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Journal	Computers (https://www.mdpi.com/journal/computers) (ISSN 2073-431X)
Manuscript ID	computers-3665830
Type	Systematic Review
Title	Human-AI collaboration in the modernisation of COBOL-based legacy systems: The case of the Department of Government Efficiency (DOGE)
Authors	Inês Melo , Daniel Polónia , Leonor Teixeira *
Abstract	This paper aims to explore the challenges of maintaining and modernising legacy systems, particularly COBOL-based platforms, the backbone of many financial and administrative systems. By presenting the DOGE team's initiative to modernise government IT systems on a relevant case study, the author analyses the pros and cons of AI and Agile methodologies in addressing the limitations of static and highly resilient legacy architectures. A systematic literature review was conducted to assess the state-of-the-art about legacy system modernisation, AI integration, and Agile methodologies. Then, grey literature was analysed to provide practical insights into how government agencies can modernise their IT infrastructures while addressing the growing shortage of COBOL experts. Findings suggest that AI may support interoperability, automation, and knowledge abstraction, but also introduce new risks related to cybersecurity, workforce disruption, and knowledge retention. Furthermore, the transition from Waterfall to Agile approaches poses significant epistemological and operational challenges. The results highlight the importance of adopting a hybrid human-AI model and structured governance strategies to ensure sustainable and secure system evolution. This study offers valuable insights for organisations that are facing the challenge of balancing the desire for modernisation with the need to ensure their systems remain functional and manage tacit knowledge transfer.

Review Report Form

Quality of English Language	<div><input checked="" type="radio"/> (x) The English could be improved to more clearly express the research.</div> <div><input type="radio"/> () The English is fine and does not require any improvement.</div>
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	Yes	Can be improved	Must be improved	Not applicable
Does the introduction provide sufficient background and include all relevant references?	<input type="radio"/> ()	<input checked="" type="radio"/> (x)	<input type="radio"/> ()	<input type="radio"/> ()
Is the research design appropriate?	<input type="radio"/> ()	<input checked="" type="radio"/> (x)	<input type="radio"/> ()	<input type="radio"/> ()
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Are the conclusions supported by the results?	<input type="radio"/> ()	<input checked="" type="radio"/> (x)	<input type="radio"/> ()	<input type="radio"/> ()
Are all figures and tables clear and well-presented?	<input type="radio"/> ()	<input type="radio"/> ()	<input type="radio"/> ()	<input type="radio"/> ()

Comments and Suggestions for Authors	This manuscript addresses an important and timely issue of the modernisation of COBOL-based legacy systems in government through AI and Agile methodologies. The inclusion of the DOGE case study adds a compelling real-world angle, and the systematic literature review is
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commendable. However, the manuscript would benefit from substantial revisions in terms of structure, clarity, methodological transparency, and academic rigor. Please consider the comments below:

1. **Originality and Contribution:** The DOGE case, while intriguing, may risk undermining the academic tone due to its connection with controversial political figures and internet meme culture. Please clarify and justify its legitimacy as a research case is necessary. Also, the manuscript lacks a clearly defined and novel research question. The contributions need to be explicitly stated in the introduction and conclusion.
2. **Clarity and Structure:** The abstract outlines key themes and findings. The manuscript also attempts to follow a logical structure throughout the paper. However, several sections are too dense and could benefit from improved paragraphing and clearer transitions. Also, some repetition exists between the literature review and results/discussion sections. Please look into that. The writing includes grammatical and stylistic inconsistencies (e.g., redundant phrases, awkward sentence constructions) that impede readability. Please do a thorough language edit to improve fluency and ensure academic tone throughout.
3. **Methodology:** Although the authors use PRISMA guidelines and systematic search in Scopus, methodological details are not sufficiently transparent to ensure reproducibility. For example, the rationale for excluding “genAI,” “Copilot,” etc., is not clearly justified. Moreover, there is no critical assessment of the grey literature sources used—particularly important given the controversial and possibly speculative nature of the DOGE case. A PRISMA diagram is mentioned but not well integrated or interpreted. Please expand the methodology section to include more detail on screening procedures, coding/analysis approach, and quality assessment of both peer-reviewed and grey literature.
4. **Literature Review:** The theoretical framing is not consistently applied throughout the manuscript. The epistemological comparison introduced early on is insightful but not well developed in the discussion. Some references, while relevant, are outdated or descriptive rather than analytical. Please deepen the theoretical engagement by critically synthesizing existing frameworks on legacy system modernisation and explicitly relating them to the DOGE case.
5. **Case Study Analysis (DOGE):** The legitimacy and data sources of the DOGE case are insufficiently explained. Is this based on official reports, interviews, or journalistic sources? The case study reads as heavily anecdotal and media-driven, which may limit its scholarly credibility. Also, the authors have raised ethical concerns (e.g., AI in public workforce evaluations), but not rigorously analysed. Please provide a clearer justification for the DOGE case’s inclusion as an empirical object of study. Also, evaluate its generalizability and limitations more explicitly.
6. **Results and Discussion:** The discussion lacks critical engagement and tends toward descriptive summary. Also, there is insufficient synthesis between the literature review findings and the DOGE case. Please revise the discussion to explicitly link empirical findings with the theoretical and methodological frameworks. Also, discuss limitations and contradictions in greater depth.
7. **Conclusion and Implications:** The authors have discussed practical and theoretical implications in broad terms. The paper would benefit from more specific, actionable recommendations. Also, some points are repetitive and could be consolidated. Please refine the conclusion to clearly articulate the study’s core contributions, implications, and how it advances knowledge in AI-enabled legacy system modernisation.

English Language	The writing includes grammatical and stylistic inconsistencies (e.g., redundant phrases, awkward sentence constructions) that impede readability. Please do a thorough language edit to improve fluency and ensure academic tone throughout.
Submission Date	11 May 2025
Date of this review	12 May 2025 10:37:41