4th International Symposium on Digital Transformation (ISDT)

Book of Abstracts

Kalmar, Linnaeus University,
17–18 September 2025

Linnaeus Knowledge Environment: Digital Transformations

Linnæus University

This work © 2025 by the authors is licensed under CC BY 4.0

This work © 2025 by the authors is licensed under CC BY 4.0

This work © 2025 by the authors is licensed under CC BY 4.0

Introduction

The Linnaeus University Knowledge Environment Digital Transformations hosted the Fourth International Symposium on Digital Transformation (ISDT) from 17–18 September 2025 in Kalmar, Sweden. Following the precedent set in previous years, the symposium accepted 47 papers, organized around six themes: Digital Business (7), Digital Working Life (6), e-Health (7), Digital Learning and Education (10), Artificial Intelligence (6), and Digital Humanities (11). All abstracts underwent anonymous peer review, and authors were invited to revise their submissions based on feedback. Together, these contributions highlight the technical sophistication, methodological diversity, and societal relevance of contemporary research in digital transformation.

In addition to paper presentations, ISDT 2025 featured three keynote addresses that underscored the symposium's scholarly and practical significance. Prof. Mato Brautović (University of Dubrovnik, Croatia) presented "*Research as a political act: data access, power and the future of digital platform accountability*"; Prof. Kathrin Creswell (University of Edinburgh, UK) discussed "*Putting the UK at the forefront of using artificial intelligence for the benefit of health and care: a mixed methods formative evaluation of the NHS Artificial Intelligence Lab*"; and Prof. Sarah Prestridge (Griffith University, Australia) examined *"It's an evolution not a revolution: examining digital learning that requires pedagogical change*". These keynotes provided conceptual anchors for the symposium, highlighting the societal, ethical, and pedagogical implications of digital transformation research.

Over two engaging days, participants explored emerging trends, current efforts, and innovative possibilities across the field. ISDT 2025 proudly welcomed researchers pursuing versatile and interdisciplinary approaches to societal challenges shaped by digitalization. The symposium emphasized not only methodological innovation but also the integration of theory and practice, demonstrating how design- and technology-oriented research can contribute to both academic knowledge and real-world applications.

We extend our sincere thanks to the Steering Committee of the Knowledge Environment Digital Transformations—Jesper Andersson, Kristoffer Holt, Päivi Jokela, Italo Masiello, Lina Nilsson, and Glenn Sjöstrand—for their guidance and support, as well as to Johan Vaide and Soumitra Chowdhury for planning assistance and Brian Kottonya for technical support. We are grateful to the administration of Linnaeus University for financial support via the internationalization fund, to the 19 reviewers who generously volunteered their time, and especially to the Communications Department at Linnaeus University for their support with the practical organization and logistics of ISDT 2025.

Emily Hanscam and Marcelo Milrad

This work © 2025 by the authors is licensed under CC BY 4.0

Digital Business

Digitalization has prompted novel forms of doing business. To satisfy constantly changing needs of customers and to stay competitive in the market, organizations need to embark in the digital transformation, hence transforming their way of doing business and organizing. Whereas some organizations have successfully managed to reap the potential of digital technologies in creating innovative products, services, and business models, others face several challenges in this journey. Digital transformation both as a process and an outcome is characterized with uncertainty and inherent complexity unfolding in several dimensions: technological, organizational, business, societal.

The abstracts that follow address topics related to digitalization and digital transformation, including abstracts examining how organizations organize for digital innovation, challenges, and the successful factors in the digital journey process.

This work © 2025 by the authors is licensed under CC BY 4.0

ELECTRONIC BILLS OF LADING (EBLS): GLOBAL CHALLENGES, REGIONAL GAPS, AND STRATEGIC POTENTIAL

Tamar Gugushvili

Faculty of Business Technologies, Georgian Technical University, Georgia.
tamunag@gmail.com

ABSTRACT

Relying on traditional paper-based bills of lading (B/Ls) in international trade leads to inefficiencies and incurs significant costs, delays, and risks, such as fraud and document loss. Although electronic Bills of Lading (eBLs) offer a solution to these problems, their adoption is still inconsistent and slow due to legal, technological, and regional obstacles. This study investigates these challenges and identifies strategic opportunities to promote the broader global adoption of eBLs.

This study utilizes a qualitative methodology that integrates the analysis of legal documents, industry reports, and case studies, along with insights from recent international surveys and expert opinions on the shipping and trade finance industries.

The results indicate notable differences in the adoption of eBL across various regions owing to inconsistent legal recognition, fragmented regulations, and differing levels of digital infrastructure readiness. While eBLs present clear advantages such as quicker document processing, improved security, reduced costs, reluctance among stakeholders, and technological constraints, they continue to pose significant challenges.

This study enhances the comprehension of eBL adoption by emphasizing the essential requirements for unified global legal standards and collaborative industry initiatives. It highlights the strategic advantages of eBLs in modernizing trade documentation, minimizing fraud, and fostering sustainable, paperless international trade. This study sets a stage for future research that concentrates on regional implementation strategies and digital preparedness in developing economies.

Keywords: Bill of Lading; Electronic Bill of Lading (e-BL); Paperless Trade; Trade Digitalization.

This work © 2025 by the authors is licensed under CC BY 4.0

DIGITAL TECHNOLOGY ADOPTION FOR CIRCULAR CONSTRUCTION IN NIGERIA: A COMPARATIVE ANALYSIS OF INDUSTRY AND PUBLIC SOCIAL MEDIA DISCOURSE

Maryam Olaoti Shehu[1]*, Fatima Fika[2], and Ahmed Taiye Mohammed[3]

[1]*Department of Built Environment and Energy Technology, Linnaeus University, Sweden, ms227sd@student.lnu.se*
[2]*Cyber Security Department, Air Force Institute of Technology, Nigeria, f.adamu-fika@afit.edu.ng*
[3]*Faculty of Humanities, Cultural Science, Linnaeus University, Sweden, ahmedtaiye.mohammed@lnu.se*
(*Main presenter and corresponding author)

ABSTRACT

Background: Digitalization has emerged as a key driver of circular construction, enhancing project efficiency, collaboration, and innovation across the construction value chain (Aghimien *et al.*, 2018). Key Digital Technologies (DTs) such as Building Information Modeling (BIM), the Internet of Things (IoT), and Artificial Intelligence (AI) are essential in enabling more effective resource tracking, lifecycle management, and process optimization within the industry. (Ezeokoli *et al.*, 2016; Adafin *et al.*, 2021). However, the adoption of these DTs specifically within Nigeria's construction sector remains limited. This is largely attributable to a confluence of factors, including prevailing economic constraints, weak government support, infrastructural deficits, low levels of digital literacy, insufficient training programs, and broader human-capital challenges (Moshood *et al.*, 2020; Bello and Abdullahi, 2023; Bamgbose, Ogunbayo and Aigbavboa, 2024). While existing research acknowledges the transformative potential of DTs for circular construction, much of it often centers on identifying obstacles rather than exploring systemic enablers. As a result, discussions around how public and industry narratives influence adoption remain underdeveloped, leaving a significant gap.

Public discourse, critically influenced by socio-economic and environmental contexts, plays an indispensable role in shaping technology adoption across all sectors, including construction. Social media platforms, described by Fieseler and Fleck (2013) modern community infrastructures provide highly accessible avenues for such discourse, often surpassing the reach of traditional publications. However, despite their potential, these platforms are underutilized in facilitating dialogue around DT adoption and circularity within the construction domain (Willems and Alizadeh, 2015).

Aim: This study therefore addresses the identified gap by conducting a comparative analysis

This work © 2025 by the authors is licensed under CC BY 4.0

of narratives on DT adoption for circular construction in Nigeria, scraping data from both social media and construction company websites. The primary aim was to uncover prevailing themes, sentiments, and perspectives articulated across these distinct platforms. The study inquired into three core areas: the representation of DTs for circular construction on social media and company websites in Nigeria; the sentiments surrounding this discourse; and the contextual similarities and differences evident in the narratives exchanged across the two platforms.

Methodology: This study utilized a quantitative and comparative content analysis methodology, drawing data from both social media and construction company websites. The initial step involved compiling a comprehensive list of Nigerian construction companies, which was efficiently gathered using a browser extension and subsequently exported to an Excel spreadsheet. Each identified company's website was then meticulously reviewed for content related to DTs and circularity. However, recognizing the limited availability of dedicated blog sections on many sites, relevant textual posts were ultimately sourced from three particularly active websites. For the social media component, a total of 197 posts were scraped from Platform X (formerly Twitter) using targeted search terms. The collected data then underwent rigorous processing and analysis using Orange Data Miner software. Texts were initially imported as corpus and subjected to essential preprocessing steps, including tokenization, removal of stop-words, and lemmatization. To identify dominant themes within the dataset, word clouds were generated. Sentiment analysis was a crucial aspect of the study, conducted using two distinct models: the Ekman model, which identified six fundamental emotions, and the VADER model, which categorized sentiment polarity. The findings from this analysis were effectively visualized through box plots, heat maps, and linear projections, allowing for a thorough exploration of emotional trends and correlations within the data.

Results and Findings: The comparative analysis of thematic content derived from both social media (Platform X) and construction company websites unveiled distinct perspectives on digital transformation within circular construction. Across both platforms, shared foundational themes such as *"construction," "projects," "infrastructure,"* and *"sustainability"* were consistently present, indicating a common understanding of the broader industry context. However, social media discourse demonstrated a broader emphasis on overarching DT terms, including *"digital," "innovation,"* and *"data,"* reflecting a more general engagement with the concept of digitalization. In contrast, company websites primarily utilized traditional industry terminology and conveyed a more explicit vision for industry progress, employing terms like *"company," "estate,"* and *"efficiency,"* which align with corporate objectives and operational improvements. Notably, specific DT tools (e.g., "AI," "BIM," "IoT") appeared with less frequency, particularly on social media, suggesting a more conceptual rather than tool-specific discussion among the public. Furthermore, social media conversations frequently referenced leadership, political dynamics, and economic challenges, thereby reflecting a wider spectrum of public concerns that extend beyond technical adoption.

Sentiment profiling, using the Ekman and VADER models, highlighted *"joy"* as a dominant emotion on both platforms indicating a general positive engagement with the topic. Social media discourse, while also displayed a notable presence of *"fear"* along with limited expression of *"anger"* and *"sadness*", which suggested public apprehension, diverse viewpoints, and polarized opinions regarding feasibility, associated costs, and practical implementation challenges of DT in circular construction. Conversely, *"Joy"* overwhelmingly dominated the sentiments expressed on company website, with negative sentiments, including

This work © 2025 by the authors is licensed under CC BY 4.0

"fear," occurring minimally. This striking disparity indicated a largely positive, often controlled narrative from the industry. Such messaging seems strategically crafted to promote progress and appeal to stakeholders while downplaying potential drawbacks.

The heatmaps and linear projections confirmed these contrasts. Social media showed diverse emotional expressions, with scattered negative sentiment and clustered positive themes around DT's potential. While website sentiment remained uniformly positive, with limited acknowledgement of challenges. This disparity highlights a communication gap: while the public expresses hope and skepticism, industry messaging remains polished and overly optimistic.

Conclusions and Recommendations: The study concluded that social media discourse serves as an effective conduit for capturing diverse sentiments regarding digital technology in circular construction, including enthusiasm for tools like IoT, BIM, and AI, alongside notable concerns about economic and regulatory barriers. Conversely, company websites primarily maintain positive, business-aligned narratives but often lack actionable strategies that explicitly link digital transformation to sustainability objectives. Despite these differences, both platforms reveal shared challenges, such as security and regulatory issues, indicating potential avenues for collaborative efforts. Therefore, there is need for more balanced, transparent industry communication that aligns with public sentiment to support DT adoption for circular construction in Nigeria as well as fostering open dialogue among stakeholders.

Limitations and Future Work: This study was limited by its narrow data scope, relying on a single social media platform and three company websites, and lacked direct stakeholder input. Future studies would expand on the data sources to include diverse textual materials and stakeholder interviews within the Nigerian construction industry.

Keywords: Circular Construction, Digital Technologies, Nigerian Construction Industry, Social Media Discourse, Industry Perspectives.

REFERENCES

Adafin, J. *et al.* (2021) 'Creating a case for innovation acceleration in the New Zealand building industry', *Construction Innovation*, 22(1), pp. 185–204. Available at: https://doi.org/10.1108/CI-10-2018-0081.

Aghimien, D. *et al.* (2018) 'Digitalisation in construction industry: Construction professionals perspective', in *Proceedings of International Structural Engineering and Construction*. *4th Australasia and South East Asia Conference on Structural Engineering and Construction, ASEA-SEC-04 2018*, ISEC Press. Available at: https://pure.uj.ac.za/en/publications/digitalisation-in-construction-industry-construction-professional (Accessed: 16 November 2024).

Bamgbose, O.A., Ogunbayo, B.F. and Aigbavboa, C.O. (2024) 'Barriers to Building Information Modelling Adoption in Small and Medium Enterprises: Nigerian Construction Industry Perspectives', *Buildings*, 14(2), p. 538. Available at: https://doi.org/10.3390/buildings14020538.

This work © 2025 by the authors is licensed under CC BY 4.0

Bello, A. and Abdullahi, I. (2023) 'Strategies for Adoption of Circular Economy in the Nigeria Construction Industry', *Journal of Management Science & Engineering Research*, 6. Available at: https://doi.org/10.30564/jmser.v6i2.5846.

Ezeokoli, O. *et al.* (2016) 'Digital Transformation in the Nigeria Construction Industry: The Professionals' View', *World Journal of Computer Application and Technology*, 4. Available at: https://doi.org/10.13189/wjcat.2016.040301.

Fieseler, C. and Fleck, M. (2013) 'The Pursuit of Empowerment through Social Media: Structural Social Capital Dynamics in CSR-Blogging', *Journal of Business Ethics*, 118(4), pp. 759–775. Available at: https://doi.org/10.1007/s10551-013-1959-9.

Moshood, T.D. *et al.* (2020) 'Barriers and Benefits of ICT Adoption in the Nigerian Construction Industry. A Comprehensive Literature Review', *Applied System Innovation*, 3(4), p. 46. Available at: https://doi.org/10.3390/asi3040046.

Willems, L. and Alizadeh, T. (2015) 'Social Media for Public Involvement and Sustainability in International Planning and Development', *International Journal of E-Planning Research*, 4, pp. 1–17. Available at: https://doi.org/10.4018/ijepr.2015100101.

This work © 2025 by the authors is licensed under CC BY 4.0

PERCEIVED IMPACT OF FINTECH PAYMENT PLATFORM ADOPTION ON THE REVENUE GENERATION OF SAVINGS AND LOANS COMPANIES IN GHANA

Ofori Yaw Owusu[1]*, Dadson Awunyo-Vitor[2]

[1]*Department of Accounting and Finance, Accra Institute of Technology, Accra, Ghana (Scholar627@gmail.com)*
[2]*Department of Agricultural Economics, Agribusiness and Extension, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana (awunyovitor@gmail.com)*

(*Main presenter and corresponding author)

ABSTRACT

FinTech payment platforms, including mobile money services, digital wallets, electronic transfers, and app-based payment systems, have transformed how financial institutions deliver services and interact with customers. In Ghana, where the financial sector is critical in promoting financial inclusion and supporting economic development, integrating FinTech payment platforms has become increasingly important, especially for non-bank financial institutions such as Savings and Loans Companies. Savings and Loans Companies in Ghana are vital intermediaries for providing credit, savings, and financial services to underserved populations and rural communities. However, these companies face mounting pressure to improve operational efficiency, enhance customer experience, and boost revenue streams in the face of growing competition, changing consumer expectations, and regulatory demands. Adopting FinTech payment platforms is often seen as a strategic response to these challenges, offering Savings and Loans companies the potential to expand their service reach, reduce transaction costs, streamline payment processes, and create new revenue opportunities. While the promise of FinTech payment platform adoption is widely acknowledged, the actual impact on revenue generation for Savings and Loans Companies remains a subject of ongoing debate. The study will examine managers' perceptions of the impact of FinTech payment platform adoption on the revenue generation of Savings and Loans Companies in Ghana. The study will employ a qualitative research approach. Data will be collected from key management personnel such as general managers, financial controllers, compliance and risk officers and others who decide on the adoption of FinTech payment platforms in Savings and Loans companies operating in Ghana. Deductive thematic analysis will be used to analyse the data. The study will provide empirical insights that can inform strategic decision-making, guide investment priorities, and support policy development aimed at strengthening the competitiveness and sustainability of Ghana's Savings and Loans Companies in the digital era.

Keywords: Savings and Loans Companies, FinTech Payment Platforms, Revenue Generation, Dynamic Capability theory

This work © 2025 by the authors is licensed under CC BY 4.0

EXPLORING CITIZEN E-GOVERNMENT READINESS IN KOSOVO: PRELIMINARY QUALITATIVE INSIGHTS

Eliot Bytyçi[1]* and Fisnik Dalipi[2]

[1]*Department of Mathematics, Faculty of Mathematical and Natural Sciences, University of Prishtina, Kosovo, eliot.bytyci@uni-pr.edu*
[2]*Department of Informatics, Faculty of Technology, Linnaeus University, Sweden, fisnik.dalipi@lnu.se*

(*Main presenter and corresponding author)

ABSTRACT

The effective adoption and utilization of e-government services are critical indicators of a nation's readiness to leverage technology for improved public administration and citizen engagement (Sheoran et al., 2022). In Kosovo, the development and promotion of platforms like e-Kosova signifies a commitment to digital transformation. Moreover, Kosovo has already established an e-government Strategy (MPB, 2023), which is in line with Digital Agenda of Kosovo 2030 (ME, 2023). This exploratory study presents preliminary results from an assessment of e-government readiness in Kosovo. It examines citizen perceptions and experiences with online public services, drawing some initial insights from qualitative interviews with individuals representing different age demographics.

E-government readiness involves not only the government's infrastructure and capacity to provide digital services but also the readiness of citizens (Mensah, 2018) to access and utilize these services effectively. Factors such as digital literacy, internet access, trust in online platforms (AbdulKareem, 2024), and the perceived usability and relevance of available services all play a significant role in the success of e-government initiatives. In a society with varied access to technology and differing levels of digital fluency across generations, understanding these dynamics is essential for inclusive digital development.

This study employed a qualitative, exploratory design, conducting semi-structured interviews with six participants from distinct age groups: one older adult (aged 65+), two young adult (aged 24), and three middle-aged adultadults (aged 40+). The interviews were specifically designed to get feedback on their awareness and experience with online government services, including the e-Kosova platform. Moreover, to find out their perceived digital skills, the barriers they face in accessing or using e-services, and their trust levels in conducting official interactions online. The small sample size means these findings are preliminary and serve primarily to identify key themes and inform potential directions for more extensive research. Preliminary findings from these three interviews reveal a varied landscape of e-government readiness among citizens in Kosovo, significantly influenced by age and associated factors like digital literacy and access. The older adult participant expressed awareness about platform, but they face significant challenges regarding digital access and limited digital skills. They prefer relying on traditional, in-person methods for accessing government services, even though they believe that e-government is a better way. Concerns about the security and

This work © 2025 by the authors is licensed under CC BY 4.0

complexity of online procedures were also evident, highlighting a clear digital divide affecting this demographic.

In contrast, the young adult participant demonstrated higher digital literacy and awareness of e-Kosova. However, their experience highlighted issues related to the platform's usability for certain tasks, the perceived limited range of critical services available online and some frustrations with technical glitches. Their perspective pointed to the need for enhanced platform functionality and a more comprehensive range of services.

The middle-aged participants acknowledged the convenience of using online services like e-Kosova for simpler tasks but faced some difficulties when dealing with payments and sometimes with issues. Nevertheless, according to them it is a practical way of balancing work and family responsibilities with no need to engage with traditional government processes. Collectively, these preliminary findings suggest that despite the availability of platforms like e-Kosova, the path to widespread and equitable e-government adoption in Kosovo faces significant challenges. A prominent digital divide exists, particularly marginalizing the older population. While younger generations are more digitally capable, the current state of e-service provision, including usability and scope, may not fully meet their expectations or needs. Trust in digital government interactions and the availability of effective online support mechanisms are also critical factors influencing readiness and adoption across all age groups, and some of them might do extra on the security side, while others might find that hard (Ragnedda et al., 2022).

In conclusion, these initial insights underscore the importance of moving beyond simply offering e-government platforms to actively fostering citizen e-readiness. While limited, these preliminary findings provide a crucial starting point for understanding the citizen-side challenges to e-government adoption in Kosovo and highlight key areas for the future, more extensive research and policy intervention.

Regarding future work, besides increasing the sample size for interviews, the preliminary findings highlight the importance of more extensive research and policy intervention focusing on targeted digital literacy programs, enhancing platform accessibility and user-friendliness, expanding fully digitalized services, and building public trust in online interactions to foster citizen e-readiness in Kosovo.

Keywords: E-government Readiness, e-Kosova, Digital Services, Citizen Perception.

REFERENCES

AbdulKareem, A. K., & Oladimeji, K. A. (2024). Cultivating the digital citizen: trust, digital literacy and e-government adoption. *Transforming Government: People, Process and Policy*, *18*(2), 270–286.

MPB, e-government Strategy Kosovo 2023-2027. Retrieved from https://mpb.rks-gov.net/Uploads/Documents/Pdf/EN

Mensah, I. K. (2018). Citizens' Readiness to adopt and use e-government services in the city of Harbin, China. *International Journal of Public Administration*, *41*(4), 297–307.

This work © 2025 by the authors is licensed under CC BY 4.0

Ragnedda, M., Ruiu, M. L., & Addeo, F. (2022). The self-reinforcing effect of digital and social exclusion: The inequality loop. *Telematics and Informatics*, *72*, 101852.

ME. *Digital Agenda of Kosovo 2030*. Retrieved from https://me.rks-gov.net/en/information-technology-and-telecommunications//2700/e-Government%20Strategy%20Kosovo%202023-2027.pdf

Sheoran, S., & Vij, S. (2022). A Review of E-Government Assessment Frameworks: E-Readiness, Adoption, Citizen Engagement and Quality. *JeDEM-eJournal of eDemocracy and Open Government*, *14*(2), 197–213.

