukes & Habash, 2010), while QurAna extends corpus infrastructure by annotating pronominal anaphora and antecedent concepts (Sharaf & Atwell, 2012). Figure 4 is embedded to show why computational Qur'an work cannot be reduced to generic Arabic NLP: the resource architecture must account for Qur'anic orthography, diacritics, morphology, and traditional grammatical categories. Figure 4 is also cited again because it exemplifies the evidence-maturity difference between reusable linguistic infrastructure and small application case studies.

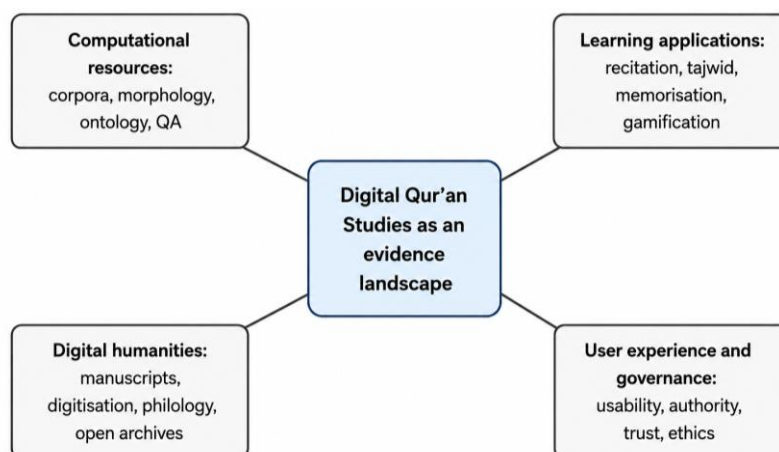
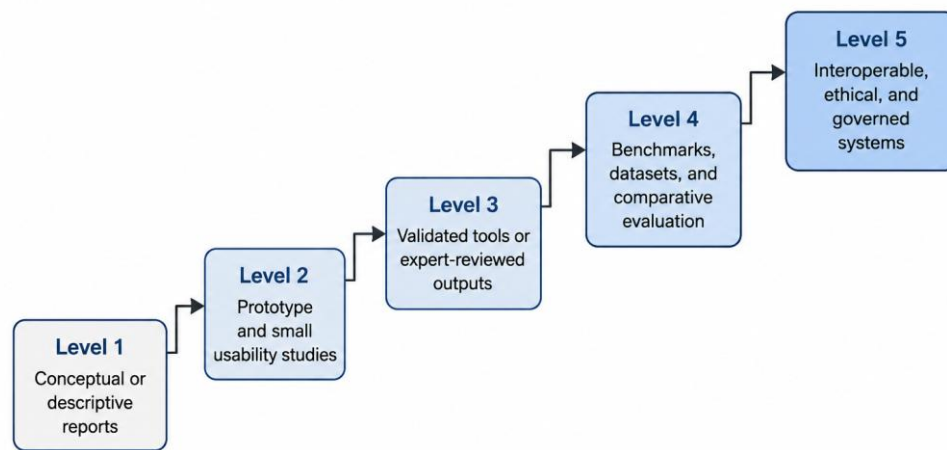


Figure 2. Thematic architecture of Digital Qur'an Studies.

Fig. 2 summarises the four-domain architecture that emerged from charting. The domains overlap rather than form a hierarchy: a memorisation app may involve speech recognition, pedagogy, usability, and scholar-validated content; a manuscript archive may require imaging, metadata, philology, public access, and digital preservation policy. Fig. 2 is cited again here because the main contribution of the review is not a claim that one domain dominates the others, but that digital Qur'an studies requires an interdisciplinary evidence framework.



Interpretation: Computational resources approach benchmark maturity, whereas many learning and UX studies remain prototype-level.

Figure 3. Evidence-maturity ladder for Digital Qur'an Studies.

The evidence-maturity ladder in Fig. 3 clarifies that the field is not uniformly weak or uniformly mature. Qur'anic question-answering shared tasks show benchmark-oriented development: Qur'an QA 2022 attracted 13 final teams and 30 submitted runs (Malhas et al., 2022), while Qur'an QA 2023 separated passage retrieval from machine-reading comprehension and drew 9 passage-retrieval teams and 6 machine-reading-comprehension teams (Malhas et al., 2023). Recent treebank data also strengthen infrastructure for Classical Arabic processing (Nashir et al., 2025). Fig. 3 is cited again because it prevents the review from treating benchmarked data papers, semantic-search tools, alpha-tested apps, and preservation case studies as equivalent forms of evidence.