This work © 2025 by the authors is licensed under CC BY 4.0

ENHANCING TRANSPARENCY IN ELECTRONIC PROCUREMENT THROUGH AI AND BLOCKCHAIN TECHNOLOGIES

Tetiana Zatonatska[1]*, Kira Horiacheva[2]

[1]*Department of Economic Cybernetics, Faculty of Economics, Taras Shevchenko National University of Kyiv, Ukraine, tetiana.zatonatska@knu.ua*
[2]*School of Business, University of Dundee, UK, khoriacheva001@dundee.ac.uk*
(*Main presenter and corresponding author)

ABSTRACT

The growing complexity and scale of public procurement processes, particularly those involving regulated goods, have exposed significant limitations in traditional oversight mechanisms. While digital platforms have increased transparency and accessibility in procurement, manual auditing remains resource-intensive and reactive. These limitations become especially acute in categories of procurement that require heightened regulatory attention due to their strategic or economic sensitivity. As governments face increasing pressure to manage large volumes of procurement transactions efficiently and with integrity, digital transformation becomes a critical policy and technological imperative (Mergel et al., 2019).

This research addresses the problem of ineffective oversight in large-scale procurement systems by developing a digital architecture that integrates artificial intelligence (AI) and blockchain technologies. The study is grounded in the need to automate the identification of potentially non-compliant procurement cases in real-time and to ensure the traceability and verifiability of procurement records. The rationale behind this work lies in the recognition that the public sector must adopt intelligent systems that not only increase efficiency but also foster accountability and trust among stakeholders (Wirtz et al., 2019).

The objective of the research is to create a modular, scalable, and transparent framework that enables real-time risk detection and secure data handling in procurement. To achieve this, the research proposes a two-part methodology. The first part involves the use of natural language processing (NLP) techniques to analyze procurement documentation. Procurement data, including lot titles and classification codes, are processed using Term Frequency-Inverse Document Frequency (TF-IDF) and cosine similarity methods to identify linguistic patterns commonly associated with regulated or sensitive procurement categories. This automated textual analysis significantly reduces the time required to screen large volumes of procurement data while improving the consistency of classification.

The second methodological component consists of risk modeling using supervised machine learning algorithms. A comprehensive set of features is generated for each procurement case, encompassing contract values, supplier characteristics, and historical procurement behavior. These features are used to train and test several classifiers, including Naive Bayes, Random Forest, and Extreme Gradient Boosting (XGBoost). These algorithms allow for probabilistic risk scoring of procurement transactions, enabling auditors to prioritize reviews based on model

This work © 2025 by the authors is licensed under CC BY 4.0

outputs. The study finds that ensemble learning models, particularly XGBoost, demonstrate high accuracy and robustness, especially in managing imbalanced datasets where non-compliant cases are underrepresented.

To complement the AI-based risk detection system, the study introduces a blockchain component designed to address issues of data integrity and auditability. Each procurement record is converted into a SHA-256 hash and stored on a blockchain ledger. This ensures that once procurement data is recorded, it cannot be altered without detection. The blockchain solution supports real-time verification by allowing public institutions and oversight bodies to validate data consistency across centralized and decentralized systems. The inclusion of blockchain also facilitates transparency for third-party observers, enhancing institutional credibility and compliance with international standards (Ølnes et al., 2017).

The research is based on an extensive dataset drawn from multiple years of procurement activity in the public sector. The data was anonymized and preprocessed to comply with privacy and ethical standards. All models were trained and validated using stratified cross-validation to ensure generalizability. Performance metrics were evaluated for each model, focusing on accuracy, precision, recall, and F1-score. The blockchain component was implemented in a simulated environment to test real-time hashing, recording, and verification of procurement entries.

Findings indicate that the combined use of AI and blockchain can substantially increase the effectiveness of procurement oversight. AI models succeeded in highlighting transactions with a higher likelihood of regulatory risk, enabling auditors to intervene proactively rather than retroactively. The blockchain implementation ensured that procurement records remained immutable and audit-ready. These two components, when integrated, form a digital ecosystem that transforms procurement oversight from a passive, delayed process into an active, intelligent, and secure function of digital governance.

The implications of this research are significant for both policy and practice. On the policy level, it demonstrates how digital transformation initiatives can address systemic weaknesses in public procurement. The use of AI reduces the cognitive load on public administrators while increasing objectivity and coverage in risk assessments. The application of blockchain offers a new standard for data reliability and public accountability. Together, they support the creation of transparent, efficient, and trustworthy procurement systems aligned with the principles of open government and sustainable development.

From an academic perspective, the study contributes to the evolving field of digital governance by offering a replicable model for intelligent procurement systems. It emphasizes the value of interdisciplinary collaboration between computer science, public administration, and legal studies. The methodological approach can be extended to other domains of public finance and regulatory compliance, demonstrating scalability and adaptability beyond the procurement context.

Future research should explore how additional data sources, such as open-source intelligence or supplier network analytics, can further enhance risk detection. Moreover, incorporating human-in-the-loop systems, where expert judgment is combined with algorithmic recommendations, may improve the interpretability and accountability of automated decisions. As digital transformation continues to reshape the public sector, this study offers a concrete roadmap for leveraging emerging technologies in the service of good governance.

This work © 2025 by the authors is licensed under CC BY 4.0

Keywords: digital transformation, public procurement, artificial intelligence, blockchain, regulated goods, digital governance

REFERENCES

Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, 36(4), 101385. https://doi.org/10.1016/j.giq.2019.101385

Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2019). Artificial intelligence and the public sector – Applications and challenges. *International Journal of Public Administration,* 42(7), 596–615. https://doi.org/10.1080/01900692.2018.1498103

Ølnes, S., Ubacht, J., & Janssen, M. (2017). Blockchain in government: Benefits and implications of distributed ledger technology for information sharing. *Government Information Quarterly,* 34(3), 355–364. https://doi.org/10.1016/j.giq.2017.09.007

This work © 2025 by the authors is licensed under CC BY 4.0

CONTEXT-AWARE LLM-BASED CHATBOTS IN SOFTWARE & IT COMPANIES

Ghazal Ghahraei

Department of Informatics, Linnaeus University, Sweden, gg222ie@student.lnu.se

ABSTRACT

AI-powered chatbots, especially those based on Large Language Models, have gained **popularity** in recent years due to their performance in different tasks such as customer service and programming, especially within enterprise environments. However, hallucination is one of the known weaknesses of LLMs, especially when responding to questions with specific contexts they were not trained on. This study explores the design, implementation, and adoption of a context-aware, LLM-based chatbot intended to support employees of software and IT companies in their daily tasks. While most existing research focused on general-purpose chatbots, this study addresses the gap in understanding how chatbots can be specifically designed for task-oriented use cases. Aligned with the socio-technical perspective of information systems, this study integrates technical development with user experience, ethical concerns, and organizational fit. A user-centered design approach was employed, guided by Design Thinking methodology, and evaluated through UTAUT2 framework. Users' needs were gathered through a Future Workshop and semi-structured interviews. The findings reveal that chatbots are especially helpful for onboarding, retrieving internal information, and answering routine questions. The study also identified limitations of current chatbots in workplace environments, including a lack of contextual awareness, privacy concerns, and high infrastructure costs. Two different chatbot prototypes were developed, one cloud-based and one locally deployed. The locally deployed Retrieval-Augmented Generation (RAG)-based chatbot was perceived as more secure, accurate, cost-efficient, and practical for enterprise use by users. This study sheds light on the design and adoption of domain-specific chatbots in technical workplace environments.

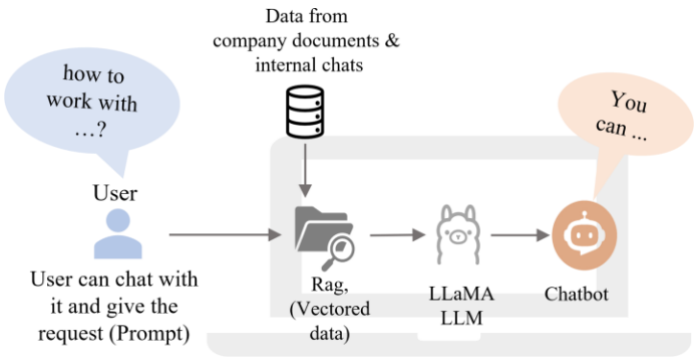

Figure 1 Locally deployed AI chatbot architecture

Through a user-centered approach, Design Thinking, and integration of the UTAUT2 model, the research identified key use cases, such as assistant for facilitating onboarding process, information retrieval, and support for routine tasks, where chatbots can offer real value. Also challenges and technical requirements are explored for effective chatbot adoption. The

This work © 2025 by the authors is licensed under CC BY 4.0

research also explored critical barriers to adoption, including limited context-awareness in general AI tools, data privacy concerns, and high deployment costs. Hence, the integration of a RAG framework into an LLM-based chatbot was selected as one of the most effective solutions. RAG was chosen due to its advantages over finetuning methods. Unlike fine-tuning which involves retraining the model and adjusting internal parameters, RAG is a non-parametric method that retrieves relevant documents and includes them in the model's prompt. This makes RAG more cost-effective, flexible, and easier to update. It is suitable for long-tail queries, scenarios with limited training data, and making a context-aware AI chatbot. It retrieves relevant external information (company data and documents) from a knowledge base and incorporates it into the prompt at runtime (Soudani et al., 2024; Dean et al., 2023).

Two AI chatbots were developed and tested. The initial prototype was created based on empirical findings during the Future Workshop (including user needs, challenges, and suggested features) and was later refined by incorporating user concerns and feedback collected during follow-up sessions, observations during testing, and interviews. Prototype version 1 (V1) was developed as a proof of concept and minimum viable product. This version was hosted on Azure Cloud and based on OpenAI's LLM (GPT-4). Prompt Flow was used to support multi-turn conversations. While prototype V1 was functional and user-friendly, its reliance on Azure brought concerns about cost, privacy, and infrastructure compatibility. Prototype version 2 (V2), presented in Figure 1, addressed these limitations through a fully local deployment. This solution aligned with user values and was seen as scalable and suitable for real-world enterprise environments. Prototype V2 is designed to be runnable locally on employees' laptops to reduce concerns regarding privacy, cost, and security. Initially, the RAG system was implemented, and then the LLAMA model was used instead of GPT-4 to enable fully local operation and make it more cost-effective. This enables employees to freely use their local documents as input to the RAG system instead of uploading them to the cloud, which might be a concern when it comes to highly confidential documentation. The final chatbot was evaluated by users (engineers and employees in the software and IT sector) during interviews with live demos and testing sessions. Feedback from participants underscored its practical benefits in streamlining workflows, enhancing the employee experience, and facilitating information retrieval. These findings demonstrate that domain-specific, context-aware, on-premise AI chatbot can play a meaningful role in enterprise environments when thoughtfully designed to align with real-world needs.

REFERENCES

Dean, M., Bond, R. R., McTear, M. F., & Mulvenna, M. D. (2023). ChatPapers: An AI chatbot for interacting with academic research. *2023 31st Irish Conference on Artificial Intelligence and Cognitive Science (AICS), Letterkenny, Ireland*, 1–7. https://doi.org/10.1109/AICS60730.2023.10470521

Soudani, H., Kanoulas, E., & Hasibi, F. (2024). Fine tuning vs. retrieval augmented generation for less popular knowledge. In *Proceedings of the 2024 Annual International ACM SIGIR Conference on Research and Development in Information Retrieval in the Asia Pacific Region* (pp. 12–22). ACM. https://doi.org/10.48550/arXiv.2403.01432

This work © 2025 by the authors is licensed under CC BY 4.0

TOWARDS A THEORY OF DIGITAL TRANSFORMATION

Darek Haftor[1]*, Soumitra Chowdhury[2]

[1]*Department of Informatics & Media, Uppsala University, Sweden, darek.haftor@im.uu.se*
[2]*Department of Informatics, Linnaeus University, Sweden, sochaa@lnu.se*
(*Main presenter and corresponding author)

ABSTRACT

The concept of digital transformation (DT) has increasingly become topical in scholarly and business circles, though initially considered a vague or business IT-enabled change buzzword (Li et al., 2017; Majchrzak et al., 2016; Vial, 2019). Critics argue that the term merely rebrands traditional concepts in new jargon, while others see it as a fundamentally new process that includes shifts in value propositions, organizational identities, or stakeholder roles. This ongoing ambiguity reflects wider tensions in research between rigor and relevance, especially within the field of information systems (Vial, 2019). Even though only 30% DT projects succeeded in the previous decades (Boston Consultancy Group, 2020), organizations keep investing an enormous amount of money on such projects. Therefore, we argue that scholars have an academic duty to study this phenomenon. We propose a theory-informed framework to better comprehend DT, especially when it aims to generate economic value.
Essentially, digital transformation is not all about implementing new technology in an organization. Rather, it is about a shift in human activity systems that include digital technology with the explicit aim of creating economic value. The proposed framework relies on a multi-theory approach deriving from five established theories: cultural-historical activity theory (CHAT), business model theory, stakeholder theory, multimodal theory, and socio-cultural evolutionary theory.

Cultural-historical activity theory is the conceptual framework for DT. Emerging out of developmental psychology and grounded in critical realism (Allen et al., 2013), CHAT considers human affairs as activity systems. An activity system has actions, tasks, subjects, tools, rules, community structures, and goals. These constitute consistent patterns of action that endure in the long term but may also change when contradictions arise—whether between actors and rules, tools and work, or between internal and external expectations (Sannino & Engeström, 2000). In CHAT, change does not just equal transformation, it means a change in the structure of the activity itself, synchronically (how it functions at the moment) and diachronically (how it evolves over time). The notion of contradiction is particularly vital as an agent of change, providing the underlying explanation for how activities transform or restructure themselves.

Within DT, CHAT places digital technologies in the role of tools within activity systems that facilitate and reconfigure activities in the sense of how they are performed. However, CHAT itself does not explain how the changes create economic value. To address this void, our framework synthesizes the business model construct (Amit & Zott, 2001; Zott & Amit, 2007), which accounts for value creation through activity systems that are linked by mechanisms

This work © 2025 by the authors is licensed under CC BY 4.0

such as novelty, efficiency, complementarity, and lock-in. Business models focus not only on the internal dynamics of a focal organization but also on the external ecosystem of agents involved in co-producing value. Though business model theory has merit, it is not detailed at the level of internal configuration and restructuring of activities and so is complementary to, though cannot substituted with CHAT.

Our framework also utilizes stakeholder theory towards a deeper understanding of actors' interests and roles within an activity system. Historically deployed on an organizational basis, stakeholder theory highlights how different stakeholders—either internal or external—share different interests, values, and motivations (Freeman, 1984; Parmar et al., 2010). Where stakeholder theory is deployed on a level of activity systems rather than entire organizations, it becomes clearer how different stakeholders influence, and are influenced by, digital developments. This move further clarifies that DT does not merely affect organizations as blocks but operates on specific groups, practices, and individuals.

To account for the diversity of stakeholder motivations and values, our framework draws on multimodal theory (Basden, 2011; Dooyeweerd, 1955–58), which adopts a more diverse approach to classify and interpret human values. This theory posits that people act according to distinct modalities such as economic, ethical, aesthetic, and juridical norms. These modalities influence how people respond to change. A transformation that improves economic efficiency might simultaneously be seen as eroding social cohesion or undermining fairness. Multimodal theory helps to surface and navigate these layered value conflicts.
Lastly, socio-cultural evolutionary theory (Mesoudi, 2011; Nelson et al., 2018) provides a dynamic context for DT by placing it within an extended co-evolution process. Activities, technologies, institutions, and values co-evolve under the influence of historical contingencies, social norms, and mechanisms of learning. Such an understanding rejects the common assumption of DT as a single project with clear start and end points. Instead, it illustrates transformation as ongoing and perpetual, though specific phases can be more readily identified than others.

By integrating these theoretical models, we theorize digital transformation as a phase in the overall socio-cultural development of an activity system. It entails the diffusion of digital technology that changes the shape and structure of an activity in order to stimulate one or more of the economic value creation mechanisms: novelty, efficiency, complementarity, or lock-in. Not all digital adoption is DT. DT must result in a structural transformation of the activity system with the aim of value creation. This distinction allows us to separate digital transformation from other kinds of organizational change or IT rollout that may not aim or achieve such results.

A practical example of this framework is the evolution of the music industry. The shift from physical sales of CD to streaming platforms illustrates how digital tools enabled new value mechanisms (novelty, efficiency), transformed activity systems (e.g., distribution and consumption), and involved conflicting stakeholder values (e.g., artist compensation vs. consumer convenience). Importantly, this transformation was evolutionary, building on earlier disruptions such as digital downloads, rather than being a one-off shift.
In conclusion, this integrated theory of digital transformation helps researchers and practitioners better analyze when and how technology-driven change becomes a true transformation of value-producing activity systems. By grounding the discussion in multiple theoretical traditions, the framework allows for more precise distinctions between surface-

This work © 2025 by the authors is licensed under CC BY 4.0

level digital change and deep, structural transformation. In the future, we will examine this framework in case studies to determine its explanatory strengths.

Keywords: Digital transformation, CHAT, Activity theory, Stakeholder theory, Multimodal theory, Value creation

REFERENCES

Allen, D. K., Brown, A., Karanasios, S., & Norman, A. (2013). How should technology-mediated organizational change be explained? A comparison of the contributions of critical realism and activity theory. *MIS Quarterly*, 37(3), 835–854.

Amit, R., & Zott, C. (2001). Value creation in e-business. *Strategic Management Journal, 22*, 493–520.

Basden, A. (2011). Enabling a Kleinian integration of interpretivist and socio-critical IS research: The contribution of Dooyeweerd's philosophy. *European Journal of Information Systems, 20*, 477–489.

Boston Consulting Group. (2020). *Flipping the odds of digital transformation success, https://www.bcg.com/press/29october2020-companies-can-flip-the-odds-of-success-in-digital-transformations-from-30-to-80?utm_source=chatgpt.com*

Dooyeweerd, H. (1955–58). *A New Critique of Theoretical Thought* (Vol. I–IV). Presbyterian and Reformed Publishing Company.

Engström, Y. (2000). Activity theory and the social construction of knowledge: a story of four umpires. *Organization, 7*(2), 301–310.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach.* Boston: Pitman.
Li, L., Su, F., Zhang, W., & Mao, J. Y. (2017). Digital transformation by SME entrepreneurs: a capability perspective. *Information Systems Journal, 28*(6), 1129–1157.

Majchrzak, A., Markus, M. L., & Wareham, J. (2016). Designing for digital transformation: lessons for information systems research from the study of ICT and societal challenges. *MIS Quarterly, 40*(2), 267–277.

Mesoudi, M. (2011). *Cultural evolution: How Darwinian theory can explain human culture and synthesize the social sciences.* University of Chicago Press.

Nelson, R. R., Dosi, G., Helfat, C. E., & Winter, S. G. (2018). *Modern evolutionary economics: An overview.* Cambridge University Press.

Parmar, B. L., Freeman, R. E., Harrison, J. S., Wicks, A. C., Purnell, L., & de Colle, S. (2010). Stakeholder Theory: The state of the art. *The Academy of Management Annals, 4*(1), 403–445.

Sannino, A., & Engeström, Y. (2018). Cultural-historical activity theory: founding insights and new challenges. *Kul'turno-istoricheskaya psikhologiya = Cultural-Historical Psychology, 14*(3),

This work © 2025 by the authors is licensed under CC BY 4.0

43–56. https://doi.org/10.17759/chp.2018140304

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *Journal of Strategic Information Systems, 28*, 118–144.

Zott, C., & Amit, R. (2007). Business model design and the performance of entrepreneurial firms. *Organization Science, 18*, 181–199.

This work © 2025 by the authors is licensed under CC BY 4.0

Digital Working Life

Digital working life centers on how digitalization changes and influences work. The abstracts that follow address how digital technology is applied and negotiated in work environments, and how digital technology transforms public and private organizations.

This work © 2025 by the authors is licensed under CC BY 4.0

DIGITAL TRANSFORMATION OF COMPETENCE SUPPLY IN THE SWEDISH PUBLIC SECTOR: USING COMPETENCE EFFICIENTLY WITH MICRO-CREDENTIAL FRAMEWORKS

Jonas Bäckelin

Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, jonas.backelin@outlook.com

ABSTRACT

There is no ultimate solution for upskilling and reskilling in the Swedish public sector, but the approach of micro-credentials for professional development has been suggested as a potential European strategy for competence supply (European Commission, 2022). Mark Brown (2021) argues that a digitally enabled ecosystem of micro-credential frameworks can support portable, stackable and flexible accreditations. The strategy *Använd kompetensen rätt* (eng. Use Competence Efficiently) from the Swedish Association of Local Authorities and Regions (SALAR, 2024a) has been adopted by the municipal executive committee as one of three main areas from 2024 to 2026 to ensure future competence supply. It emphasizes the importance of effectively optimizing the use of employees' skills and competencies within local government and regional organizations.

This qualitative study explores the benefits and challenges of implementing micro-credential frameworks as a tool for strategic competence supply in the public sector. Group interviews formed the basis for identifying prioritized categories that may help realize the potential of micro-credentials in the Swedish public sector. The aim of the selective coding was to relate the perceived benefits and challenges to three pre-established frameworks: the six strategies in the European Commission's approach to micro-credentials, the three core features of micro-credential frameworks as defined by Mark Brown, and the Swedish Association of Local Authorities and Regions strategy Use Competence Efficiently. The interview method followed a collaborative program logic model, where participants from the same organization used digital sticky notes on a shared digital whiteboard. In the first step, each participant identified potential use cases; in the second, the group clustered and labeled the categories; and in the final step, participants outlined potential barriers or risks to implementation (Hasson & von Thiele Schwarz, 2023).

Theoretical sampling guided the selection of participants across three rounds of group interviews. Data collection began in 2024 with key stakeholders (n=4), followed by pilot participants (n=3), and concluded in 2025 with early adopters of digital credentials (n=3). In the first round [R1], stakeholders from the national initiative *Yrkesresan* (The Professional Journey) identified key benefits and barriers for professional development (SALAR, 2024b). In the second round [R2], pilot participants from *Kompetenspasset* (The Competence Passport) shared their experiences and best practices (RISE, 2021). The third round [R3] involved early adopters who recommended how digital credentials can support competence supply in the Swedish public sector.