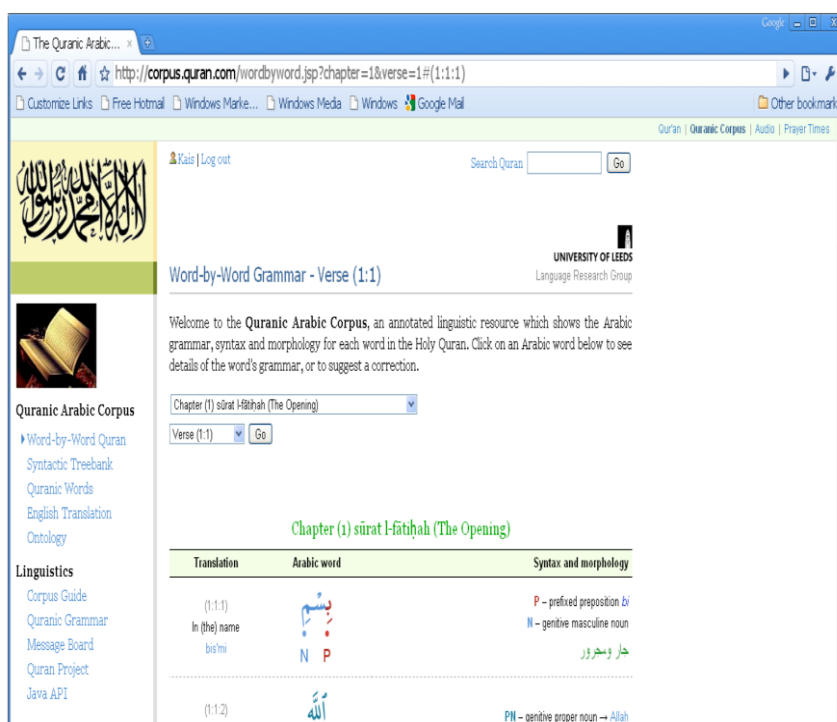


Figure 4. Extracted example of Quranic Arabic Corpus word-by-word annotation and tags.
Source: Dukes and Habash (2010).

Semantic search is the second computational strand. The Quranic Semantic Search Tool (QSST) used manual topic annotation, word embeddings, cosine similarity, and expert review to move beyond literal keyword retrieval (Mohamed & Shokry, 2022). Fig. 5 is instrumental because it makes visible the pipeline from Qur'anic text and annotated topics to vector-based retrieval. Fig. 5 is cited again because it indicates why evaluation in this subfield should include both information-retrieval metrics and Islamic-expert validation; technical relevance alone is insufficient for high-trust religious knowledge systems.

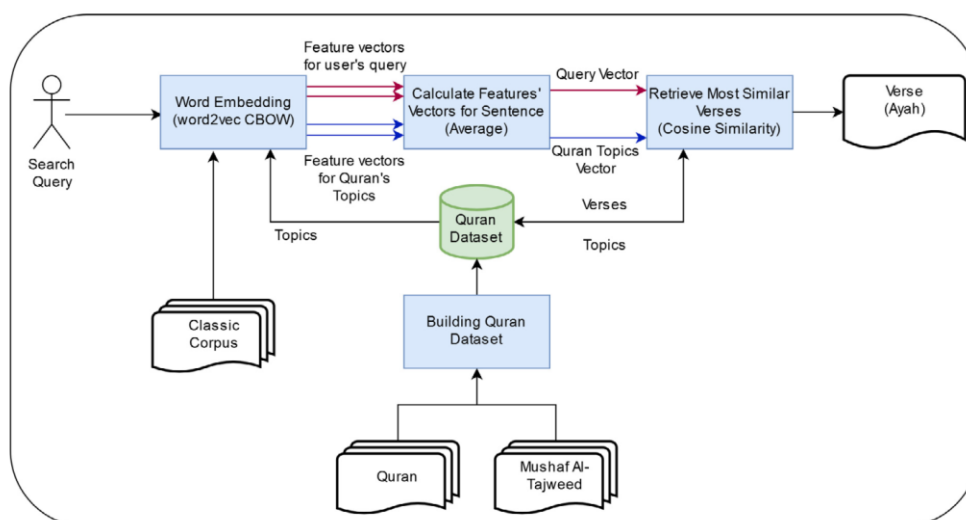


Figure 5. Extracted QSST semantic-search model. Source: Mohamed and Shokry (2022).