This work © 2025 by the authors is licensed under CC BY 4.0

While theoretical coding is traditionally associated with inductive grounded theory, in this study it was applied deductively to relate participant-generated categories to three pre-existing frameworks. According to Saldaña (2021), theoretical coding helps researchers identify core themes by linking categories into conceptual framework. This is a process that benefits from data saturation across diverse perspectives. Commonalities between categories were analyzed using selective coding, guided by a theory-informed qualitative approach. The constant comparative method was used to identify patterns and differences in the data, allowing for the refinement of categories through a co-constructive process between researcher and participants. Table 1 summarizes the potential relationships between categories identified across the three interview rounds, reflecting both participant consensus and researcher interpretation.

The findings from the first round [R1] showed that three of the six European strategies aligned with the barriers and benefits reported by the stakeholders (see Table 1). When the pilots in the second round [R2] were asked to elaborate on these three themes, their recommendation was "The validation process should include submitting a self-evaluation as well as documentation of acquired knowledge", "Reskilling and upskilling start with matching the available training with the demands of skills in the organization" and "To address the emerging skills in society and bridge the gap between formal education and employment, micro-credentials should be used to support flexible learning pathways". These responses were interpreted as aligning with the three core features of micro-credential frameworks mentioned by Mark Brown (see Table 1).

Result from the third round [R3] indicate that the most prioritized participant-generated categories from the three groups [G1-3] are "Adapting pedagogical design to the organizational context", "Building trust and reliability in micro-credentials" and "Organizing competences within skill frameworks linked to work assignments". Group 1 [G1] also emphasized that combining in-service training with incremental steps tied to work tasks should be visualized as progress and used to support career development. They proposed a strategy that allows employees to choose their learning paths and includes recognition of prior learning (RPL). Group 2 [G2] argued that without trust in the assessment criteria, there is no reliable foundation for quality improvement or goal setting. They stressed the need for alignment with national qualification frameworks to ensure interoperability. Group 3 [G3] highlighted that return on investment (ROI) in professional development requires measurable outcomes and proposed that industry recognition clusters define sector-specific skill frameworks and learning pathways. This strategy underscores that matching employees' abilities with appropriate tasks and roles leads to improved efficiency and job satisfaction. The first group [G1] also prioritized "Mapping and Management of Skills" and emphasized the validation of informal and workplace-acquired skills. This represents a competence supply strategy where traditional grades are replaced by performance-based assessments. During the second group interview [G2] another prioritized area was the "Potential of Interoperability" to transfer skills across contexts, enabling internal mobility and portability between employers. They also mentioned the Swedish Qualifications Framework (SeQF) to strengthen the credibility of skill validation, and highlighted how micro-credentials can enhance the visibility of existing competencies within the organization. The third group [G3] argued that their main strategy for competence supply with micro-credentials was "Retention of a Skilled Workforce". Improved work quality was seen as motivating, and documented skills could be used to identify candidates for cross-functional teams. The

This work © 2025 by the authors is licensed under CC BY 4.0

alignment between micro-credential frameworks and the SALAR strategy was moderate, likely due to its origin in 2018, before micro-credentials became widely adopted.

This study suggests that micro-credential frameworks can support more efficient competence supply in the Swedish public sector. A possible interpretation is that realizing the potential of micro-credentials should begin with a tailored skills framework, structured into incremental steps and aligned with flexible learning pathways. In parallel, co-creation with industry recognition clusters should ensure that pedagogical design is contextualized and linked to real work tasks. Given the limited empirical scope, the study cannot establish strong connections between the European strategy, micro-credential frameworks, and the SALAR strategy. However, Table 1 outlines potential relations that would benefit from further investigation in future research.

European strategy [R1]	Micro-credential frameworks [R2]	Use Competence Efficiently [R3]
Transparent Learning outcomes will have been assessed against transparent and clearly defined criteria.	**Portable** Allows internal mobility and portability between different employers.	**Collaborate and share expertise** Sharing expertise across units, administrative, municipal and regional boundaries contribute to both operational development and skills supply.
Qualification framework Underpinned by quality assurance following agreed standards in the relevant sector or area of activity.	**Stackable** Unbundled and stackable accreditations.	**Review of the working methods** To review what tasks are done, who performs the tasks and how the work is carried out, and to gather skills in teams with the aim of using the skills better.
Market needs Designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural or labour market needs.	**Flexible** Support flexible learning pathways.	**Promote development and transformation** To work strategically with career paths, skills development and transition, and to create participation, which increases both motivation and commitment when employees' skills are used in the best way.

Table 1. The possible relations between the European strategy for micro-credentials, micro-credential frameworks and the SALAR strategy Use Competence Efficiently.

Keywords: Digital transformation, micro-credentials, competence supply, public sector, qualification frameworks, performance-based assessment

REFERENCES

Brown, M., Nic Giolla Mhichíl, M., Beirne, E., & Mac Lochlainn, C. (2021). The global micro-credential landscape: Charting a new credential ecology for lifelong learning. Retrieved April26, 2025, from https://oasis.col.org/server/api/core/bitstreams/9fbe0044-c5f8-4c62-90f8-f75b223f43af/content

Hasson, H., & von Thiele Schwarz, U. (2023). *Implementeringsboken: Så inför du nytt som gör nytta*. Natur & Kultur.

RISE (2021) Kompetenspasset (eng. The Competence Passport). Research Institutes of Sweden Retrieved April 27, 2025, from https://www.ri.se/sv/expertisomraden/projekt/kompetenspasset

This work © 2025 by the authors is licensed under CC BY 4.0

SALAR (2024a). Använd kompetensen rätt (eng. Use Competence Efficiently). Swedish Association of Local Authorities and Regions. Retrieved April 28, 2025, from https://skr.se/skr/arbetsgivarekollektivavtal/personalochkompetensforsorjning/kompetensfors orjningstrategier/anvandkompetensenratt.79791.html

SALAR (2024b). Yrkesresan – satsning på kompetensutveckling (eng. The Professional Journey). Swedish Association of Local Authorities and Regions. Retrieved April 28, 2025, fromhttps://skr.se/skr/integrationsocialomsorg/socialomsorg/nationellkunskapsstyrningsocialtjanst/verksamhetsutvecklingochledarskap/yrkesresan.32120.html

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). SAGE Publications. ISBN-13: 978-1529731743

This work © 2025 by the authors is licensed under CC BY 4.0

FROM CLASSROOM TO CROSS-BORDER INNOVATION: ADVANCING DIGITAL FORESTRY THROUGH INTERNATIONAL ACADEMIC COLLABORATION

Raúl Morales Salcedo[1]*, Norma Elizondo Hubbard[2], Juan Manuel Cuevas Gaytán[3] and Rodrigo Eguiluz Ortiz Durán[4]

[1,2,3,4]*Computer Science Department, Faculty of Engineering, University of Monterrey, Mexico, raul.moraless, norma.elizondo, juan.cuevasg, 26odrigo.eguiluz @udem.edu*

(*Main presenter and corresponding author)

ABSTRACT

Forest management faces critical challenges in the digital age, where traditional manual methods struggle to provide the accuracy, efficiency, and scalability required for sustainable resource management. Current practices relying on human-dependent measurements and fragmented software tools introduce inconsistencies, while existing algorithms often fail to adapt across diverse forest ecosystems. These limitations hinder precise forest inventories, carbon sequestration tracking, and biodiversity conservation efforts. This research addresses these pressing issues through an innovative international collaboration between the University of Monterrey (Mexico) and Linnaeus University (Sweden), combining Sweden's forestry expertise with Mexico's technological capabilities to develop advanced computational solutions for modern forestry challenges.

The primary objectives of this study were threefold: to develop robust algorithms for individual tree identification across different forest biomes, to create an integrated system for processing and visualizing LiDAR forest data, and to establish a replicable model for international academic collaboration in environmental technologies. The research specifically investigated which clustering and deep learning approaches (including DBSCAN and CNNs) could optimize tree identification accuracy while maintaining computational efficiency, how to improve algorithmic generalization across diverse forest structures, and what methodological frameworks best support knowledge transfer between international research teams working at the intersection of technology and ecology.

The methodology employed a phased, interdisciplinary approach that bridged computer science and forestry expertise. Initial prototype development at the University of Monterrey created a foundational LiDAR processing pipeline using density-based clustering and Agile development frameworks. This technical foundation was then enhanced through a research exchange at Linnaeus University, where Swedish forestry datasets and expert input transformed the system into an operational tool. The final phase involved cross-regional validation, testing the hybrid segmentation approach in both Mexican and Swedish forest ecosystems while optimizing computational efficiency through advanced compression techniques. The research utilized real-world LiDAR datasets collected from both countries, processed through a modular pipeline incorporating noise removal, metadata extraction, and interactive visualization components.

This work © 2025 by the authors is licensed under CC BY 4.0

Major findings demonstrate significant advancements in digital forestry capabilities. The developed system achieved a 25% improvement in processing efficiency through optimized pipeline architecture and LASzip compression techniques. The hybrid segmentation approach combining DBSCAN clustering with convolutional neural networks showed superior performance in cross-biome generalization compared to single-algorithm solutions. The web-based visualization interface successfully bridged the gap between computational outputs and practical forestry applications, enabling field verification by forest engineers. Perhaps most importantly, the project established a proven protocol for international academic collaboration in applied environmental technologies, demonstrating how complementary expertise from different institutions and countries can be effectively integrated to solve complex ecological challenges.

The implications of this research extend across scientific, educational, and practical domains. Scientifically, it contributes benchmark performance metrics for tree segmentation algorithms and provides open-access datasets for cross-biome computational forestry research. Practically, the developed tools enhance precision in carbon stock assessments and sustainable harvest planning while reducing operational costs through automation. Educationally, it creates a blueprint for transnational project-based learning in STEM disciplines and develops workforce competencies at the critical technology-environment interface. The success of this collaboration argues strongly for increased investment in structured exchange programs for environmental technology research, joint international funding mechanisms for sustainability science, and standardized frameworks for ecological AI applications.

This research makes three primary contributions to the field of digital forestry and international academic collaboration. First, it demonstrates how strategic partnerships between institutions with complementary expertise can accelerate innovation in environmental technologies. Second, it provides a validated methodological framework for developing AI solutions that must operate across diverse ecological contexts. Third, it establishes that classroom-based research initiatives can indeed evolve into impactful, real-world solutions when properly structured and supported. The project's outcomes suggest that similar collaborative models could be effectively applied to other global environmental challenges, from biodiversity monitoring to climate change mitigation strategies. Future research directions include expanding machine learning modules for species-level classification, developing mobile deployment platforms for field applications, and establishing an international research consortium to advance forest digitalization technologies.

Keywords: international research collaboration, sustainable forest management, point cloud processing, environmental technology transfer, academic partnership, cross-border education

This work © 2025 by the authors is licensed under CC BY 4.0

FARMER.CHAT: GENAI, LEARNING AND AGRICULTURAL ADVICE FOR SMALLHOLDER FARMERS

Christopher High[1]*, Namita Singh[2] and Gusztáv Nemes[3]

[1]*Social Studies, Social Science, Linnéuniversitet, Sweden, chris.high@lnu.se*
[2]*Digital Green, India, namita@digitalgreen.org*
[3]*HUN-REN KRTK, Hungary,nemes.gusztav@krtk.hun-ren.hu*
(*Main presenter and corresponding author)

ABSTRACT

The agricultural sector in the Global South faces mounting challenges including climate volatility, biodiversity loss, and persistent rural poverty. Smallholder farmers, who constitute the majority of agricultural producers in the world, often operate under severe structural constraints with limited access to timely, relevant, and personalized agricultural knowledge. Traditional agricultural extension systems, while historically vital, are increasingly unable to meet the demands of these farmers due to resource limitations and systemic inefficiencies. In response, digital innovations—particularly those leveraging artificial intelligence (AI)—are being explored as potential solutions to bridge this advisory gap.

This paper presents a case study of Farmer.Chat, a generative AI-powered agricultural advisory platform developed by Digital Green in collaboration with Microsoft Research. Farmer.Chat is designed to deliver personalized, multilingual, and multimodal agricultural advice to smallholder farmers in real time. It employs a Retrieval-Augmented Generation (RAG) architecture that integrates curated, locally vetted knowledge bases with large language models (LLMs) to generate context-specific responses. The platform has been deployed in India, Kenya, Nigeria, and Ethiopia, and is tailored to support users with low literacy and limited digital experience through voice, text, and image-based interactions.

The study situates Farmer.Chat within the broader theoretical framework of Agricultural Knowledge and Innovation Systems (AKIS), drawing on typologies of learning that distinguish between individual and social learning, and between knowledge-first, farmer-first, and interactive orientations. Using this framework, the paper critically examines how AI-enabled tools can support not only information dissemination but also deeper, transformative learning processes among smallholder farmers.

Methodologically, the research adopts a mixed-methods approach. Quantitative data include platform analytics from over 300,000 user queries across 15,000 users, measuring query complexity, response accuracy, and system performance. Qualitative data were gathered through focus group discussions, in-depth interviews, usability tests, and shadowing sessions with farmers and extension agents in Kenya.

These data were analyzed to assess user experience, trust dynamics, and the learning implications of AI-mediated advisory systems.

This work © 2025 by the authors is licensed under CC BY 4.0

Findings indicate that Farmer.Chat significantly enhances the reach and responsiveness of extension services. Its multilingual and multimodal interface lowers barriers to access, particularly for women and marginalized users, and enables farmers to receive timely, localized advice. Extension agents report reduced workloads, allowing them to focus on complex problem-solving rather than routine queries. However, the study also identifies critical limitations. The platform's current design emphasizes individualized, one-way communication, with limited mechanisms for feedback, co-creation, or collective learning. While farmers can rate responses, active engagement with feedback features remains low, and the system struggles to incorporate farmer-generated knowledge or adapt dynamically to local innovations.

The paper argues that these limitations reflect a broader ethical concern: the risk that AI systems, if not carefully designed, may reinforce top-down, extractive models of knowledge dissemination. To counter this, the authors advocate for AI systems that are embedded within trusted social and institutional systems, and that prioritize participatory, relational, and adaptive learning. Farmer.Chat's success is attributed in part to Digital Green's longstanding participatory ethos and its integration into existing community networks, including lead farmer models and self-help groups.

In conclusion, Farmer.Chat demonstrates the potential of generative AI to transform agricultural extension by enhancing access, personalization, and efficiency. However, realizing its full promise requires a shift from information delivery to learning facilitation—supporting not just better farming practices, but also farmer agency, innovation, and co-creation. The paper calls for a reimagining of AI in agriculture: not as a replacement for human expertise, but as a tool to amplify participatory, inclusive, and trust-based knowledge systems.

Keywords: GenAI, Agricultural extension, Smallholder farmers, Social learning, Participatory technologies

This work © 2025 by the authors is licensed under CC BY 4.0

DIGIPLATFORM AS AN INTEGRATION SOLUTION FOR THE UNIVERSITIES DIGITAL TRANSFORMATION AND COLLABORATION SUPPORT

Taras Panchenko[1]* and Kseniia Smyrnova[2]

[1]*Theory and Technology of Programming, Faculty of Computer Science and Cybernetics, Taras Shevchenko National University of Kyiv, Ukraine, taras.panchenko@knu.ua*
[2]*Vice-Rector for Education (International Affairs), Taras Shevchenko National University of Kyiv, Ukraine, kseniia.smyrnova@knu.ua*

(*Main presenter and corresponding author)

ABSTRACT

The Digital University – Open Ukrainian Initiative (DigiUni) aimed to support higher education in Ukraine during times of war and post-war recovery. DigiUni is the largest (4-year-long) project supported by Erasmus+, which includes 21 institutions as full members and 5 associated partners from Ukraine and EU countries. DigiUni is one of the most significant digital transformation projects in Ukraine, supported by the EU through Erasmus+ within the special window. The project aims to digitalize education and facilitate academic mobility (exchanges). DigiUni proposes to start the process of creating a full-fledged, integrated, sustainable, enriching, inclusive and high-performing digital educational ecosystem in Ukraine.

The problem addressed in this work is twofold. On the one hand, the task was to integrate the course content, various educational artifacts, other learning elements, and the best practices of Ukrainian universities in education, all while facing the wide-scale invasion by russia in 2022. There was a high risk of the destruction of all the accumulated education artifacts and the underlying infrastructure. On the other hand, the task was to organize the education process in this new reality under unexpected and fast-changing circumstances in a sustainable way so that all involved Higher Education Institutions (HEI) will get the platform to continue their work and even get an increment in the functionality allowing them to collaborate in a new, more smooth, way – to achieve the interoperability between their in-house systems and to have higher flexibility in education process organization. The expectations in 2022 ranged from partial damage to hardware, software, and/or infrastructure or partial loss of data – to full loss of all infrastructure and achieved learning results, including any education materials. All members of the consortium are eager to play a role in setting up a high-performing digital education ecosystem of all Ukrainian universities.

After conducting in-depth research on possible solutions, we experimented with various approaches, ranging from a new centralized Learning/Content Management System (LMS) to a distributed solution with an integration "umbrella" system, to arrive at a joint decision for all interested HEIs. The latter, the distributed approach, appears to be the winning solution, which allows for flexibility in interconnection and communication between diverse subsystems while retaining most of the artifacts from the conventional UI/UX for end users. The decentralized nature of this approach also helps to distribute the general workload

This work © 2025 by the authors is licensed under CC BY 4.0

naturally between separate LMS (instances). The Moodle LMS was chosen as a software platform for development because it is the most used specialized professional (also free and well-supported by the community) platform for education in Ukraine. This decision appears to be the most efficient for all members of the Ukrainian universities consortium, taking into account 1) familiarity and positive experience with Moodle, 2) stability and continuous development of the Moodle platform, 3) available expertise of Ukrainian specialists in the technologies, and 4) time to delivery. It is currently under development, led by the Taras Shevchenko National University of Kyiv, the leading institution and coordinator of the DigiUni project and the top-ranked HEI in Ukraine.

There were many challenges on the way to achieving the project aim: we had too many partners with their specific understandings, goals, and visions of the best solution – so it took a lot of time to communicate, convince, and elaborate on the best solution. Of course, it is rather iterative discussions than smooth one-time decisions. Next, there were lots of discussions challenging the proposed architecture. Still, we have numerous communications with our partners to ensure the solution will be both firm enough to achieve the set goals and flexible enough to be upgraded for custom and upcoming tasks, supporting future development.

The architecture of the solution is two-layered: all the HEI LMSes will be integrated with an "umbrella" interconnection system, which will bridge inter-LMS communications using an LTI-based protocol and enable data interchange for academic mobility accounting between institutions, as well as provide other support functions, such as certificates of mobility generation and reporting. The interconnection between LMSes will enable the smooth exchange of courses and user profiles. The single Sign-on concept will help to simplify the interconnection. The course catalog will be accessible to students on the DigiPlatform, enabling them to plan their academic mobility between the HEI partners of the consortium. Access to MOOCs is provided to all learners on the platform. The shared storage of the DigiUni allows HEIs to save any educational course in a centralized location as a backup version. The developed platform is expected to be hosted in the cloud to prevent power outages in Ukraine and to mitigate other potential risks, such as physical destruction and cyberattacks. In summary, we expect to significantly upgrade the HEIs interconnection via the DigiUni project, based on the DigiPlatform foundation, and also to increase collaboration between HEIs from Ukraine and the EU through the joint development of this project and the use of shared results. One of the main features of the DigiPlatform is its support for academic mobility throughout the entire process, from course selection and application to certificate generation, reporting, and documentation.

Keywords: higher education institution, university digital transformation, learning management system, LMS integration, academic mobility support, DigiUni

This work © 2025 by the authors is licensed under CC BY 4.0

PRACTICING AN ETHICS OF CARE IN DIGITAL TRANSFORMATION RESEARCH

Frida Ivarsson, Ph.D.

Department of Informatics, Linnaeus University, Sweden frida.ivarsson@lnu.se

ABSTRACT

In information systems research, digital transformation (DT) is considered a dynamic, substantial, and ongoing organizational change process, that takes place within as well as across organizational boundaries, when organizations embrace digital technologies in innovative ways (Hanelt et al., 2020; Wessel et al., 2021; Wiener et al., 2025). Generally, studying processes requires a longitudinal research design and oftentimes a close engagement with the context of study from the researchers involved (Langley et al., 2013). Given its processual nature, researching DT is therefore resource intensive and depends on a significant research commitment.

Unfortunately, DT researchers rarely disclose their experiences of researching this topic (Davison et al., 2022). Consequently, the DT literature lacks a knowledge base on common ethical dilemmas that researchers face when doing DT research and insights on how those dilemmas can be navigated (Vial, 2019). Typically, ethical considerations tend to center on procedural elements, such as securing ethical approval, ensuring informed consent, or warranting data confidentiality. These aspects are important, but, as argued here, insufficient to address all ethical dilemmas that may emerge in DT research.

Therefore, this extended abstract suggests that DT research can benefit from incorporating an ethics of care into the research process. This approach takes guidance from the values of attentiveness, responsibility, nurturance, and compassion in research, and focuses on enacting those values to tend to the needs of others (Tronto, 2020). The view on "others" in ethics of care is broad, and open for considering other (groups of) people, objects, and nature (ibid.). In this way, an ethics of care focuses on relationships with others, and is thereby distinguished from, for example, virtue ethics that centers on individual character (Held, 2005). Instead, it foregrounds the researchers' relations that form while conducting the research.

An ethics of care also ties well to the view of ethics as a practice that is enacted through the research method (Markham, 2018). This view departs from that unforeseen ethical dilemmas likely will emerge in research (Mertens, 2013). Such dilemmas are oftentimes difficult to resolve only through predefined laws, rules, frameworks, although these should serve as guidelines when making situational judgments on what is the right thing to do in a specific situation (Markham et al., 2018). Here, the values emphasized in an ethics of care makes a helpful complement to those.