The learning-application literature demonstrates practical innovation but weaker causal evidence. EzHifz, for example, was developed as a mobile Qur'an memorisation tool grounded in VARK learning style and evaluated through alpha testing, user acceptance, and heuristic testing (Mustafa et al., 2021). Fig. 6 is cited here because it illustrates how multimodal interfaces can combine text, image, gesture, audio, and learner-selected modes. Fig. 6 is cited again to emphasise the main limitation of the strand: positive usability or expert-review findings should not be interpreted as longitudinal evidence of memorisation retention, tajwid accuracy, or independent recitation improvement without stronger study designs.



FIGURE 5: Kinesthetic submenu.



Figure 6. Extracted EzHifz VARK memorisation interface and kinesthetic submenu. Source: Mustafa et al. (2021).

Digital manuscript studies extend the scope of the field beyond app-based learning. MAQDA illustrates how Qur'anic manuscripts held by individuals and pesantren can be inventoried, digitised, organised, and disseminated through a mobile-accessible platform (Aini et al., 2025). Fig. 7 is cited here because the digitisation workflow connects preservation practice with public access. Fig. 7 is cited again to stress a central gap: manuscript digitisation should be linked to metadata standards, image-quality control, ethical ownership agreements, and philological documentation rather than being treated as a mere media-transfer exercise. Fedeli's work similarly shows that digital Qur'anic manuscript studies can support collaborative spaces, markup, imaging, and plural scholarly interpretation (Fedeli, 2020).

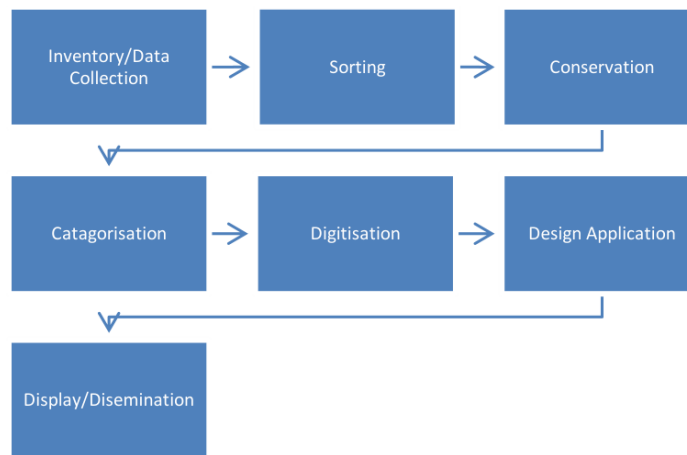


Figure 7. Extracted MAQDA digitisation workflow. Source: Aini et al. (2025).

Table 1. Condensed Evidence Charting Matrix.

No.	Reference	Domain	Digital object/method	Evidence type	Key contribution and limitation
1	Dukes & Habash (2010)	Computational corpus	Quranic Arabic Corpus	Corpus/resource paper	Multi-layer morphological and syntactic annotation. Limitation: foundational but older and resource-oriented.
2	Sharaf & Atwell (2012)	Computational corpus	QurAna anaphora corpus	Dataset/resource paper	Over 24,500 pronouns annotated with antecedents. Limitation: corpus value exceeds direct user-outcome evidence.
3	Mohamed & Shokry (2022)	Semantic search	QSST word embedding and ontology	System development/evaluation	Reports precision, recall, F-score, and expert evaluation. Limitation: tool-specific and needs broader replication.
4	Malhas et al. (2022)	Question answering	Qur'an 2022	QA Shared task overview	Introduced benchmarked QA task with 13 teams and 30 runs. Limitation: benchmark does not resolve religious authority questions.

5	Malhas et al. (2023)	Question answering	Qur'an 2023	QA	Shared task overview	Separated passage retrieval and MRC subtasks. Limitation: evaluation remains task-specific and model-dependent.
6	Mustafa et al. (2021)	Memorisation learning	EzHifz application		ADDIE development and alpha testing	Integrates VARK and memorisation techniques with expert testing. Limitation: not a longitudinal effectiveness trial.
7	Aini et al. (2025)	Digital manuscripts	MAQDA application		Qualitative philological/facsimile study	Digitises privately held East Java Qur'anic manuscripts. Limitation: application impact and metadata interoperability need follow-up.
8	Fedeli (2020)	Digital philology	Imaging, markup, collaborative manuscript work		Conceptual/methodological article	Shows digital tools can reshape Qur'anic manuscript studies. Limitation: more implementation studies are needed.
9	Nashir et al. (2025)	Treebank data	Multi-layered Quranic treebank		Data paper	Strengthens reusable infrastructure for Classical Arabic processing. Limitation: downstream educational or religious-use validation is separate.

Table 1 is cited again in the interpretation of Figure 3 because it shows how evidence type determines maturity: corpus resources, shared tasks, alpha-tested applications, and qualitative preservation studies answer different questions.

Table 2. Cross-domain gaps and publication-facing research agenda.

Domain	Mapped strength	Main gap	Recommended next study	Governance implication
Computational Qur'an resources	Corpora, treebanks, semantic search, QA benchmarks	Limited integration with religious authority and user trust	Benchmark tasks with scholar-reviewed answer rationales	Outputs should cite sources and allow abstention.

Learning and memorisation apps	Prototype tools, VARK design, expert/user acceptance	Few longitudinal learning-outcome measures	Controlled longitudinal studies on retention, tajwid, and fluency	Claims should distinguish usability from effectiveness.
Digital manuscripts and philology	Digitisation workflows and public access models	Weak interoperability between archives, metadata, and teaching tools	Metadata-driven repositories linked to paleography and pedagogy	Ownership, consent, and cultural heritage rights must be explicit.
User experience and trust	Growing attention to interface quality and digital practice	Usability is rarely combined with content-authority assessment	Mixed-method UX studies with scholar validation and user diversity	Religious apps require trust, accessibility, and privacy metrics.
AI-mediated Qur'anic knowledge	Emerging retrieval and QA infrastructures	Hallucination, source fidelity, and qira'at/tafsir sensitivity remain under-tested	Evaluation frameworks for accuracy, traceability, uncertainty, and privacy	AI should assist rather than replace qualified religious scholarship.

Table 2 is cited again in the final synthesis because it converts descriptive mapping into a concrete research agenda. It also clarifies why future publication claims should avoid effectiveness language unless the underlying design actually measures learning, retention, accuracy, or behavioural change.

Taken together, Table 1 and Table 2 support a conservative interpretation. Digital Qur'an studies is expanding rapidly, but methodological maturity varies by evidence object. The corpus and QA strands are closest to reproducible computational science; the memorisation and tajwid application strand is closest to educational design research; and the manuscript strand is closest to digital humanities and preservation studies. The field therefore needs integrated evaluation rather than a single metric of success. A high-quality digital Qur'an tool should be usable, pedagogically meaningful, source-traceable, privacy-sensitive, and religiously accountable.

This synthesis responds directly to the author-review concern that the earlier draft read partly as a conceptual essay. The revised argument is anchored in charted evidence, repeated references to Table 1 and Table 2, and figure-based interpretation. It also strengthens the discussion of Islamic epistemic authority: digital systems do not merely deliver information; they mediate sacred text, translation, recitation norms, tafsir access, and user trust. For this reason, a mature research agenda must include scholar review,

citation provenance, uncertainty signalling, abstention mechanisms, and clear boundaries between learning assistance and religious ruling.

IV. CONCLUSION

This scoping review maps digital Qur'an studies as an emerging interdisciplinary evidence landscape. The field has mature computational resources and promising semantic-search and question-answering benchmarks, but educational and application-oriented studies still require stronger longitudinal, comparative, and outcome-sensitive designs. Digital manuscript work broadens the field by linking Qur'anic preservation, philology, and public access, while user-experience research demonstrates that trust, accessibility, privacy, and content authority must be evaluated alongside technical performance. The central contribution of the review is therefore conceptual and methodological: digital Qur'an studies should be evaluated across computational robustness, pedagogical value, philological transparency, and religious-content governance. Before journal submission, the open-source evidence map should be rerun with authenticated Scopus and Web of Science exports to finalise database counts, but the revised synthesis already identifies the key research agenda needed to move the field from fragmented digital innovation to validated, ethical, and interoperable Qur'anic scholarship.

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