I learnt of the importance of practicing an ethics of care in DT research during an approx. 5-year longitudinal case study of a company's DT in the Swedish forest industry where I used an engaged scholarship approach (Van de Ven, 2007). I spent 86 days in the field and used

This work © 2025 by the authors is licensed under CC BY 4.0

various qualitative methods for generating a rich data set, including focus groups, interviews, and participatory observations. During the research, several situations surfaced the need for relational responsibility and situational judgment. When wrapping up the fieldwork, I reflected on these moments through vulnerable writing (see Ivarsson, 2023), an autoethnographical exercise based on self-reflection and self-disclosure (Schultze, 2000). This led me to the ethics of care literature that helped me make sense of my experiences. Thereby, the importance of ethics of care emerged as a learning rather than an initial methodological commitment. I noticed that I had practiced care in two ways: *caring for organizational members* and *caring for environmental consequences*.

Caring for organizational members in DT research means being attentive and responsive to prevent harms of research participants during the research. This is especially important given the complex power dynamics in politically layered organizational contexts where some groups are less empowered than others (Buchanan & Bryman, 2007). Two situations illustrate this need. In the first situation, ambiguities and politically charged discussions emerged about the evolving role of "forest buyers" during the company's DT. To care for this group, we collaboratively explored how their expertise could remain valuable in new ways and be expanded as part of the organization's DT in focus groups that I organized together with members from top management.

In the second situation, discussions around gender imbalances emerged as part of the organization's process of generating digital content on social media. These discussions represented important data to understand how DT unfolded. To make use of these data, I needed to care for both the woman employee who raised the issue and for myself as a woman researcher. This required treating informed consent as ongoing, by ensuring the employee's consent on several occasions, such as before analyzing and publishing these politically-laden data (Mertens, 2013). I also had to assess whether it was safe for me to seek organizational support for including these data in the analysis. I worried (for no reason, it showed) that it might harm my relationship with the organization if I did, even though my gender hadn't negatively affected the research process before that.

Caring for environmental consequences in DT research means being attentive and responsive to prevent harm to nature during the research. This is challenging, since digital applications can produce unintended harms to complex ecological systems (Crawford, 2021) or may both benefit and damage nature in different ways at the same time (Bohnsack et al., 2021). In one focus group, I co-developed a digital application intended to help forest owners optimize carbon uptake via forestry. While I initially embraced its environmental promise, I later questioned my limited understanding of its broader ecological and social impacts. The research coincided with debates in Sweden about forestry's role in climate change mitigation, where some problematized the neglect of biodiversity concerns and lack of consideration for indigenous people's rights. This experience taught me that caring means not only promoting environmentally promising digital innovations but also acknowledging one's current knowledge limits and engaging with contested perspectives in DT research.

This extended abstract has argued that an ethics of care is a vital, complementary ethical practice in DT research. Without it, researchers risk (inadvertently) reinforcing power imbalances, ignoring social inequalities, or contributing to environmental harm. In my DT research, I needed to practice care for organizational members and environmental consequences. However, care might need to be practiced differently in other DT research

This work © 2025 by the authors is licensed under CC BY 4.0

projects. Ultimately, practicing an ethics of care requires context sensitivity and situational judgement in each unique research situation.

Keywords: digital transformation, engaged scholarship, research ethics, ethics as practice, ethics of care

REFERENCES

Bohnsack, R., Bidmon, C., & Pinkse, J. (2021). Sustainability in the digital age: Intended and unintended consequences of digital technologies for sustainable development. *Business Strategy and the Environment*, *31*(2), 599–602. https://doi.org/10.1002/bse.2938

Buchanan, D. A., & Bryman, A. (2007). Contextualizing methods choice in organizational research. *Organizational Research Methods*, *10*(3), 483–501. https://doi.org/10.1177/1094428106295046

Crawford, K. (2021). *The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. Yale University Press. https://doi.org/10.2307/j.ctv1ghv45t

Davison, R. M., Martinsons, M. G., & Wong, L. H. M. (2022). The ethics of action research participation. *Information Systems Journal*, *32*(3), 573–594. https://doi.org/10.1111/isj.12363

Hanelt, A., Bohnsack, R., Marz, D., & Antunes, C. (2020). A systematic review of the literature on digital transformation: insights and implications for strategy and organizational change. *Journal of Management Studies*, *58*(5), 1159–1197. https://doi.org/10.1111/joms.12639

Held, V. (2005). *The Ethics of Care*. Oxford University Press. https://doi.org/10.1093/0195180992.001.0001

Ivarsson, F. (2023). *Frame Shifting and Frame Blending in Digital Transformation*. Doctoral dissertation, Gothenburg University.

Langley, A., Smallman, C., Tsoukas, H., & Ven, A. H. V. de. (2013). Process studies of change in organization and management: Unveiling temporality, activity, and flow. *Academy of Management Journal*, *56*(1), 1–13. https://doi.org/10.5465/amj.2013.4001

Markham, A. N. (2018). Afterword: Ethics as impact—Moving from error-avoidance and concept-driven models to a future-oriented approach. *Social Media+ Society*, *4*(3), 1–11. https://doi.org/10.1177/2056305118784504

Markham, A. N., Tiidenberg, K., & Herman, A. (2018). Ethics as methods: doing ethics in the era of big data research—introduction. *Social Media+ Society*, *4*(3), 1–9. https://doi.org/10.1177/2056305118784502

Mertens, D. (2013). Ethical Use of Qualitative Data and Findings. In U. Flick (Ed.), *The Sage Handbook of Qualitative Data Analysis* (pp. 510–523). Sage.

Schultze, U. (2000). A confessional account of an ethnography about knowledge work. *MIS Quarterly*, *24*(1), 3–41. https://doi.org/10.2307/3250978

This work © 2025 by the authors is licensed under CC BY 4.0

Tronto, J. C. (2020). *Moral Boundaries*. https://doi.org/10.4324/9781003070672

Van de Ven, A. H. (2007). *Engaged scholarship: A guide for organizational and social research*. Oxford University Press.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144. https://doi.org/10.1016/j.jsis.2019.01.003

Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Jensen, T. B. (2021). Unpacking the Difference Between Digital Transformation and IT-Enabled Organizational Transformation. *Journal of the Association for Information Systems*, *22*(1), 102–129. https://doi.org/10.17705/1jais.00655

Wiener, M., Strahringer, S., & Kotlarsky, J. (2025). Where are the processes in IS research on digital transformation? A critical literature review and future research directions. *The Journal of Strategic Information Systems*, *34*(2), 101900. https://doi.org/10.1016/j.jsis.2025.101900

This work © 2025 by the authors is licensed under CC BY 4.0

AI IN QUALITATIVE RESEARCH: A METHODOLOGICAL EXPLORATION OF PROMISE AND RISK

Corrado Matta[1*], Susanna Nordmark[2] and Italo Masiello[2]

[1]*Department of Education, Linnaeus University, Sweden, corrado.matta@lnu.se*

[2]*Department of Computer Science and Media Technology, Linnaeus University, Sweden, susanna.nordmark@lnu.se, italo.masiello@lnu.se*

([*]Main presenter and corresponding author)

ABSTRACT

The rapid rise of accessible artificial intelligence (AI) tools, especially large language models (LLMs) such as ChatGPT, has opened new possibilities for qualitative researchers. These tools promise to overcome long-standing challenges in managing and analyzing unstructured data, particularly in large interdisciplinary projects characterized by complex stakeholder involvement. However, they also pose significant risks—both methodological and epistemological—that may undermine core principles of qualitative research. This paper investigates these tensions through a concrete case study of a digital professional development initiative, where researchers applied an integrative analytical approach combining humanistic discourse analysis, text mining, and AI-supported thematic analysis.

The study is situated within the EdTechLnu research group at Linnaeus University, which led a four-year pilot project promoting digital competencies among teachers in collaboration with municipalities, schools, and digital learning material providers. The project generated a rich, multifaceted dataset consisting of interview transcripts, classroom observations, teacher logbooks, and surveys. The central research problem of the case study was to understand the discursive shifts and conceptualizations of digital learning materials (DLMs) as teachers engaged in digital competence development. The objective of the study was twofold: to identify emergent discourses on DLMs and to assess the feasibility, strengths, and limitations of combining traditional and AI-driven methods in qualitative research.

The research employed a triangulated methodology. First, humanistic discourse analysis was used to manually identify discursive patterns and conceptual structures in the teacher interview data. Second, a text mining approach based on topic modeling and sentiment analysis was applied to detect linguistic trends and shifts in the dataset. Finally, an AI-supported thematic analysis was conducted using LLMs to generate themes based on the same interview data. The researchers organized the analytical work so that different team members led each track, ensuring methodological independence before convergence discussions.

Comparison of findings revealed that the discourse analysis and text mining approaches cohered around three conceptualizations: DLMs as pedagogical tools, as effectivization tools, and as boundary objects mediating analog-digital tensions. The AI-supported analysis generated themes aligned with two of these: "Interactive and Dynamic Learning" and "Personalized Learning" corresponded to the pedagogical tools conceptualization, while "Efficiency in Teaching" matched the effectivization discourse. However, the AI failed to

This work © 2025 by the authors is licensed under CC BY 4.0

capture the third discourse—DLMs as boundary objects—highlighting the tool's blind spots in identifying contextual and less statistically dominant themes.

The study found that the strongest insights emerged from methodological triangulation. Coherent outcomes across approaches increased confidence in the robustness of results, echoing robustness analysis logic. Yet, the iterative process also revealed how preliminary insights influenced subsequent analyses, suggesting that methodological contamination through shared assumptions is difficult to avoid. For instance, indications of a hybrid analog-digital discourse identified in AI outputs were later pursued in text mining and manual analysis, potentially reinforcing interpretative convergence through feedback loops rather than independent discovery.

Beyond empirical findings, the study highlights two fundamental risks associated with LLM-supported qualitative research. The first is epistemic conservatism, where AI tools tend to produce the most statistically probable narratives—potentially at the expense of rare but accurate insights. The second is interpretive depletion, where LLMs generate synthesized interpretations based on prior texts, undermining the centrality of human sense-making in qualitative inquiry. Together, these risks represent an existential threat to qualitative research's epistemological integrity. If AI-generated analyses become the norm, qualitative findings risk becoming decontextualized artifacts optimized for typicality rather than truth.

To address these risks, the paper calls for a shift in how AI tools are conceptualized in research. Drawing on Matteo Pasquinelli's "Labor Theory of AI", the authors argue that AI should not be understood as simulating intelligence, but rather as automating aspects of intellectual labor. Under this lens, AI tools are better viewed as procedural devices that replicate archival and translational tasks rather than cognitive judgment. This reframing encourages researchers to adopt AI not as an epistemic authority but as a heuristic aid, and to treat AI outputs as hypothesis-generating rather than conclusive.

In conclusion, the study contributes both substantive and methodological insights. Substantively, it sheds light on how teachers' discourses around digital learning materials evolve in the context of structured digitalization projects. Methodologically, it offers a pragmatic yet critical exploration of how AI tools can be integrated into qualitative research workflows. The results suggest that AI can support theme detection and pattern identification when complemented with traditional methods and critical human interpretation. However, they also underline that blind reliance on AI threatens to erode the distinctiveness of qualitative inquiry. The authors recommend future researchers adopt iterative, reflexive, and multi-method strategies when working with AI in qualitative contexts, ensuring that technological convenience does not come at the cost of interpretive depth or epistemic validity.

Keywords: Artificial Intelligence, Qualitative Research, Discourse Analysis, Large Language Models, Methodological Triangulation, Digital Learning Materials

This work © 2025 by the authors is licensed under CC BY 4.0

e-Health

E-health focuses on the transformation of health through digitalization and the knowledge- and evidence-based application of digital technology in nursing and care. The following abstracts address how digital technology transforms nursing and care and how digitalization can contribute to secure, sustainable and effective nursing and care practices, as well as good and just health among the population.

This work © 2025 by the authors is licensed under CC BY 4.0

DIGITAL PATHWAYS TO HEALTH EQUITY: ADDRESSING HEALTH INEQUALITIES THROUGH DIGITAL SOLUTIONS

Nadeem Abbas[1]*, Chiara Lenza[2], and Marcelo Milrad[3]

[1]*Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, nadeem.abbas@lnu.se,*
[2]*Department of Health and Caring Sciences, Faculty of Health and Life Sciences, Linnaeus University, Sweden, chiara.lenza@lnu.se*
[3]*Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, marcelo.milrad@lnu.se*
(*Main presenter and corresponding author)

Problem and Research Aim

Health inequalities, which refer to unjust and avoidable differences in health status within and between countries, remain a global challenge. According to WHO, these disparities are shaped by the complex social determinants of health, such as economic status, education, and cultural background, influencing health outcomes (Marmot, 2005).

In the EU, these disparities cost an estimated 9.4% of GDP annually. Despite Sweden's strong welfare system, regions like Kronoberg and Kalmar have seen widening health gaps (The Lancet Regional Health – Europe, 2023). Recognizing the ethical and economic urgency of this issue, Sweden adopted a national public health policy in 2018 to eliminate avoidable health inequalities through coordinated, cross-sectoral efforts (Folkhälsomyndigheten, 2021). Digital transformation is increasingly viewed as a critical enabler in this context, offering opportunities to enhance healthcare access and personalization. However, if not inclusively designed, digital tools risk deepening existing disparities, particularly for vulnerable groups such as the elderly and immigrants, who often face barriers to digital literacy, language, and platform usability (World Health Organization, 2022).

To explore how digital tools can help mitigate these inequalities, we formed a transdisciplinary team and launched a seed project in Araby, a socioeconomically disadvantaged area in Växjö Municipality. Supported by Linnaeus University's Knowledge Environment: Digital Transformations, the project brought together experts from health sciences, social sciences, informatics, and computer science to synthesize existing knowledge and generate locally grounded insights.

Method

We followed a mixed-methods approach for the seed project, combining a systematic literature review (SLR) with a semi-structured interview method. We used the SLR to review existing knowledge and performed nine semi-structured interviews to seek and investigate stakeholders' perspectives and experiences regarding health inequalities and the use of digital tools. These interviews were done with key stakeholders from the Region Kronoberg, Växjö Municipality, and civil society organizations, including the Red Cross and Araby Family Center.

This work © 2025 by the authors is licensed under CC BY 4.0

Initial Findings
Initial findings from the literature review revealed a broad range of digital interventions, including telemedicine, eHealth and mHealth platforms, AI-driven analytics, and digital health literacy initiatives designed to address health disparities. Stakeholders' interviews provided valuable local insights that reinforced the findings of the SLR and revealed region-specific concerns, particularly around the usability of digital health platforms, which are often underrepresented in the international literature.

While stakeholders strongly supported digital health solutions, they emphasized the need for inclusive design to ensure these tools do not inadvertently exacerbate existing inequalities. In particular, the complexity and limited usability of platforms such as 1177.se and 1177 Direkt were reported as major barriers for vulnerable groups, especially those facing language and cultural challenges or possessing low digital and health literacy levels. To address these issues, stakeholders recommended simplifying user interfaces, offering multilingual support, incorporating visual aids, and implementing targeted digital literacy programs.

Future Directions
Highlighting the critical role of digital transformation in addressing health inequalities while also cautioning against one-size-fits-all approaches, we aim to expand our research to additional areas within Kronoberg and neighboring regions to enable a comparative analysis of health inequality drivers and digital health needs across diverse local contexts. This will help us identify both common and unique challenges, guiding the development of scalable, adaptable digital health solutions. With this end, our transdisciplinary team will actively engage small and medium-sized enterprises (SMEs) from both regions. As vital contributors to regional innovation, SMEs offer practical insights and expertise essential for designing context-sensitive digital tools. Through a participatory approach—blending stakeholders' engagement, empirical research, and digital innovation—we aim to co-create solutions that are not only technically sound but also socially and culturally attuned. This will support a more equitable and accessible healthcare system. Ultimately, our approach underscores the power of user-centered design and regional collaboration to shape global strategies, demonstrating how locally rooted innovations can scale to meet broader health challenges.

Keywords: health, health inequalities, digital, digital health, digital divide, regional development.

REFERENCES

Folkhälsomyndigheten. (2021). *Towards a good and equitable health: A framework for implementing and monitoring the national public health policy* (Article No. 21273). Public Health Agency of Sweden. https://www.folkhalsomyndigheten.se/publikationer-och-material/publikationsarkiv/t/towards-a-good-and-equitable-health/

Marmot, M. (2005). Social determinants of health inequalities. *The Lancet, 365*(9464), 1099–1104. https://doi.org/10.1016/S0140-6736(05)71146-6

This work © 2025 by the authors is licensed under CC BY 4.0

The Lancet Regional Health – Europe. (2023). Sweden's economic inequality gap is widening and worrying. *The Lancet Regional Health – Europe, 26*, 100610. https://doi.org/10.1016/j.lanepe.2023.100610

World Health Organization. (2022). *Equity within digital health technology within the WHO European Region: A scoping review* (WHO/EURO:2022-6810-46576-67595). WHO Regional Office for Europe. https://iris.who.int/bitstream/handle/10665/365326/WHO-EURO-2022-6810-46576-67595-eng.pdf

This work © 2025 by the authors is licensed under CC BY 4.0

FROM DISRUPTION TO SUPPORT? CO-CREATING E-HEALTH TOOLS FOR SELF-CARE AMONG OLDER ADULTS WITH CHRONIC ILLNESS

Susanna Strandberg

Department of Health and Caring Sciences, Faculty of Health and Life Sciences, Linnaeus University, Sweden, susanna.strandberg@lnu.se

ABSTRACT

Background: The growing aging population and increasing prevalence of chronic illnesses are placing significant pressure on healthcare systems, necessitating greater emphasis on self-care among older adults. While digital transformation and eHealth tools offer potential to enhance healthcare access and efficiency, especially in primary care, older adults with chronic illness are often excluded from these solutions. A clear knowledge gap exists regarding how these individuals experience self-care and how eHealth tools can be effectively co-created and integrated within primary care to enhance self-care practices. Addressing this gap is essential to developing inclusive, sustainable interventions that promote self-care and improve health outcomes.

Aim: The aim of this project was to explore the use and co-creation of eHealth tools in self-care among older adults with chronic illness. **Methods:** An exploratory qualitative design was used in this project. In Phase 1, 24 participants (including patients with chronic illness and their informal carers) were recruited from primary care in Region Kalmar län. Semi-structured telephone interviews were conducted (March–November 2020) to explore experiences with a telemonitoring application used for self-care. Data were analyzed using qualitative content analysis. In Phase 2, four pairs of older adults, recruited from the first phase, participated in co-creating and testing self-care exercises via the video feedback tool "Move Improve." This second phase involved three iterative steps; identifying self-care needs; developing self-care exercises; and testing them at home using think-aloud methods - conducted through workshops and usability tests between March 2021 and March 2022. Reflexive thematic analysis was applied to both inductively and deductively analyzing participant experiences in the second phase.

Findings: eHealth tools, such as telemonitoring applications and video feedback tools, can support self-care by enabling personalized feedback, dynamic interaction, and mutual support, contributing to a sense of safety and connection. However, eHealth tools effectiveness relies heavily on continuous professional guidance and individualized feedback, which help older adults with chronic illness feel seen, supported, and confident. Without adequate follow-up from healthcare professionals or meaningful engagement, these tools may evoke stress, anxiety, or feelings of abandonment. Co-creation of self-care exercises, especially when facilitated by mutual relationships, can strengthen learning, motivation, and long-term sustainability in self-care practice. Older adults with chronic illness emphasized the importance of clarity, progress visibility, and reciprocal communication as key features of an effective eHealth tool.

This work © 2025 by the authors is licensed under CC BY 4.0

Conclusions: eHealth tools can both enhance and disrupt self-care among older adults with chronic illness. Their success depends on sustained engagement, professional support, and co-creative development processes. When older adults are actively involved in the design and implementation of eHealth tools, the solutions become more relevant, empowering, and sustainable. In addition, eHealth has the potential to promote flexible, mutual relationships between older adults and healthcare professionals in primary care. Future research should prioritize co-creation between older adults and healthcare providers, ensuring eHealth tools are adapted to age-related needs and seamlessly integrated into existing care structures.

This abstract synthesizes results previously published in two separate articles (Strandberg et al., 2023; Strandberg et al., 2024).

Keywords: co-creation, eHealth, older adults, primary care, self-care

This work © 2025 by the authors is licensed under CC BY 4.0

OLDER PERSONS' SOCIAL PARTICIPATION, HEALTH AND WELL-BEING THROUGH DIGITAL ENGAGEMENT

Sarfraz Iqbal

Department of Informatics, Faculty of Technology, Linnaeus University, Sweden, Sarfraz.iqbal@lnu.se

ABSTRACT

This scoping review (*Iqbal, Fischl, & Asai, 2025*) synthesizes findings from 38 studies to explore how digital technologies impact social participation, health, and well-being among older adults. It addresses the growing relevance of digital engagement in aging societies.

Background and Rationale: The global demographic shift toward an aging population has introduced critical challenges in supporting the health, social inclusion, and well-being of older adults. As physical and cognitive declines limit traditional forms of social engagement, digital technologies present a promising avenue for sustaining social participation and autonomy among older persons. However, older adults are often marginalized in digital spaces due to barriers such as limited digital literacy, poor infrastructure, and lack of tailored technological solutions. Despite increasing interest in digital engagement for aging populations, the field lacks a comprehensive understanding of older adults' specific needs, the availability and effectiveness of digital tools, and the systemic factors that enable or hinder adoption.

Purpose and Research Objectives: This study aims to identify (1) the digital engagement needs and preferences of community-dwelling older adults, (2) the range of digital technologies available to support their social participation, health, and well-being, and (3) the research frameworks and methodologies employed in studying this phenomenon. The overarching goal is to map the current landscape of digital engagement in aging populations and to propose a conceptual framework that guides future interventions and policy.

Methods: A scoping review methodology was employed, adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The authors conducted systematic searches across three bibliographic databases PubMed, Scopus, and Web of Science retrieving 3312 records published between 2013 and 2024. Following a rigorous screening and eligibility assessment, 38 peer-reviewed studies were included in the final synthesis. Thematic analysis was used to code and categorize the extracted data, focusing on key themes related to older adults' digital engagement, health, and social participation.

Findings: Three major findings emerged: Older adults have diverse and evolving needs encompassing physical and mental health support, emotional well-being, meaningful relationships, digital literacy, and self-management. Technologies that facilitate telehealth, cognitive and physical exercises, spiritual engagement, and routine monitoring are especially valued.

This work © 2025 by the authors is licensed under CC BY 4.0

A wide range of digital tools are in use, including health and wellness apps, assistive devices (e.g., smart home sensors, hearing aids), communication platforms (e.g., video conferencing, social media), and entertainment and learning tools (e.g., interactive games, podcasts). However, access and adoption are hindered by factors such as usability, affordability, and socio-cultural fit.

Research approaches span qualitative and quantitative methods, including randomized controlled trials, longitudinal cohort studies, behavioral interventions, ethnographic research, and participatory design. Despite this diversity, there is a notable gap in research focused on digital tools for purely social engagement, particularly in underrepresented and developing regions.

Implications and Contributions: This study contributes a structured synthesis of the state of digital engagement for older adults and proposes a conceptual framework illustrating how digital tools, mediating factors (e.g., literacy, infrastructure), and contextual enablers (e.g., policy, community access) interact to shape outcomes such as autonomy, cognitive health, and social participation. The findings have significant implications for designers, healthcare providers, and policymakers working toward inclusive digital aging strategies. They also highlight the need for age-friendly innovation, longitudinal studies, and digital training programs to bridge the digital divide. Ultimately, this research emphasizes the central role of digital technologies in fostering dignity, independence, and well-being among older populations in an increasingly digital society.

Keywords: systematic mapping review, social participation, older persons, digital engagement.

REFERENCES

Iqbal, S., Fischl, C., & Asai, R. (2025). Older persons' Social Participation, Health and Well-Being Through Digital Engagement. *Activities, Adaptation & Aging*, 1-30. https://doi.org/10.1080/01924788.2025.2512299

This work © 2025 by the authors is licensed under CC BY 4.0

PATIENTS' EXPERIENCES OF SELF-MONITORING OF BLOOD PRESSURE AND THEIR PERSPECTIVES ON SELF-ASSESSMENT OF SELF-CARE: AN INTERVIEW STUDY ON HYPERTENSION MANAGEMENT

Elnura Halmambetova[1]*, Evalill Nilsson[1, 2], Cecilia Fagerström[1,3], Kristofer Årestedt[1,3], Mimmi Bjöersdorff[4] and Linda Ljungholm[3]**

[1]Department of Research, Region Kalmar County, Kalmar, Sweden,
[1]elnuraruslanovna.halmambetova@regionkalmar.se,
cecilia.fagerstrom@regionkalmar.se, kristofer.arestedt@lnu.se
[2]Department of Medicine and Optometry, Faculty of Health and Life Sciences, Linnaeus University, Kalmar-Växjö, Sweden, evalill.nilsson@lnu.se
[3]Department of Health and Caring Sciences, Faculty of Health and Life Sciences, Linnaeus University, Kalmar-Växjö, Sweden, linda.ljungholm@lnu.se
[4]Qulturum – Center for Learning and Innovation, Region Jönköping County, Sweden, Jönköping, mimmi.bjoersdorff@rjl.se

(*Main presenter and **corresponding author)

ABSTRACT

Background: Digital health technologies have increasingly empowered individuals with chronic conditions to engage in self-management activities. Among these, self-monitoring of blood pressure is becoming a common and recommended strategy for patients with hypertension. Although self-monitoring of blood pressure can greatly support the management of hypertension, combining it with self-assessments of self-care might further improve blood pressure control and patients' health situation. The aim of the study was to explore patients´ experiences of self-monitoring of blood pressure, and the potential added value of using a self-assessment questionnaire of self-care in connection with the self-monitoring, focusing on how patients derive meaning from these practices in the context of managing hypertension.

Methods: Qualitative explorative study design with 15 semi-structured in-depth interviews with primary care patients with hypertension who self-monitor their blood pressure and who were given a self-assessment questionnaire on self-care of hypertension for review. Data were analyzed inductively using reflexive thematic analysis.

Results: Two themes, gaining knowledge about health and co-creating of health, were generated to capture patients´ experiences with self-monitoring of blood pressure and patients' thoughts on potential use of self-assessment questionnaire in hypertension care. While self-monitoring of blood pressure enabled an increased understanding of one's body, the self-assessment questionnaire of self-care elicited reflection on one's health situation. Gaining such knowledge about personal health was seen as providing opportunities for patients to actively co-create health and self-care in collaboration with healthcare professionals. According to patients, the collection of the self-assessment of self-care questionnaire by healthcare professionals had the potential to make the latter more engaged in patients' health

This work © 2025 by the authors is licensed under CC BY 4.0

and self-care. Besides that, it could also make the healthcare professionals to better meet patients' information needs about the illness and treatment. This collaborative process where patients and healthcare professionals actively share information to support patient´s health and self-care was expressed to enhance patient participation in hypertension management.

Conclusions: Self-monitoring of blood pressure combined with self-assessment of self-care has the potential to promote a deeper awareness of personal health and improve the patient-professional relationship, through perceived support and engagement. To harness the optimal use of self-assessment of self-care in addition to self-monitoring of blood pressure, healthcare should be designed to not only collect data but also support interpretation and personalized feedback through healthcare professionals' engagement with patient-generated data. Further research could shed light on whether self-monitoring of blood pressure combined with consistent use of self-assessment questionnaires can promote a culture of collaboration and shared decision-making in hypertension care.

Keywords: hypertension, digital health, self-monitoring, patient-reported data, self-care, primary care

This work © 2025 by the authors is licensed under CC BY 4.0

IVCMASSIST: DECISION SUPPORT SYSTEM FOR DETECTION OF ACANTHAMOEBA KERATITIS CYSTS IN VIVO CONFOCAL MICROSCOPY IMAGES

Yan Song[1*], Meichen Ji[1], Jenny Roth[2], Alisa Lincke[1], António Filipe Teixeira Macedo[2], Welf Löwe[1], Neil Lagali[3]

[1]Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, ys222ei@student.lnu.se

[2]Department of Medicine and Optometry, Faculty of Health and Life Sciences, Linnaeus University, Sweden, jenny.roth@lnu.se [3]Department of Biomedical and Clinical Sciences, Faculty of Medicine, Linköping University, Sweden, neil.lagali@liu.se

([*]Main presenter and corresponding author)

ABSTRACT

Acanthamoeba are ubiquitous microorganisms found in the air, soil, tap and drinking water, swimming pools, and in both saltwater and freshwater environments [1]. They can cause corneal infections that lead to *Acanthamoeba keratitis* (AK), which is serious medical condition accompanied by intense eye pain, sensitivity to light, and severely impaired vision. AK is commonly associated with contact lens use, particularly in developed countries, where up to 90% of cases are linked to contact lens wear [2]. Timely identification and diagnosis of AK are critical to preventing vision loss. Corneal culture is the gold standard for diagnosing AK, but its low sensitivity and slow turnaround can delay treatment and worsen infection [3]. A complementary method uses non-invasive clinical imaging such as in-vivo confocal microscopy (IVCM) [4,5]. Despite several advantages such as high-resolution imaging, rapid diagnosis, and the ability to monitor disease progression, IVCM has limitations, including the large volume of images generated and the needs for identifying informative/useful images and experienced interpretation. While previous approaches have primarily focused on building models to detect AK in pre-selected images, our decision support system [6], IVCMAssist, automates the entire diagnostic workflow—from processing raw IVCM images and removing artifacts, to sorting images by corneal layer, to identifying informative images, and to detecting AK signs such as cysts in informative images. It enhances the AK diagnosis process by reducing the time spent on image sorting and pre-selection of informative images (non-overlapped images with detected AK cysts), while enabling experienced observers to correct model errors through a human-in-the-loop AI approach.

AK shows in IVCM images as hyper-reflective, round or oval structures called *cysts* and may manifest itself in various forms such as “bright circles/spots”, “signet ring”, clusters, chain, binary cysts, depending of the stage of infection and the imaging plane [7]. Detecting AK cysts can be challenging due to their morphological variability and the presence of similar-appearing structures such as inflammatory cells or epithelial nuclei which lead to diagnostic uncertainty and potential misidentification [8]. The interpretation of AK cysts in IVCM images requires significant expertise to differentiate cysts from similar-appearing artifacts. These

This work © 2025 by the authors is licensed under CC BY 4.0

factors underscore the need for advanced diagnostic tools and experienced observers to improve the accuracy of Acanthamoeba keratitis diagnosis using IVCM.
Recent advancement in artificial intelligence (AI) have shown promising results in diagnosing AK using IVCM images with 93.5% accuracy [9], 76% accuracy [10], and 83% accuracy [6], respectively. However, despite these encouraging results there remains room for improvements in enhancing diagnostic precision, specificity, and reliability.

We approached the task of detecting AK cysts by focusing on their most common form—regular, round, and hyper-reflective structures—and explored two methods: one that classifies entire images based on the presence of AK cysts [6], and another using object detection to localize individual cysts within the images. The former approach has several limitations: it lacks precise localization of cysts, which offers limited interpretability making it difficult to correct AI decisions, especially since AK cysts occupy only a small portion of an image. This misleads the model to learn from background noise rather than the subtle features needed for accurate detection. Additionally, it often fails on images with a high presence of inflammatory cells, which can resemble cysts and lead to misclassification. Therefore, we chose to apply an object detection approach, focusing on accurately localizing individual cysts within the image taking into account their spatial distribution within the image. This may allow us to better distinguish them from irregular inflammatory cells. Both approaches validated on the dataset of 4399 images (19 patients with AK positive, 24 patients without AK but other disease) collected using Heidelberg Retinal Tomograph 3 (Heidelberg Engineering, Germany) at the Department of Ophthalmology, Linköping University. The object detection approach outperformed the entire image classification approach by 10.25 %, achieving 93% cyst-wise accuracy, 79% image-wise accuracy, and 80.8% patient-wise accuracy.

Despite the significant improvements achieved with the object detection approach, challenges remain particularly in distinguishing cysts from inflammatory cells. Also, the model may still generate false positives by detecting cyst-like structures in individuals without actual AK, often due to the presence of features that resemble cysts but are not true Acanthamoeba cysts (low recall). Hence, the next step involves applying a segmentation model, which is currently under development. Preliminary results are promising, showing improved ability to distinguish AK cysts from inflammatory cells. However, further validation and training on a larger, well-annotated dataset are still needed.

The proposed IVCAssist system is openly available to researchers working on AK, providing a valuable tool to support further study and development in this area.

Keywords: Acanthamoeba keratitis, deep learning, image processing, confocal microscopy, cysts

REFERENCES

[1] Marciano-Cabral, F., & Cabral, G. (2003). Acanthamoeba spp. as agents of disease in humans. *Clinical microbiology reviews*, *16*(2), 273-30

[2] Carnt, N., Minassian, D. C., & Dart, J. K. G. (2023). Acanthamoeba Keratitis Risk Factors for Daily Wear Contact Lens Users: A Case-Control Study. Ophthalmology, 130(1), 48–55.

This work © 2025 by the authors is licensed under CC BY 4.0

https://doi.org/10.1016/j.ophtha.2022.08.002

[3] Azzopardi, M., Chong, Y. J., Ng, B., Recchioni, A., Logeswaran, A., & Ting, D. S. J. (2023). *Diagnosis of Acanthamoeba keratitis: past, present and future. Diagnostics, 13, 2655*.

[4] Recchioni A, Barua A, Dominguez-Vicent A. Enhancing Clinical Decision-Making in Complex Corneal Disorders: The Role of In-Vivo Confocal Microscopy. Life. 2023; 13(3):679

[5] N. S. Lagali, "Acanthamoeba keratitis – use of in vivo confocal microscopy in clinical examination and diagnosis," Oftalmolog, 2020.

[6] A. Lincke, J. Roth, A. F. Macedo, P. Bergman, W. Löwe, and N. S. Lagali, "AI-Based Decision-Support System for Diagnosing Acanthamoeba Keratitis Using In Vivo Confocal Microscopy Images," Translational Vision Science Technology, vol. 12, no. 11, pp. 29–29, 11 2023.

[7] De Craene S, Knoeri J, Georgeon C, Kestelyn P, Borderie VM. Assessment of confocal microscopy for the diagnosis of polymerase chain reaction–positive Acanthamoeba keratitis: A case-control study. Ophthalmology. 2018;125(2):161-8.

[8] Przybek-Skrzypecka, J., Armstrong, M., Kim, J., Walkden, A., Au, L., Brahma, A., ... & Chidambaram, J. D. (2025). Diagnostic features of Acanthamoeba keratitis via in vivo confocal microscopy. *Scientific Reports*, *15*(1), 1-11.

[9] Essalat, M., Abolhosseini, M., Le, T. H., Moshtaghion, S. M., & Kanavi, M. R. (2023). Interpretable deep learning for diagnosis of fungal and acanthamoeba keratitis using in vivo confocal microscopy images. *Scientific Reports*, *13*(1), 8953.

[10] Shareef, O., Soleimani, M., Tu, E., Jacobs, D. S., Ciolino, J. B., Rahdar, A., ... & Saeed, H. N. (2024). A novel artificial intelligence model for diagnosing Acanthamoeba keratitis through confocal microscopy. *The Ocular Surface*, *34*, 159-164.

This work © 2025 by the authors is licensed under CC BY 4.0

AI-ENHANCED ADMINISTRATIVE SYSTEM: AUTOMATING DIAGNOSIS CODING IN HEALTHCARE- AT LINKÖPING UNIVERSITY HOSPITAL (RÖ)

Fereshteh Rezaei Haji Abad

Informatics, Technology, Linnaeus University, Sweden, ac223ms@student.lnu.se

ABSTRACT

The increasing complexity of healthcare delivery, driven by growing patient volumes and administrative requirements, places considerable burdens on clinical staff, particularly in managing documentation and diagnosis coding process. At the Physiology Clinic of Linköping University Hospital, over 30,000 echocardiography reports are processed annually, each requiring careful interpretation and manual assignment of diagnostic codes. This manual process is labor-intensive, requires specialized knowledge, and consumes resources equivalent to a full-time position, contributing to inefficiencies and increased likelihood of human error. Despite significant advances in digital transformation across Swedish healthcare, diagnosis coding has remained a bottleneck due to its reliance on human judgment, fragmented documentation, and the absence of effective, context-aware automation tools. This research addresses the pressing need for an AI-enhanced administrative system capable of automating the diagnosis coding process using LLMs, with the aim of reducing workload, increasing accuracy, and improving administrative efficiency.

The objective of the study was to design, develop, and evaluate an AI-based administrative system that supports automated diagnosis coding from echocardiography reports within a real clinical setting. The research sought to identify stakeholder needs, explore the contextual challenges of integrating AI tools in healthcare administration, and develop a system prototype informed by empirical data and grounded in the field of IS. The research questions guiding the study focused on determining the practical challenges influencing AI-based administrative systems in diagnosis coding and identifying the design features that best support integration, consistency, and usability in healthcare workflows.

To achieve these objectives, the study employed a Design Science Research methodology, which facilitates iterative development and evaluation of artifacts aimed at solving real-world problems. The research process unfolded through two iterative cycles, beginning with problem identification based on direct observation of the existing workflow. The study utilized qualitative methods, including in-depth observations, semi-structured interviews with seven clinical and administrative stakeholders, and a participatory evaluation workshop. These methods provided comprehensive insights into current practices, user expectations, and system usability considerations. The prototype was developed to support integration with LLMs and was refined based on stakeholder feedback during the evaluation workshop. The artifact was designed to extract relevant diagnostic codes from unstructured clinical narratives using contextual analysis, with users able to verify and modify outputs, thereby maintaining clinical oversight.

The findings reveal several critical insights. First, the existing manual diagnosis coding

This work © 2025 by the authors is licensed under CC BY 4.0

process is inefficient and highly dependent on individual experience, leading to inconsistencies in coding accuracy and delays in administrative workflows. Second, stakeholders expressed a strong willingness to adopt AI tools, provided that the system supports transparency, integrates seamlessly into existing clinical systems, and enhances rather than replaces their professional roles. The system prototype demonstrated potential to streamline the coding process by accurately suggesting diagnosis codes based on free-text clinical data, significantly reducing the time required for manual input. Stakeholders highlighted the system's intuitive interface and contextual adaptability as key strengths. However, the study also identified challenges related to system interoperability, data quality, and user trust. These challenges underscored the importance of continuous user engagement, localized system training, and integration with hospital information systems for successful deployment.

The research concludes that AI-enhanced administrative systems, particularly those leveraging LLMs, hold transformative potential in automating complex language-based tasks such as diagnosis coding. The integration of such systems can reduce cognitive load on clinical staff, improve documentation consistency, and support better resource planning and data-driven decision-making. However, the study emphasizes that technological innovation alone is insufficient. Effective implementation requires alignment with organizational processes, ethical safeguards for data privacy, and active involvement of end-users in the design and refinement process. The artifact developed in this study demonstrates how AI can be applied meaningfully within real-world clinical settings, contributing not only a functional tool but also practical and theoretical knowledge to the field of IS.

This work contributes to the growing body of IS research that addresses the intersection of artificial intelligence and healthcare administration. It offers a validated design approach for AI-based administrative tools, highlights the importance of human-centered development, and underscores the role of DSR in bridging the gap between theoretical models and practical application. Future research should explore scaling the system to other clinical departments, ensuring ethical compliance with data governance standards, and examining long-term impacts on administrative performance and patient care outcomes.

Keywords: Artificial intelligence, diagnosis coding, large language models, design science research, healthcare administration, information systems

This work © 2025 by the authors is licensed under CC BY 4.0

BRIDGING THE CLINICAL-TECHNICAL DIVIDE: AN INTERNATIONAL COLLABORATION FOR AI-ASSISTED MEDICAL DIAGNOSTICS

Raúl Morales-Salcedo[1]*, Javier Vargas García[2] and Cristopher Hildebrand Sánchez[3]

[1,2,3]*Computer Science Department, Faculty of Engineering, University of Monterrey, Mexico, raul.moraless, javier.vargas, cristopher.hildebrand @udem.edu*

(*Main presenter and corresponding author)

ABSTRACT

The global healthcare system faces persistent challenges in diagnostic accuracy, with imaging-related errors contributing significantly to delayed or incorrect treatments. Particularly in resource-constrained settings, the shortage of specialist radiologists and ophthalmologists exacerbates this problem, creating an urgent need for reliable decision-support tools. While artificial intelligence (AI) has demonstrated remarkable capabilities in medical image analysis, most solutions fail to transition from research environments to clinical practice due to three fundamental gaps: inadequate integration of medical domain knowledge during development, lack of explainability in AI decision-making processes, and insufficient attention to workflow compatibility. This research addresses these interconnected challenges through an innovative international collaboration between computer engineers and medical experts, developing an AI platform that combines technical sophistication with clinical usability.

The study's primary objective was to create a diagnostic support system that achieves three critical outcomes: clinical-grade accuracy in disease detection, transparent decision-making processes understandable by medical professionals, and seamless integration into existing healthcare workflows. The research design employed a three-phase, interdisciplinary methodology combining technical development with continuous clinical validation. Phase 1 involved the creation of a baseline diagnostic platform by computer engineering students at the University of Monterrey (UDEM), utilizing transfer learning with DenseNet121 for chest X-ray analysis and InceptionV3 for retinal image interpretation. While this initial prototype demonstrated technical viability with 89.7% accuracy in preliminary tests, formative evaluations revealed crucial limitations in clinical relevance and explainability.

Phase 2 constituted the project's pivotal transformation through strategic engagement with Linnaeus University's (LNU) medical and technical experts in Sweden. This collaboration introduced three essential dimensions to the research: clinical validation protocols from the Faculty of Health and Life Sciences, human-computer interaction principles from the eHealth Arena team, and advanced image processing techniques from the Department of Computer Science. The Swedish partnership enabled a complete redesign of the platform's interface and decision-support outputs, incorporating Gradient-weighted Class Activation Mapping (Grad-CAM) visualizations and confidence scoring aligned with clinical reasoning patterns. Phase 3 focused on iterative refinement and validation, employing a mixed-methods approach. Quantitative assessment utilized curated datasets from both institutions (3,712

This work © 2025 by the authors is licensed under CC BY 4.0

chest X-rays and 2,859 retinal images), while qualitative feedback came from twelve participating clinicians across both countries. The technical implementation featured a microservices architecture deployed on cloud infrastructure, ensuring scalability while maintaining data security standards compliant with international healthcare regulations. The platform's diagnostic algorithms underwent rigorous testing against three benchmarks: standalone performance metrics, comparison with specialist interpretations, and workflow efficiency gains in clinical simulations.

The research yielded significant findings across technical and clinical dimensions. In controlled evaluations, the final platform achieved 93.4% sensitivity and 97.1% specificity for pneumonia detection in chest X-rays, surpassing the performance of the initial prototype by 11.2%. For diabetic retinopathy classification, the system demonstrated 91.6% sensitivity and 98.3% specificity, comparable to specialist ophthalmologists. More importantly, the explainability features reduced clinician skepticism substantially - post-implementation surveys showed a 62% increase in trust scores compared to the initial black-box version. Workflow integration studies revealed an average 37% reduction in interpretation time for abnormal cases, with particular benefits for junior practitioners whose diagnostic accuracy improved by 28% when using the AI support tool.

These outcomes carry important implications for both healthcare delivery and technical development. The study demonstrates that international academic collaborations can effectively bridge the gap between AI research and clinical application, particularly when incorporating continuous domain expert feedback throughout the development process. The success of the explainability components suggests that transparent AI systems may overcome one of the most significant barriers to clinical adoption. Furthermore, the project establishes a replicable model for educational institutions to combine student learning objectives with meaningful research contributions, as evidenced by the platform's transition from classroom project to clinical testing.

The research contributes novel insights to multiple disciplines. For medical AI development, it presents a framework for creating clinically viable diagnostic tools through structured international partnerships. For health informatics, it demonstrates how explainability features can enhance trust and adoption of AI systems. For engineering education, it offers a proven model for project-based learning that addresses real-world healthcare challenges. The platform's modular design and open architecture provide a foundation for future expansion to additional diagnostic modalities and geographic implementations.
Current limitations, including dataset diversity and need for longitudinal clinical studies, point to important directions for future research. Ongoing work focuses on three areas: expanding the platform's capabilities to include ultrasound and CT imaging, developing adaptive learning mechanisms to improve performance across diverse patient populations, and establishing formal clinical validation pathways for regulatory approval. The international nature of the collaboration continues to yield benefits, with planned multicenter trials leveraging the distinct healthcare environments of Mexico and Sweden to test the platform's generalizability.

This project underscores the transformative potential of interdisciplinary, cross-border partnerships in addressing complex healthcare challenges. By successfully merging technical innovation with clinical needs through structured academic collaboration, the research provides both a functional diagnostic tool and a replicable model for future innovations at the

This work © 2025 by the authors is licensed under CC BY 4.0

intersection of AI and medicine. The findings suggest that similar approaches could accelerate the translation of other medical AI research into practical clinical applications, ultimately improving patient outcomes worldwide.

Keywords: medical artificial intelligence, diagnostic decision support, international research collaboration, explainable AI, deep learning in healthcare

This work © 2025 by the authors is licensed under CC BY 4.0

Digital Learning and Education

Digital learning lies in the intersection of digital technologies, education, and life-long learning. The following abstracts address numerous topics related to the transformation of education and the development and application of digital technologies in diverse educational settings.

This work © 2025 by the authors is licensed under CC BY 4.0

EXPLORING THE DIGITAL TRANSFORMATION OF HIGHER EDUCATION INSTITUTIONS: A GLOBAL PERSPECTIVE

Minh Ngoc Do[1*], Minsun Jung [2]

[1]*Department of Informatics, Faculty of Technology, Linnaeus University, Sweden, md223me@student.lnu.se*
[2]*Department of Informatics, Faculty of Technology, Linnaeus University, Sweden, mj224vw@student.lnu.se*

([*]Main presenter and corresponding author)

ABSTRACT

This study aims to explore the digital transformation of higher education institutions (HEIs) across the globe in the post-COVID-19 era, with a focus on Artificial Intelligence (AI) transformation in teaching and learning. The pandemic exerts a long-lasting impact on society generally and higher education specifically (Anthony et al., 2020). It is considered as a catalyst that accelerates the integration of technology in education (Wang et al., 2024). It is important to examine the topic of digital transformation in HEIs because of three reasons: there is a strong interest in integrating technology into learning environment (Deacon et al., 2022), digital transformation in HEIs is a key driving force for value creation for society (Kaputa et al., 2022), and there is a huge research gap in understanding how to best exploit technology in diverse learning environment (Sharadgah & Sa'di, 2022; Watrianthos et al., 2023). The objective of this study is to address three issues: how HEIs worldwide adapted their teaching and learning strategies post-COVID, how AI is integrated into teaching and learning, and how institutional AI tools influence educators' and students' perceptions of teaching and learning.

To answer three questions above, the study employs a mixed-method approach, which is a combination of quantitative analysis of global survey's responses with qualitative analysis of open-ended questions and interviews with educators and learners at a Swedish university. Quantitative analysis consists of descriptive analysis and regression analysis of multiple-choice and Likert-scale questions in the global survey. Qualitative analysis is conducted on open-ended questions in the global survey and interviews. Quantitative results show that the majority of HEIs have significantly revised their teaching and learning strategies since the pandemic, with most changes in strategy, multimodal learning, rethinking/redesigning physical place, budgeting, and collaboration between professors. Surprisingly, change in terms of offering online modules/external courses as parts of the degrees is the least while the majority of students expected more flexibility in delivery mode. This digital transformation is found to be statistically driven by the perceived positive impact of technology, and student demand, yet the changes have not yet effectively addressed the flexibility aspect that students long for. Quantitative analysis also demonstrated that there is no statistically apparent driving force behind AI transformation of HEIs. HEIs have largely educated their students on the permission and use of AI, but haven't had any official committee to regulate this. Qualitative analysis of open-ended questions in the survey show that AI-related issue is among the main concerns that institutions have when being asked about the current challenges in digital

This work © 2025 by the authors is licensed under CC BY 4.0

transformation. Other challenges include data-related issues such as security, privacy and reliability, propriety issues, digital equality, staff competence, and technological integration. Qualitative analysis of interviews indicate that educators and learners have used AI quite extensively in their teaching and learning practices but the technology itself rather than institutional force is the main drive that motivate their use of AI. The institution has attempted to integrate AI in teaching and learning, nevertheless, this effort has not been effective as interviewees seemed to navigate by themselves with this tool rather than relying on institutional support. Overall, study results conclude that institutions are making considerable changes in their digital transformation as well as implementing AI, but institutional changes haven't really addressed students' main need for more flexible modes of learning and institutional efforts in regulating and educating about AI tools have not been well-established and effective. The study has significant implications for decision-makers in understanding the current state of digital transformation in higher education and in strategizing for successful implementation of technology in teaching and learning practices.

Keywords: digital transformation, AI, higher education, institutional change, teaching, learning

REFERENCES

Anthony, W., Levine-Brown, P., Fynn, N., Gadzekpo, P., & Spinks, M. (2020). Technology considerations and opportunities in higher education. *Journal of College Academic Support Programs*, 3(1), 31-42. https://files.eric.ed.gov/fulltext/EJ1341779.pdf

Deacon, B., Laufer, M., & Schäfer, L. O. (2022). Infusing educational technologies in the heart of the university—A systematic literature review from an organisational perspective. *British Journal of Educational Technology*, 54, 441-466. https://doi.org/10.1111/bjet.13277

Sharadgah, T. A., & Sa'di, R. A. (2022). A systematic review of research on the use of artificial intelligence in English language teaching and learning (2015-2021): What are the current effects? *Journal of Information Technology Education: Research*, 21, 337-377. https://doi.org/10.28945/4999

Wang, C., Chen, X., Yu, T., Liu, Y., & Jing, Y. (2024). Education reform and change driven by digital technology: A bibliometric study from a global perspective. *Humanity Social Sciences Communities*, 11, 256. https://doi.org/10.1057/s41599-024-02717-y

Watrianthos, R., Ahmad, S. T., & Muskhir, M. (2023). Charting the growth and structure of early ChatGPT-education research: A bibliometric study. Journal of Information Technology Education: Innovations in Practice, 22, 235-253.https://doi.org/10.28945/5221

This work © 2025 by the authors is licensed under CC BY 4.0

NAVIGATING THE DIGITAL TRANSFORMATION: STRENGTHENING TEACHERS' DIGITAL LITERACY IN DEVELOPING CONTEXTS

Rafiniati Safran Efendi

Learning, Digitalization and Sustainability (LeaDS) Program, School of Education and Communication, Jönköping University, Sweden, rafiniati26@gmail.com

ABSTRACT

The digital transformation in Indonesian schools has led to increased use of digital tools by both students and teachers, raising concerns surrounding ethical issues such as privacy, cybersecurity, and responsible online behavior. This reflects Falloon's (2020) view that digital literacy goes beyond technical proficiency as it also involves the ethical and safe use of technology. Without an understanding of digital literacy, risks such as online threats, cyberbullying, and sexual exploitation loom over students (Azzahra & Amanta, 2021). In this regard, digital literacy for teachers becomes increasingly important, as Hermida et al. (2022) asserts that it is essential for teachers to have skills in managing and protecting personal data as they tend to deal with the sensitive data of students and their families. Unfortunately, while teachers are also expected to assist students in navigating the safe and ethical online environment, they are often not trained and lack the capacity needed to effectively teach digital ethics (Karima et al., 2023). This not only compromises students' digital safety but also hinders the development of an ethical and secure digital culture in educational settings. This study aims to address the issue by designing and implementing a targeted training program for Indonesian teachers to improve their digital literacy and equip them to pass this knowledge on to their students.

This study uses Protection Motivation Theory (PMT) (Rogers, 1975) and Self-Efficacy Theory (Bandura, 1977) as the theoretical frameworks to inform content structure and pedagogical strategies in the training. This training project lasts for 5 weeks with a five-step implementation process, including planning and preparation, participant recruitment and pre-assessment, training delivery, post-training support, and evaluation. The main training session consists of a 1.5-hour live session via Zoom meeting with two local expert speakers presenting topics related to digital netiquette, data protection and online safety practices. This way, training content has been specifically prepared to be culturally relevant and context-specific. A total of 46 teachers from various educational levels and regions in Indonesia registered for the training. 25 attended the live Zoom session, whereas 34 joined a WhatsApp group created for ongoing discussion and peer learning. Prior to participation, all teachers received complete information about the project and provided their informed consent. The effectiveness of the training was assessed through pre- and post-training surveys and semi-structured interviews involving five selected participants.

The findings showed significant improvements in participants' understanding of digital ethics competencies. Teachers highlighted the importance of digital ethics education, with some expressing their intention to integrate the concepts into their classroom practices. Several

This work © 2025 by the authors is licensed under CC BY 4.0

challenges related to the training implementation were also identified, including lower than expected attendance at live sessions, due to scheduling conflicts and varying levels of teacher motivation. Furthermore, the training had to accommodate varying levels of digital literacy among teachers, requiring adaptive training strategies. This underscores the importance of developing long-term strategies that go beyond individual teacher training, involving institutional support, ongoing professional development, and policy-level interventions to ensure sustainable and equitable implementation of digital literacy education.

This study contributes to the broader discussion on digital literacy in developing countries by demonstrating the effectiveness of a theory-based training program targeted to teachers. While this study provides a replicable model, several limitations need to be acknowledged. As the study sample was relatively small, it may not be generalizable to a larger population. Since the training involved teachers from different levels of education, future research could focus on a specific level, such as primary or secondary schools only, as different levels of educational environments may require different materials and methods for effective digital literacy integration.

Keywords: Digital Ethics, teacher training, digital literacy, developing country

REFERENCES

Azzahra, N. F., & Amanta, F. (2021). Promoting Digital Literacy Skill for Students through Improved School Curriculum. Center for Indonesian Policy Studies. http://www.jstor.org/stable/resrep62369

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191
Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. Educational *Technology Research & Development, 68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Hermida, M., Imlig-Iten, N., Schrackmann, I., & Marinus, E. (2022). Assessing and priming pre-service teachers' attitudes about online privacy and their protection strategies for social networks, email, and cloud storage. *Teaching Education, 34*(3), 265–282. https://doi.org/10.1080/10476210.2022.2106963

Karima, R., Rejekiningsih, T., & Triyanto. (2023). Teaching digital ethics through citizenship education in the Merdeka curriculum at junior high schools in Surakarta. In *Proceedings of the 3rd International Conference on Social Sciences and Education*. Universitas Sebelas Maret.

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology, 91*(1), 93–114. https://doi.org/10.1080/00223980.1975.9915803

This work © 2025 by the authors is licensed under CC BY 4.0

A CRITICAL DISCOURSE ANALYSIS OF DIGITAL EDUCATION POLICY IN KOSOVO

Hana Hasimja

Academic Affairs Department, RIT Kosovo, hxhcad@rit.edu

ABSTRACT

In recent years, digital education has gained increasing attention as a key strategy for education reform across the globe. In Kosovo, the National Education Strategy 2022-2026 places digitalization as one of the main objectives of its reform agenda, presenting it as a necessary step toward improving efficiency, quality and alignment with international standards. While digitalization is widely promoted as a solution to complex social challenges, there is a lack of critical analysis of how it is framed in policy discourse, particularly how problems and solutions are constructed, and what assumptions they carry. This study critically examines the discourse around digital education policies in Kosovo, focusing on the balance between technology and pedagogy for K-12. It aims to uncover the underlying assumptions and potential implications of prioritizing technology in policy and examine the narratives that drive these policies. The central aim of this research is to deepen the understanding of how the framing of digital education reform may overlook deeper pedagogical and contextual considerations, by presenting reform as more of a technical and managerial process. Moreover, it seeks to explore how policies are legitimized and operationalized through policy language.

The rationale for this research stems from debates around the concept of techno-centrism, policy borrowing and influence of international actors. Many scholars have critiqued the tendency in policy discourse to frame digital technologies as inherently transformative, often disconnecting technology from pedagogy and classroom realities. In middle-income countries like Kosovo, donor influence adds a further layer of complexity, as digital education policies are promoted through support and development narratives, and external benchmarks. A very powerful global discourse has been established, one that assumes that technology is a simple answer to complex problems.

This research adopts a qualitative methodology, employing Critical Discourse Analysis (CDA). Specifically, it applies James Paul Gee's discourse analysis framework, focusing on his seven building tasks (Significance, Relationships, Practices, Identities, Connections, Politics, Sign Systems and Knowledge) and tools of inquiry (Conversations, Intertextuality, Discourse, Social Languages), to uncover how policies are used to assign value, define roles and shape meaning. Additionally, Carol Bacchi's "What's the Problem Represented to Be" (WPR) approach is used to explore the assumptions, silences and effects embedded in the way policy solutions are framed. These two complimentary frameworks allow for a nuanced exploration of both the linguistic and ideological perspectives of the texts.

The analysis focuses on four key documents: 1) Kosovo's National Education Strategy 2022-2026, with specific attention to Objective 5 on Digitalization of Education; 2) A speech by the

This work © 2025 by the authors is licensed under CC BY 4.0

Prime Minister delivered at a national education event; 3) A policy brief by UNICEF Kosovo Programme on the Learning Passport platform; and 4) the World Bank's Education Digital Readiness Assessment Report. These documents were selected because they are actively shaping the national digital reform agenda and represent both domestic and international perspectives. The data were analyzed and divided into two main themes and each theme was further broken down into sub-themes, such as technology as a solution, digital content and infrastructure, governance and monitoring, etc.

In general, the findings reveal that digital education policies in Kosovo are predominantly framed through a technocratic and managerial lens. Both national and donor discourse position digitalization as a simple technical solution to educational challenges, with success largely defined through efficiency of processes, economic competitiveness, and alignment with international best practices. Pedagogical concerns, such as learning processes, teacher input and agency or local context, are secondary. Inclusion is primarily understood in terms of access to devices and connectivity, rather than as meaningful engagement with digital learning. This framing reflects a broader trend in global education policy where reform is steered by standardized models, performance indicators, often at the expense of pedagogical depth and local values. A powerful underlying assumption is that the integration of ICT in learning directly contributes to national economic growth, reinforcing a discourse in which education is valued for its ability to serve productivity goals.

This research contributes to the field by offering a critical lens on how digital reform is shaped not only by technological possibilities, but also by discursive choices that reflect broader political and ideological agendas. Local research is very limited, especially in regards to critiques of technology in teaching and learning. The study calls for a more reflective approach to digital education policy, that balances technology with pedagogical integrity, teacher voice and local needs. The study encourages stakeholders to move beyond solutionist narratives and engage more deeply with the complex realities of teaching and learning.

Keywords: digital education, digital technologies, techno-centrism, international influence, pedagogy, discourse analysis

This work © 2025 by the authors is licensed under CC BY 4.0

MARKETING STUDENTS' ADOPTION OF LARGE LANGUAGE MODELS IN EDUCATION: AN EXTENDED UTAUT2 PERSPECTIVE

Georgios Mitsiou

Department of Informatics, Faculty, Faculty of Technology, Linnaeus University, Sweden, gm222jt@student.lnu.se

ABSTRACT

Large Language Models (LLMs) such as ChatGPT are rapidly transforming higher education, particularly in fields that rely on creativity, communication, and data-driven work. In marketing education, these AI tools offer both opportunities and ethical challenges, especially as they become deeply integrated into student learning practices. Despite widespread discourse on generative AI, empirical studies exploring what drives students to adopt LLMs remain limited. Moreover, few studies investigate how structured exposure to LLMs within curricula might shape ethical usage and technology acceptance. This study addresses these gaps by extending the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) with two additional constructs: Perceived Risk and Perception of Ethical Use.

The objective of this research is to understand the factors influencing Swedish university marketing students' adoption and use of LLMs in education, and to assess how structured exposure to such tools within a course setting alters usage behavior and ethical considerations. Drawing on the UTAUT2 model, the study examines the influence of traditional predictors—Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, and Habit—while introducing two contextually relevant extensions: Perceived Risk (e.g., loss of critical thinking or plagiarism concerns) and Perception of Ethical Use (e.g., attitudes toward acceptable academic AI use).

A quantitative survey was conducted among 161 bachelor's and master's level marketing students at Stockholm Business School, Stockholm University. The sample was divided into two groups: students exposed to structured LLM use in the form of a custom GPT-powered course assistant (experimental group), and those with no formal exposure (control group). A validated multi-item scale measured all constructs. Multivariate regression analysis were used to test the hypothesized relationships.

The findings show that, for the full sample, Hedonic Motivation and Habit are significant positive predictors of Behavioral Intention to use LLMs. Perceived Risk negatively affects Behavioral Intention, confirming concerns about ethical dilemmas and overreliance on AI. Together, these constructs explained 66% of the variance in students' intention to use LLMs. Actual use was predicted by both Habit and Behavioral Intention, jointly explaining 73% of the variance in reported usage.

Group comparisons revealed meaningful differences. Among students with structured exposure to LLMs, Habit was the sole predictor of both Behavioral Intention and actual use. This indicates that repeated and familiar use in an academic setting leads to habitual

This work © 2025 by the authors is licensed under CC BY 4.0

engagement with the technology. In contrast, students without structured exposure were more driven by enjoyment (Hedonic Motivation), and their Behavioral Intention was negatively influenced by Perception of Ethical Use—suggesting these students were more conflicted about whether their LLM usage was academically appropriate.

Further analysis showed that students with structured LLM exposure were more transparent about their use, less likely to use LLMs for full paragraph or essay generation, and more likely to use it as a complementary tool for idea generation and grammar assistance. These findings suggest that formal integration of LLMs into academic settings can help cultivate ethical and mindful usage among students.

This research offers several contributions. Theoretically, it validates the UTAUT2 model in the novel context of LLM adoption in higher education and shows that its predictive power can be enhanced by incorporating Perceived Risk and Perception of Ethical Use. Practically, the findings offer actionable insights for university administrators and educators. Implementing structured LLM tools into the curriculum not only facilitates adoption but also mitigates unethical usage by framing AI tools as legitimate and transparent learning aids rather than shortcuts.

By focusing on marketing students—a group that bridges creative and analytical disciplines and is likely to use LLMs professionally in the near future—this study highlights the importance of discipline-specific perspectives on AI adoption. As future marketers expected to handle sensitive data and create ethical campaigns, their early experience with ethical and transparent use of AI in education holds broader implications for the responsible deployment of generative AI in business.

In conclusion, this study emphasizes that universities should not only acknowledge the presence of generative AI tools like ChatGPT in students' lives but proactively shape how such tools are used. Structured exposure can drive habitual, ethical, and pedagogically aligned use of LLMs. For universities navigating the rapidly changing digital transformation of education, this research offers empirical grounding to inform AI integration strategies and policies.

Keywords: LLM, AI in education, UTAUT2, adoption, ethics, student behavior

This work © 2025 by the authors is licensed under CC BY 4.0

UNDERSTANDING AND OPERATIONALISING AI LITERACY IN EDUCATION: THE COSTS OF CUTTING CORNERS

Johanna Velander[1]*, Nuno Otero[2]

[1]*Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, Johanna.velander@lnu.se*
[2]*School of Computing and Mathematical Sciences , Faculty of Engineering and Sciences, University of Greenwich, United Kingdom, N.R.PalmeiroOtero@greenwich.ac.uk*

(*Main presenter and corresponding author)

ABSTRACT

AI literacy is increasingly being conceptualised in research (Chiu et al., 2024; Long & Magerko, 2020; Ng et al., 2021) and shaped through teachers' and students' interactions with AI in both personal and professional contexts (Lindberg & Haglind, 2024). Current research often frames AI literacy in terms of technical and operational competence, how AI works and how to use it (Velander et al., 2024; Sperling et al., 2024). This is frequently linked to the idea of responsible use, aimed at equipping students for future employment and civic life (Ng et al., 2021). However, this focus risks positioning students merely as passive recipients rather than active agents capable of shaping AI's role in education and society.

We argue that how AI literacy is framed is connected to how we understand technological change and digital literacy. A more emancipatory approach would include critical, cultural, and agentic dimensions, enabling students and teachers to interrogate and influence how AI is integrated into educational systems (cf. Pangrazio & Sefton-Green, 2021).

The launch of generative AI tools such as ChatGPT in November 2022 has rapidly accelerated the disruption of educational practices (Velander et al., 2024). These tools bring both immediate implications, such as concerns over cheating and the erosion of traditional assessments, and promises to improve efficiency in planning and evaluation. However, automating routine tasks raises pressing questions about the evolving role of teachers and the nature of pedagogy. Generative AI also challenges established ways of understanding and assessing learning. For example, how should we evaluate students' use of AI in collaborative or project-based learning? This study is situated within this moment of transformation, seeking to explore the intersection of AI literacy theory and classroom practice through two guiding research questions:

- *What do teachers want to know about AI and why?*
- *How does this intersect with current AI literacy research?*

To explore these questions, we invited teachers to complete a pre-workshop questionnaire and participate in a workshop. Data was collected from the questionnaire, chatbot interaction logs, and a group-based SWOT analysis. Of 60 participating teachers, 46 completed the

This work © 2025 by the authors is licensed under CC BY 4.0

questionnaire. Recruitment occurred via a university-school collaboration network, involving two Swedish municipalities.
The workshop began with a brief introduction covering AI concepts (e.g., generative AI, machine learning, neural networks), AI literacy research, and a demonstration of the chatbot used in the study. Teachers used a custom chatbot built on OpenAI 4.0, which saved all user interactions. Participants were asked to co-create a lesson plan using two chatbot versions: one default and one configured to prompt critical reflection. While the detailed configuration is beyond this abstract's scope, it aimed to encourage users to question and reflect on the chatbot's suggestions. Log data allowed us to examine interaction patterns, particularly whether participants engaged critically with the bot. The workshop concluded with SWOT analyses in groups of six, followed by a plenary discussion.

Of the 46 questionnaire respondents, 70% already use generative AI for lesson planning, often describing it as a collaborative partner that helps them adapt material efficiently. About 30% use it in teaching, and 15% in assessment. Most teachers expressed a desire to improve their prompting skills and become more adept at using AI tools. Only one participant mentioned broader AI literacy concerns, asking, "What should our students be able to know in this important area? It is unclear. There are no goals or guidelines as far as I know."

The main concern identified was cheating, with teachers wanting strategies to detect AI-generated student work. Many also expressed a need to teach students responsible AI use, including source criticism. These findings suggest that teachers' expressed needs align most closely with an operational framing of AI literacy.

Preliminary analysis of the chatbot interaction logs indicates that teachers seldom paused to critically reflect on responses, regardless of which version of the bot they used. Most interactions followed a pattern of accepting the response and moving on. As a result, many lesson plans were built on unchallenged content. Further analysis is underway to explore this in more depth.

The SWOT analysis highlighted key themes. **Strengths** included time-saving, accessibility, adaptability, fairness, and enjoyment. **Weaknesses** focused on source credibility, hallucinations, and AI's tendency to reinforce dominant narratives. **Opportunities** included increased creativity, personalised learning, and new learning methods. **Threats** ranged from job displacement and inaccuracy to manipulation, loss of critical thinking, and concerns over what constitutes knowledge. These reflections indicate an emerging awareness of the broader implications of AI in education, pointing toward a more critical and holistic conception of AI literacy that includes issues of knowledge construction, manipulation, and automation.

Our findings raise two key areas for discussion. First, the issue of assessment. As generative AI challenges the authenticity of student work, how might we shift from focusing solely on learning outcomes to capturing the learning process itself? Digital environments like the one used in our study generate rich interaction data. Can such data provide insight into students' learning trajectories? If so, what kind of data is relevant, and how do we interpret it through pedagogical frameworks?

Second, we reflect on the strong emphasis on efficiency evident in both teacher practice and attitudes. This may be shaped by broader policy pressures to increase the efficiency of public services through mechanisms like performance indicators and accountability tools. In this

This work © 2025 by the authors is licensed under CC BY 4.0

context, teachers may view AI less as a pedagogical opportunity and more as a survival strategy. This raises uncomfortable but important questions: To what extent is the profession being reshaped by systemic efficiency drives? Will teachers fear being replaced, or will they be empowered?

In conclusion, our study offers early insight into how teachers are engaging with AI and what they want to learn. While many focus on practical and operational skills, there is a pressing need to expand the conversation to include critical and agentic dimensions of AI literacy. As educational systems adapt to these technologies, teacher perspectives must be central in shaping a balanced, equitable, and pedagogically grounded approach.

Keywords: AI literacy, AI education, Generative AI, teachers using AI, Generative AI in lesson planning

REFERENCES

Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. *Computers and Education Open*, 6, 100171. https://doi.org/10.1016/j.caeo.2024.100171

Durrant, C., & Green, B. (2000). Literacy and the new technologies in school education: meeting the l (IT) eracy challenge?. *The Australian Journal of Language and Literacy*, 23(2), 89-108.

Howard, S., Tondeur, J., Neubert, C., Hauck, J., & Boehme, R. (2025). The AIMED model: Creating opportunities for AI in Higher Education.

Lindberg, Y., & Haglind, T. (2024). Who Holds the Future? Value Enactment through Futures Framing by Upper Secondary School Teachers. In *Framing Futures in Postdigital Education: Critical Concepts for Data-driven Practices* (pp. 21-37). Cham: Springer Nature Switzerland.

Long, D., & Magerko, B. (2020). *What is AI Literacy? Competencies and Design Considerations. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1–16. https://doi.org/10.1145/3313831.3376727

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041. https://doi.org/10.1016/j.caeai.2021.100041

Velander, J., Otero, N., & Milrad, M. (2024). What is Critical (about) AI Literacy? Exploring Conceptualizations Present in AI Literacy Discourse. In *Framing Futures in Postdigital Education* (pp. 139–160). Springer, Cham. https://doi.org/10.1007/978-3-031-58622-4_8

This work © 2025 by the authors is licensed under CC BY 4.0

SUPPORT SKILLS-TRACING IN OPEN LEARNING ENVIRONMENTS: DESIGN AND EVALUATION OF AN AUTHORABLE LEARNING ANALYTICS DASHBOARD

Marianthi Grizioti[1]*, Maria Stella Nikolaou[2], Chronis Kynigos[3] and Sokratis Karkalas[4]

[1]*Educational Technology Lab, Department of Educational Studies, National and Kapodistrian University of Athens, Greece, mgriziot@eds.uoa.gr*

[2]*NKUA, msnikolaou@eds.uoa.gr*

[3]*Εργαστήριο Εκπαιδευτικής Τεχνολογίας, Πανεπιστήμιο Αθηνών, kynigos@eds.uoa.gr*

[4]*University of Derby, UK, sokratis.karkalas@gmail.com*

(*Main presenter and corresponding author)

ABSTRACT

With the international education agendas highlighting the transformation of education towards a trans-disciplinary and skill-oriented paradigm, there is much emphasis placed on cultivating students' digital competences and 21st-century skills. Lately researchers and educational stakeholders are looking new ways for supporting teachers to design, monitor and evaluate activities that enhance students' skills. Learning Analytics (LA) systems and dashboards could contribute to that effort, since they can capture a big variety of data coming from students interaction with the learning activity. These data can include student interactions with learning materials, assessment performance, and engagement dynamics. By analyzing these data, educators can derive valuable insights into student learning behaviours, identify areas for pedagogical improvement, and customize instructional strategies to cater to individual student needs (Dawson et. al., 2019). This empowers educators to monitor student progress in real-time, enabling timely interventions and support, as well as providing summative feedback. However collecting, analysing and visualising meaningful and valuable learning data in exploratory activities remains a challenge, as there is no predetermined solution or pathway of learner engagement with the environment (Masiello et. al., 2024; Renz, Krishnaraja, & Gronau, 2020; Karkalas et. al. 2025). Moreover, in such environments the expected interactions and learning outcomes may vary significantly between different activities. As a result, LA systems that follow a top-down design process and provide predefined horizontal analysis and visualizations for all the activities fall short to cover real teacher needs and usually are not adopted by teachers in their educational practice.

This paper aims to address this gap by discussing the iterative design and evaluation of an authorable learning analytics dashboard that enables teachers to author learning analytics' rules and visualizations for skill-based assessments in constructionist learning environments. For the dashboard development we employed a participatory user-centered design approach (Spinuzzi, 2005) to design the tool, focusing on making the relationship between environment data and 21st-century skills transparent and authorable. The approach involved EdTech experts and teachers in participatory design workshops in different stages of the LA dashboard development and in a final cycle of empirical implementation, aiming the final system to reflect their perceptions on 21st century skill assessment through the collected data. After each cycle we evaluated a set of collected data that informed the redesign of the system. In this paper we will focus on the last two cycles (cycle 3 and cycle 4 from now on) that focused on the

This work © 2025 by the authors is licensed under CC BY 4.0

evaluation of the ALA Dashboard by teachers first in a lab environment and then in real school context with students. The research data we collected involved teachers interviews and an observation protocol kept by the research team. The aim was two answer key research questions: (1) How can we identify fine-grained relationships between learner interactions and 21st-century skills? (2) How can we design an intuitive interface that enables teachers to define these relationships?

Cycle 3 included a comprehensive evaluation workshop with 20 EdTech experts that was organized as two parallel interventions. The workshop utilized a task-based questionnaire, simulating user testing, wherein participants could work individually, in pairs, or small groups. They were encouraged to verbalize their thought processes during the tasks, effectively employing a think-aloud protocol. The evaluation of the collected data provided a foundational understanding of authorable analytics, revealing a clear need for a more granular expression of relevant data patterns and a more expressive user interface for teachers to articulate these patterns. In cycle 4, the final evaluation cycle, the ALA system was used by in-service teachers in school interventions with students in the context of Design Thinking projects. We collected and evaluated data from 4 interventions across 3 EU countries aiming to explore the opportunities and barriers of the ALA system in a real school context. The qualitative analysis of teacher interviews and research observation protocols confirmed the tool's useability and effectiveness and revealed specific cases that the dashboard was quite helpful for the teachers. These included the improvement of instructional design to promote 21st century skills by the teachers, the better monitoring of different teams during DT projects and the opportunity for the teacher to focus on students' _progress in certain parts of the activity afterwards (e.g. the evolution of their coding program). The analysis also revealed some points for improvement such as the clearer distinction between team and individual data analysis and the need for better explanation of some diagrams.

Findings of the presented study demonstrate the effectiveness of the Authorable Learning Analytics Dashboard in enabling teachers to define and customize skill-based analytics, revealing the nature of complex skill-data relationships. The research contributes to the development of adaptive learning environments that align with modern educational paradigms, emphasizing the importance of teacher-driven analytics for 21st-century skill assessment.

Keywords: Learning Analytics, Learning Dashboards, Skill-based Analytics, 21st century skills, exploratory learning environments, teacher-driven analytics

This work © 2025 by the authors is licensed under CC BY 4.0

IDEALIZED DESIGN AS AN INTEGRATED FRAMEWORK: A THEORETICAL LENS AND METHODOLOGICAL TOOLKIT FOR ADDRESSING COMPLEXITY IN COMPUTATIONAL THINKING EDUCATION

Ali Hamidi

Linnaeus University, Sweden, ali.hamidi@lnu.se

ABSTRACT

Computational Thinking (CT) is increasingly viewed as a foundational skill for the 21st century. It is associated with the ability to solve problems, design systems, and understand human behavior by drawing on key concepts from computer science. However, efforts to integrate CT into education have encountered a number of challenges. These include the lack of a shared definition, the common misconception that CT is synonymous with programming, limited teacher training, and unclear implementation strategies. Addressing these issues requires more than isolated interventions or linear planning models. This study proposes a systems thinking approach, specifically through the use of Idealized Design, to better understand and respond to the complex nature of CT education. The focus is on the Swedish K–12 education system, but the findings have broader relevance for educational policy and practice.

Many current approaches to CT education are reductionist in nature. They often address only one component, such as curriculum development or professional training, while neglecting the interrelated factors that influence the system as a whole. In contrast, systems thinking provides a holistic view that accounts for interdependencies, feedback loops, and emergent behaviors. It is appropriate for analyzing educational change because it considers multiple layers of influence, including institutional norms, teacher practices, policy constraints, and sociocultural values. CT education is thus conceptualized in this study as a dynamic system, rather than a standalone subject.

Idealized Design, developed by Russell L. Ackoff (1993), is used in this research to explore and understand such complexity. Idealized Design is an interactive planning approach grounded in systems thinking. It helps stakeholders move beyond reactive and preactive planning by asking them to imagine what a system would look like if it were designed today, without the limitations of current constraints. The goal is not to predict the future, but to envision a desirable present and use that vision to shape the system. The process consists of four key phases. First, participants describe the current problematic situation as a system, identifying its main elements and how they are connected. Second, they reflect on reference projections, which are future outcomes based on continuing current practices and trends. Third, they explore reference scenarios, which describe the possible negative outcomes if existing challenges are not addressed. Finally, participants develop an idealized design by imagining how the system would work under ideal conditions, without being limited by current constraints.

This work © 2025 by the authors is licensed under CC BY 4.0

In this study, Idealized Design is applied in two complementary ways. First, it is used as a theoretical framework to guide the overall direction and focus of the research. Second, it is applied as a methodological toolkit to support data collection and organization. In this role, it informs the structureof participatory workshops with teachers, helping to gather both critical insights and creative ideas through active engagement.

In addition to Idealized Design, the study uses visual systems tools such as rich pictures and causal loop diagrams. Rich pictures help participants illustrate the actors and relationships within the educational system. Causal loop diagrams then model the circular dynamic relationships among key variables, including policy initiatives, teacher preparedness, technological infrastructure, and societal expectations.

Empirical data were collected through a series of workshops with teachers and students as part of ongoing PhD research. These workshops followed the phases of Idealized Design. First, participants identified current obstacles to CT integration, such as inconsistent training, vague curricular goals, and limited institutional support. Next, they created reference scenarios that projected what might happen if these trends continued. Finally, participants engaged in co-constructing idealized visions for CT education. These included improved collaboration between schools and policy makers, teacher-led innovation, and better alignment between societal goals and classroom realities.

The findings reveal that a systems-oriented approach helps educators move beyond surface-level solutions. Participants were able to see how different elements of the system interact and how change in one area may produce unintended effects in another. More importantly, the process of envisioning a desirable present encouraged creative and actionable thinking. Instead of identifying problems, participants began to articulate what meaningful CT education could look like and what values it should reflect.

In conclusion, this research contributes to both theory and practice. Theoretically, it positions systems thinking and Idealized Design as useful approaches for exploring and addressing challenges in education. These approaches allow for a deeper understanding of how CT education is embedded in broader institutional, technological, and cultural systems. Methodologically, the study offers a structured and replicable framework for participatory research and planning. Educators, policymakers, and researchers can adopt and adapt this framework to better navigate the complexity of educational transformation.

REFERENCES

Ackoff, R. L. (1993). Idealized design: Creative corporate visioning. *Omega, 21*(4), 401–410.

This work © 2025 by the authors is licensed under CC BY 4.0

CHALLENGES AND OPPORTUNITIES IN CURRICULA CO-CREATION BETWEEN INDUSTRY AND ACADEMIA: A CASE STUDY IN THE INTEGRATION BETWEEN ARTIFICIAL INTELLIGENCE AND INTERACTION DESIGN

Mexhid Ferati[1]*, Rafael M. Martins[2], Juan P. Velasquez[3], Fisnik Dalipi[4], Timmy Öberg[5] and Arianit Kurti[6]

[1]*Department of Informatics, Linnaeus University, Sweden, mexhid.ferati@lnu.se*
[2]*Department of Computer Science and Media Technology, Linnaeus University, Sweden, rafael.martins@lnu.se*
[3]*Department of Informatics, Linnaeus University, Sweden, juan.velasquez@lnu.se*
[4]*Department of Informatics, Linnaeus University, Sweden, fisnik.dalipi@lnu.se*
[5]*Department of Informatics, Linnaeus University, Sweden, timmy.oberg@lnu.se*
[6]*Department of Informatics, Linnaeus University, Sweden, arianit.kurti@lnu.se*

(*Main presenter and corresponding author)

ABSTRACT

As Artificial Intelligence (AI) technologies increasingly shape interactive systems and user experiences (De Silva and Halloluwa, 2025), higher education programs must evolve to address the intersection between AI and Interaction Design (IxD). Effective integration demands structured co-creation processes between academia and industry that prioritize practical skills and contemporary industry needs, moving beyond purely theoretical frameworks.
Current educational initiatives typically separate technically-focused AI and design-focused IxD into isolated curricula, resulting in graduates who lack integrated competences demanded by the industry like pedagogical frameworks that combine AI competencies with human-centered design outcomes (Kim et al., 2025; Kok et al., 2024). This gap is further amplified by students who have reported that current design education insufficiently addresses contemporary challenges such as automation, human-machine interdependence, and the ethical implications of AI-enhanced technologies (Kuo & Xia, 2023).

One of the recurrent issues in aligning IxD and AI education is the differing priorities of academia and industry (Windl, 2022). While academic programs emphasize theory and critical reflection, industry seeks graduates equipped with practical, market-relevant skills. IxD students, in particular, often struggle to articulate their professional roles in AI-influenced design fields (Sørum, 2017). Recent studies have emphasized the need for AI education that better reflects job market demands through structured, collaborative processes between academia and industry (Li et al., 2019; Laundon, 2023).

Responding to this challenge, our study reports on a co-creation initiative that involved industry representatives and academic experts to develop advanced educational offerings: a specialization in IxD and a new Master's program in Interactive AI. The process produced six course proposals directly addressing industry-identified skill requirements. These proposals were subsequently evaluated quantitatively and qualitatively by students and alumni.

This work © 2025 by the authors is licensed under CC BY 4.0

A mixed-methods approach combined a qualitative workshop with a quantitative survey. The workshop included representatives from four Swedish companies in sectors such as software, educational technologies, and forestry. Participants ranged from IxD professionals to company leaders. Using a Design Thinking-inspired, five-step process—*problematisation*, *ideation*, *design*, *sharing*, and *closing*—the workshop generated course ideas based on identified industry needs and future skills requirements.

The resulting course proposals included: *Novel Interaction Methods Using AI*, *Accessibility/Inclusive Design*, *Process-based Understanding of an Organisation*, *AI Non-functional Requirements*, *Business Agility and AI*, and *Tools with AI*.

A subsequent survey gathered feedback from 61 students and alumni from two bachelor programs: Interaction Design and Web Programming. Respondents rated their interest in the proposed courses using a 5-point Likert scale and provided open-ended comments on content preferences, motivations, and desired formats. The survey revealed strong support for three courses: *Accessibility/Inclusive Design* (mean 4.23/5), *Tools with AI* (4.07/5), and *Novel Interaction Methods Using AI* (3.80/5). These were consistently rated highest by both program groups, indicating a clear consensus.

Qualitative feedback emphasized students' desire for practical, hands-on learning and exposure to AI tools relevant to their fields. IxD students showed greater interest in integrating AI into design processes, prototyping, and creative documentation, while Web Programming students prioritized workflow optimization, time-saving applications, and technical implementations. Both groups emphasized the importance of integrating accessibility principles into education, with IxD students focusing on inclusive design practices and Web Programming students emphasizing legal compliance and technical standards.

Courses related to business processes and organizational management were rated lower, perceived as too broad or less directly applicable to the respondents' professional interests. A recurring concern was the rapid pace of AI development, with students advocating for flexible, regularly updated curricula to maintain relevance.

In conclusion, this co-creation initiative demonstrates the benefits of structured collaboration between academia and industry in curriculum development for AI and IxD. The findings reveal a shared emphasis on accessibility, AI-enhanced tools, and practice-oriented learning, providing actionable insights for future educational planning and program design. These outcomes provide a foundation for refining curricula to meet both pedagogical goals and industry expectations.

Keywords: Co-creation, workshop, survey, courses, Interaction Design, Artificial Intelligence

Acknowledgments: Authors thank KK-Stiftelsen (#20230059-H-01) in Sweden for supporting this research and company representatives, students, and alumni for their opinions.

REFERENCES

De Silva, C., Halloluwa, T.: Augmenting human potential: The role of LLMS in shaping the future of HCI. *Interactions* 32(2), 42 (2025)

This work © 2025 by the authors is licensed under CC BY 4.0

Kim, Y.J., Kim, G., Stoiber, A.: Playful design for AI literacy: Creating inclusive learning and assessment opportunities. *Int. J. Hum.-Comput. Stud.* (2025)

Kok, C.L., Ho, C.K., Koh, Y.Y., Thanh, N.T.C.: Preparing future engineers: Strategies for integrating AI platforms in higher education. In: *IEEE TENCON 2024 Conf. Proc.* (2024)

Kuo, J.Y., Xia, Z.: Exploring intelligent user interfaces from design students' perspectives on smart home products through peer assessment, focus group and ChatGPT. In: Storga, M., et al. (eds.) *Leveraging Transdisciplinary Engineering in a Changing and Connected World*, pp. 161–170. IOS Press, Amsterdam (2023)

Laundon, M., Williams, P., Williams, J.: Benefits of co-creating higher education learning resources: An industry participant perspective. *Aust. Educ. Res.* 51(4), 1627–1646 (2024)

Li, Y., Wang, X., Xin, D.: An inquiry into AI university curriculum and market demand: Facts, fits, and future trends. In: *Proc. SIGMIS-CPR 2019*, pp. x139–142. ACM, New York (2019)

Sørum, H.: Design of digital products in the future: A study of interaction design students and their perceptions on design issues. In: Marcus, A. (ed.) *Design, User Experience, and Usability: Theory, Methodology, and Management*, DUXU 2017, LNCS, vol. 10288, pp. 740–754. Springer (2017)

Windl, M., Feger, S.S., Zijlstra, L., Schmidt, A., Wozniak, P.W.: 'It is not always discovery time': Four pragmatic approaches in designing AI systems. In: *Proc. 2022 CHI Conf. Human Factors in Computing Systems*, pp. 1–12. ACM, New York (2022)

This work © 2025 by the authors is licensed under CC BY 4.0

DIGITAL TRANSFORMATION IN PRIMARY EDUCATION THROUGH DESIGN THINKING AND GAME DESIGN

Maria-Stella Nikolaou[1]*, Christina Gkreka[2] and Chronis Kynigos[3]

[123]*Educational Technology Lab, Department of Educational Studies, National and Kapodistrian University of Athens, Greece, msnikolaou@eds.uoa.gr, xristgreka@eds.uoa.gr, kynigos@eds.uoa.gr*

ABSTRACT

This study presents a dual educational intervention conducted in a primary school in a rural area outside Athens, Greece, as part of the European project *"Extending Design Thinking with Emerging Digital Technologies - Exten(DT)²"*[1]. The project aimed to explore how the integration of constructionist digital tools (Papert, 1980; Kafai & Burke, 2015), guided by the Design Thinking methodology, can support digital transformation in primary education. Utilising the digital tool SORBET, a web-based, open environment that allows users to create, play and modify classification games (Nikolaou & Kynigos, 2025), students of grades 5 and 6 collaborated in pairs to envision, develop and evaluate their own digital classification games, addressing real-world issues through creative content design.

The intervention was guided by the following research question:

1. How does engaging in the design of digital classification games through Design Thinking support students' development of critical and data literacy skills?

Although data literacy is increasingly recognised as a core dimension of digital literacy, essential for navigating and interpreting complex information systems of contemporary life (Van Audenhove et, al., 2020; Gebre, 2022), there is still limited research on how it can be meaningfully integrated into formal education, especially in primary school contexts. This study proposes that students' data literacy can be cultivated through their engagement in the design of digital classification games, which require them to analyse, structure, and communicate information. The pedagogical intervention that was organised around the phases of Design Thinking methodology (Scheer et al., 2012; Panke, 2019), following an iterative process of design, testing and reflection. First, in the *Empathise* phase, students discussed with their teachers the needs and interests of their peers as a hypothetical target audience for the games. In *Define*, they identified the problem or theme they wanted to address and selected relevant objects and categories for classification, followed by the *Ideate* phase, where they exchanged ideas about the functionality and aesthetics of the games. In the *Prototype* phase, they used SorBET to digitally construct games by uploading images, defining categories and designing rules for object classification. *Feedback* was collected in peer-testing sessions, which informed the *Redesign* phase. Finally, in *Deliver*, they presented their final games to the class, prompting discussion and collaborative play.

6th-grade students tackled the issue of low engagement in history classes. Recognising that

[1] The official website for the Exten(DT)² project: https://extendt2.eu/

This work © 2025 by the authors is licensed under CC BY 4.0

these lessons are often experienced as disconnected from everyday life, they sought to transform textbook material into an interactive game that would offer peers a more experiential and playful approach to learning specific sections of the syllabus for the History lesson. The activity triggered critical reflection on the school content, with students evaluating which historical facts were worth 'transforming' into digital objects. These objects were either images or text. While many students relied on visual elements, they also recognized the limitations of images alone in conveying historical information and debated the need for explanatory text or clearer visuals. One student remarked: 'We can't learn information from the picture alone', highlighting the role of combining visual and textual modes for conveying meaning.

Students' approaches varied widely. For example, one group selected two key figures of the Greek Enlightenment (Rigas Feraios and Adamantios Korais) as classification categories and used historical sources (texts and images) to highlight their contributions and ideas. Another group organised the game around four major wars (World War I, World War II, and the two Balkan Wars), classifying critical events (e.g., "Hiroshima bombing") and personalities under each. A third group chose regional revolutions (e.g., Central Greece, Aegean) as categories, incorporating maps and places as objects to visually anchor historical events. Finally, a group exploring historical eras like the Renaissance and Enlightenment used abstract concepts such as "religious tolerance" or inventions like "electricity" as text game objects. These varied approaches required students to interpret the textbook's linear narrative, make selections about what historical knowledge is worth transforming into interactive digital content, and critically reflect on how such information can (or cannot) be visually represented. This process foregrounded skills in synthesis, categorisation and media literacy, while also surfacing tensions between visual clarity and historical complexity.

While the 6th-grade work focused on historical reinterpretation, the 5th-grade project addressed environmental themes and civic responsibility, designing games related to the recycling of clothing and household textiles. They explored which items are appropriate for the "purple bins" used in textile recycling in Greece, often using internet searches to investigate unclear cases. For example, when asked whether carpets are recyclable, one student initiated a search to check the specifications. Discussions emerged around source validity and clarity of visual representation, as students evaluated which images best represented recyclable materials. While they could have used text, they preferred images for aesthetic appeal, often against the legibility of many objects. However, an analysis of the game instructions authored by the students revealed that they often prioritised explaining how the SorBET games are played (how to classify things in general) over conveying the conceptual content, suggesting that the digital tool's functionality tended to dominate their focus.

Interestingly, the games revealed varying levels of abstraction in students' representational choices. While some objects were concrete and visually representable (e.g., historical figures, locations, recyclable items), others were more abstract (e.g., "religious tolerance", "freedom of expression"), challenging students to reflect on how to communicate conceptual content. This contrast points to an emerging awareness of multimodal representation and the cognitive demands of classifying and expressing diverse forms of knowledge (Serafini, 2014).

In the final stage of the intervention, the 6th-grade students tested the 5th-grade games on an interactive whiteboard via multi-touch interaction. They provided feedback on issues such as the pace of object display, the clarity of pictures and consistency in categories. This was also an

This work © 2025 by the authors is licensed under CC BY 4.0

opportunity to compare different technological interaction modes, since the 6th graders had previously played using gesture recognition through a webcam interface.

Overall, our findings, although preliminary, illustrate how even in low-resource rural settings, digital transformation in education can be approached not as a top-down implementation of tools, but as a participatory, student-led process grounded in design, reflection and real-world relevance. It highlights the pedagogical value of positioning students as co-creators of educational content and suggests that tools like SorBET, combined with design thinking, can cultivate essential 21st-century and data-related skills while offering a meaningful way to reimagine curriculum through learner agency. While these are preliminary findings, they reveal valuable insights into how students engage with digital classification, critical curation and multimodal representation, guiding principles that can inform future educational activities aimed at fostering these skills.

Keywords: Digital Transformation, Data Literacy, Primary Education, Design Thinking, Game-Based Learning, SORBET

Acknowledgements: This research is funded from the E.U. Horizon Europe Framework Programme for Research and Innovation "Exten.D.T.2 - Extending Design Thinking with Emerging Digital Technologies" (Project No. 101060231). Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union, neither the European Union nor the granting authority can be held responsible for them.

REFERENCES

Nikolaou, MS & Kynigos, C (2025). From Novice Players to Creative Designers: A Constructionist Attempt with SorBET: From Players to Designers with SorBET. (2025). Constructionism Conference Proceedings, 8, 97-108. https://doi.org/10.21240/constr/2025/56.X

Gebre, E. (2022). Conceptions and perspectives of data literacy in secondary education. British Journal of Educational Technology, 53(5), 1080-1095. https://doi.org/10.1111/bjet.13246

Kafai, Y. B., & Burke, Q. (2015). Constructionist Gaming: Understanding the Benefits of Making Games for Learning. *Educational Psychologist*, 50(4), 313–334. https://doi.org/10.1080/00461520.2015.1124022

Panke, S. (2019). Design thinking in education: Perspectives, opportunities and challenges. *Open Education Studies, 1*(1), 281-306. https://doi.org/10.1515/edu-2019-0022

Papert, S. (1980). "Mindstorms" Children. Computers and powerful ideas.

Scheer, A., Noweski, C., & Meinel, C. (2012). Transforming constructivist learning into action: Design thinking in education. Design and Technology Education, 17(3), 8-19. Available at https://eric.ed.gov/?id=EJ996067

Serafini, F. (2014). *Reading the visual: An introduction to teaching multimodal literacy*. Teachers College Press.

This work © 2025 by the authors is licensed under CC BY 4.0

Van Audenhove, L., Van den Broeck, W., & Mariën, I. (2020). Data literacy and education: Introduction and the challenges for our field. *Journal of Media Literacy Education*, 12(3), 1-5. https://doi.org/10.23860/JMLE-2020-12-3-1

This work © 2025 by the authors is licensed under CC BY 4.0

BEYOND CODE: FOSTERING CRITICAL REASONING AND MEDIA LITERACIES THROUGH DESIGN THINKING AND INTERACTIVE TECHNOLOGIES

Mohammed Ahmed Taiye[1]*, Katrin Lindwall[2] and Marcelo Milrad[3]

[1] *Department Cultural Science, Arts and Humanities, Linnaeus University, Växjö, Sweden, ahmedtaiye.mohammed@lnu.se*

[2]*Department of Computer Science and Media Technology, Linnaeus University, Växjö, Sweden, katrin.lindwall@lnu.se*

[3]*Department of Computer Science and Media Technology, Linnaeus University, Växjö, Sweden, marcelo.milrad@lnu.se*

(*Main presenter and corresponding author)

ABSTRACT

ChoiCo, a game-based learning platform, is designed to enhance critical thinking and collaboration among students by presenting real-world challenges through interactive scenarios and decision-making processes (Qian & Clark, 2016). This platform supports the Design Thinking (DT) approach, allowing students to apply principles such as empathy, ideation, and prototyping in a hands-on, experiential learning environment (Plattner et al., 2009). The Exten(DT)^2 project, funded by the EU, investigates how ChoiCo and DT can empower students to address complex socio-scientific issues (SSIs), particularly media and information literacy (MIL). The study focuses on the challenge of online information disorder, including misinformation, disinformation, and malinformation, which are prevalent in the media space (Al Zou'bi, 2022). The study adopted a design-based research approach to integrate DT processes with the ChoiCo game platform in a socio-scientific educational context (Johansson-Sköldberg et al., 2013). It involved 11 Swedish upper secondary school students (18-19 years old; 2 males, 9 females) with prior Scratch experience, working in five groups under teacher and researcher supervision. Over seven weeks, students engaged in 14 hours of activities across five phases to explore the integration of DT and ChoiCo. Data was collected through structured surveys and semi-structured interviews, revealing that participants found DT beneficial for structuring ideas and prototypes despite initial inexperience. They also perceived game-based learning with SSI as enhancing understanding but reported challenges such as managing game complexity and navigating the interface.

Qualitative analysis of interview data revealed that DT and computational tools fostered cognitive and collaborative skills, with students demonstrating enhanced reasoning and creativity through iterative processes and visual aids. The findings suggest that integrating DT and ChoiCo can significantly enhance educational outcomes, though improvements in platform usability are needed. Crucially, students' engagement with novel digital tools, such as AI for image generation, coupled with their critical reflections on online safety practices, highlighted the potential for both pedagogical innovation and the cultivation of critical digital literacies vital for sustainable digital transformation. These findings directly supported the research questions, confirming that DT with ChoiCo fosters advanced reasoning, enhances engagement, drives pedagogical innovation, and promotes essential digital literacies. The

This work © 2025 by the authors is licensed under CC BY 4.0

teacher of the subject in which the intervention was carried out also gave good remarks and acknowledgement:

"*My students participated in Extend DT during the spring and my impressions of their involvement are very positive. I feel that the Design Thinking approach made the students more engaged and involved in their work. The process led them to understand more about the subject and gain greater knowledge/insight into the recipient's behavior. The students who normally find it difficult to motivate themselves and get started became very engaged and took steps they usually don't, for example, they took the lead in the project, conducted interviews in English, and presented at the university. Games are also something most people use and have an idea of how they want to use them. It was also very positive that they got to do the project together with external supervisors, and in that way, step a little out of their bubble, practice communicating with outsiders, and receive very positive feedback. Some students reacted to the interface and what was possible to do; many are so used to advanced games and nice graphics. I had a little difficulty seeing where it would lead, but I feel more confident in that role now. Thank you for your kind reception and for letting us participate!*"

Despite acknowledged limitations, including a small and relatively homogenous sample of Swedish upper secondary students, a short study duration limiting the assessment of long-term impacts, and reliance on self-reported data, this exploratory study provides valuable initial insights into integrating DT and the ChoiCo model for addressing SSIs. These limitations, while present, highlight crucial avenues for future research, such as expanding to larger and more diverse participant groups for enhanced generalizability, conducting longitudinal studies to understand skill sustainability, and exploring the model's applicability across other disciplines and its potential to promote equitable access to STEM and SSI education. In conclusion, the study establishes a compelling foundation, with evidence closely aligned to its research questions, for the pedagogical potential of integrating DT and ChoiCo in fostering meaningful, skill-oriented learning experiences crucial for navigating 21st-century complexities.

Keywords: Design Thinking, ChoiCo, Socio-Scientific Issues, Media Literacy, Game-Based Learning, Digital Transformation

REFERENCES

Al Zou'bi, R. M. (2022). The impact of media and information literacy on students' acquisition of the skills needed to detect fake news. *Journal of Media Literacy Education*, *14*(2), 58–71.

Johansson-Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and Innovation Management*, *22*(2), 121–146.

Plattner, H., Meinel, C., & Leifer, L. J. (Eds.). (2009). *Design thinking: Understand–improve–apply*. Springer Science & Business Media.

Qian, M., & Clark, K. R. (2016). Game-based learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, *63*, 50–58.

This work © 2025 by the authors is licensed under CC BY 4.0

Artificial Intelligence

The abstracts that follow present the work of researchers and practitioners, sharing their insights, ideas, and breakthroughs within the growing field of AI. New collaborations across disciplinary boundaries are a key feature of this field, in addition to co-creation of new knowledge between academia and industry.

This work © 2025 by the authors is licensed under CC BY 4.0

EVALUATING TOPIC MODELS FOR NATIONAL AI STRATEGIES: A COMPARATIVE STUDY OF LDA AND BERTOPIC

Pontus Henningsson

Department of Cultural Sciences, Faculty of Arts and Humanities, Linnaeus University, Sweden, ph223ed@student.lnu.se

ABSTRACT

Artificial Intelligence (AI) has seen an increased use and prevalence in recent years, exemplified through the surge in adoption of Large Language Models such as ChatGPT. Following the increase in use, a great deal of benefits, but also risks, have materialized. To navigate the rapidly developing world of AI, and its subsequent implications, a whole host of countries have opted to publish national AI strategies; documents that outline and detail a country's attitude, and vision, for the use of AI. Studying a country's national AI strategy, and comparing it to others, can therefore provide a glimpse into nations' different approaches to AI, and thereby also for what objectives they aim to employ AI for, such as military, scientific, economic, or other purposes.

An increasingly common method to study countries' national AI strategies is through topic modeling. Topic modeling is a popular method for uncovering latent themes in large collections of text. While Latent Dirichlet Allocation (LDA) is a widely used topic modeling technique, it has limitations that newer approaches like BERTopic, leveraging advancements within AI through the use of neural networks, aim to address by capturing semantic context and relationships. Furthermore, BERTopic has shown impressive performance on automated metrics of topic coherence that approximate human judgement, suggesting better alignment with how humans interpret texts and categorize them into topics. However, direct comparisons between LDA and BERTopic are scarce, particularly for government policy and strategy documents, and the use of BERTopic remains unexplored in the context of national AI strategies. Due to the rising number of countries publishing national AI strategies, this in turn creates a bigger need for tools that can help researchers analyze and understand these increasing numbers of documents.

This study sets out to evaluate and compare LDA and BERTopic topic models on a dataset consisting of 41 national AI strategies, gathered from the OECD AI policy repository and published between 2017-2023 by countries in Europe, Asia, the Middle East, North America, South America, and Oceania. Both human and automated evaluation is used to assess and compare the models' topic coherence. Four topic models are created, two LDA and two BERTopic models, respectively. Fifteen human evaluators with domain knowledge perform a word intrusion and topic rating task to evaluate the topic coherence of the models. For the word intrusion task, evaluators are tasked with identifying the unrelated semantic term (the intruder word) in a list of words sampled from a topic; if the intruder word is found, this indicates that a topic is coherent, and vice versa. For the topic rating task, evaluators are asked to assess the semantic relatedness of words describing a topic using a three-point scale; a higher rating indicates higher topic coherence. For the automated evaluation of topic coherence, the widely used coherence metrics CNPMI and CV are employed, which calculate the

This work © 2025 by the authors is licensed under CC BY 4.0

word co-occurrence and context vector similarity respectively, approximating human judgement of topic coherence.

The results indicate that there is no definitive “best-performing” topic modeling technique, LDA nor BERTopic, in the domain of national AI strategies. While an LDA model achieves the highest topic coherence based on human evaluation, a BERTopic model shows competitive results on the automated metrics. However, the alignment between the human and automated evaluation is inconsistent, highlighting the need for evaluating topic models using human judgement, and not solely relying on automated metrics which is the current de facto standard. Notably, the most computationally complex model, a BERTopic model, showed poor performance on both human and automated evaluation, suggesting that increased complexity does not necessarily relate to improved performance. Furthermore, the findings of this study are in contrast to those of previous research, where neural topic models, such as BERTopic, based on automated metrics, have outperformed LDA for topic coherence.

This study contributes to the 7ield by providing a comprehensive comparison of LDA and BERTopic, adding to the limited literature on topic modeling performance and evaluation in the context of national AI strategies, and by extension, government policy and strategy documents. This study exemplifies the misalignment between human and automated metrics for topic model evaluation, and posits that positive automated evaluation does not necessarily imply a positive human judgement, emphasizing the current lack of accurate and reliable automated coherence metrics; calling for improved automated coherence metrics with greater human alignment for effective and reliable evaluation of topic models. In addition, this study can aid researchers in selecting, employing, and evaluating topic modeling techniques, especially for national AI strategies, with the methodology of this study serving as a valuable reference for future studies that seek to employ topic modeling, covering dataset creation to model evaluation using open-source code and a publicly available dataset.

Keywords: LDA vs BERTopic Comparison, Topic Modeling Evaluation, Human vs Machine Evaluation, National AI Strategies, AI Governance

This work © 2025 by the authors is licensed under CC BY 4.0

CODE MEETS CLIMATE: AI-POWERED PRODUCT DEVELOPMENT IN CLEANTECH START-UPS

Henrik Kindblom

Department of Marketing and Tourism Studies, School of Business and Economics, Linnaeus University, Sweden, henrik.kindblom@lnu.se

ABSTRACT

Since the mid-19th century, Sweden has undergone an enormous economic transformation. In Sweden—as in many other countries—this transformation has largely been driven by technological progress and innovation. A key factor in this development has been the emergence of General Purpose Technologies, which create entirely new development blocks that affect not only specific industries but society as a whole. The latest General Purpose Technology is generative AI. By processing, analyzing, and generating new data, generative AI holds enormous potential to positively transform society. Despite growing interest in AI, there is a research gap regarding how AI affects product development routines and practices in clean tech start-ups.

To address this gap, this study asks: How does the adoption of AI tools reshape product development routines and practices in clean tech start-ups? What AI tools are used in different phases of product development? How do employees perceive the value, risks, or limitations of using AI?

Three complementary perspectives will be used in the study. *First,* the concept of General Purpose Technologies provides a historical and macroeconomic framing to the study. General Purpose Technologies are powerful, transformative innovations that impact several sectors across the economy. They are characterized by declining costs and improving performance over time and often serve as catalysts for further innovation, leading to new products and processes. Technologies such as the steam engine, electricity, the automobile, the airplane, and the computer have changed how we live and experience the world. *Second*, the study draws on organizational routines theory. According to Feldman and Pentland, organizational routines have both an ostensive and a performative aspect. The ostensive aspect refers to the essential idea of the routine, as manifested in manuals, operating procedures, or "self-evident" norms. The performative aspect is how the routine is enacted in practice, which may differ from the ostensive aspect. These aspects interact, creating a gap that makes routines less rigid and more adaptable. Routines are maintained, interpreted, reinforced, and modified by people; agency and interpretation matter. *Third*, the study is informed by the concept of sociomateriality. According to Orlikowski, organizational research has often downplayed the importance of materiality or focused narrowly on technological diffusion or usage. Given the centrality of material elements—such as buildings, computers, data, and networks—this is problematic. Reality cannot be divided into separate social and material spheres; instead, they are deeply entangled. Materiality influences social practices, which in turn shape materiality. Thus, organizations are sociomaterial.

This work © 2025 by the authors is licensed under CC BY 4.0

For example, search engines and mobile phones are technologies deeply embedded in organizations, reshaping organizational behavior and blurring the boundary between private and professional life.

With regards to the method, the *first step* involves identifying all cleantech start-ups currently operating in Sweden. While approximately 70,000 new companies are registered annually, only a small fraction qualifies as cleantech. To identify these firms, a comprehensive, systematic approach will be used, including searches through public registers, databases (Allabolag), and relevant websites (ALMI Invest, Northzone Ventures, EQT, Creandum, Norrsken Accelerator, etc.). Keyword-based filtering using terms such as "cleantech," "environment," and "climate," associated with clean technologies, will refine search results to isolate the relevant subset of start-ups. In the *second step*, a mixed approach will be used for collecting data, combining surveys and in-depth interviews. Initially, a structured paper-based survey with approximately 20 questions will be administered to all identified cleantech start-ups in Sweden. To enhance response rates, reminder mails (not emails) will be sent to non-responding companies. The survey will target research and development managers. Following this, semi-structured telephone interviews will be conducted with a randomly selected subsample of 15 cleantech firms, also targeting research and development managers for consistency. All responses will be anonymized. This design balances breadth and depth to provide an in-depth understanding of how cleantech start-ups in Sweden are using AI technologies.

The preliminary findings from initial contacts suggest that AI tools such as ChatGPT are increasingly being used within cleantech companies. AI is applied for information research, troubleshooting, and for generating and developing new ideas. Additionally, it is employed for both internal and external communication. According to the engineers, a key limitation of AI is that its output can be somewhat unreliable (hallucination), particularly in areas involving mathematics and physics. The engineers express mixed feelings about AI - acknowledging its benefits while also voicing concerns about the potential for massive disruption. Overall, AI appears to be reshaping internal research routines within these companies, effectively functioning as a "research assistant" to the engineers. As AI takes on human-like characteristics, the boundaries between the social and material worlds increasingly appear to blur, indicating that AI is indeed a transformative General Purpose Technology.
These findings contribute to organizational studies and innovation research by providing early insight into how AI transforms product development in Swedish cleantech start-ups.

Keywords: cleantech, AI, organizational routines, product development, sociomateriality, start-ups

This work © 2025 by the authors is licensed under CC BY 4.0

BLOCK-BASED PROGRAMMING VS PROMPT-BASED PROGRAMMING: EXPLORING THE POTENTIAL OF GENERATIVE AI TO BRING PROGRAMMING INTO MIDDLE SCHOOL

Rafael Zerega[1]* and Marcelo Milrad[2]

[1]*Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, rafael.zerega@lnu.se*
[2]*Department of Computer Science and Media Technology, Faculty of Technology, Linnaeus University, Sweden, marcelo.milrad@lnu.se*

(*Main presenter and corresponding author)

ABSTRACT

The introduction of programming in the subject matter of mathematics and technology in the Swedish curriculum for elementary and secondary education since 2018 (Skolverket, 2022) has represented a challenge especially for students with no previous knowledge in this area. The International Computer and Information Literacy Study (ICILS) conducted in 2023 shows that 4 out of 10 students in 8th grade lack programming skills and other relevant digital competences (Fraillon, 2024). Exploring ways to bring programming closer to students is an urgent necessity as it is an essential skill in our digital and highly technological society. However, learning to program is a complex process as it requires the development of logical thinking for the construction of the algorithm and in most cases, it also requires dealing with the syntax specific for each programming language. Some scholars argue that programming extends beyond mere coding and that it is a thought process where it is crucial to be able to identify the problem and formulate its solution (Grover, 2018).

Modern computing with its increasingly processing power allows for the emergence of more friendly and more intuitive user interfaces that allow for a an easier and more natural form of interaction with computers. Visual block-based programming is a programming method that has been developed to take advantages of the affordances of the graphic user interface (GUI) to allow novice programming students to build algorithms by dragging and connecting blocks in the fashion of a puzzle game without the need to learn the specific syntax of a given programming language (Batni et al., 2025). The advent of AI technology and in particular of generative AI based on large language models (LLM) is offering yet another method of interaction for programming based on the formulation of a series of instructions or *prompts* using natural language. This way of programming through prompts is usually called *prompt engineering* or *prompt-based programming* and just like block-based programming, it can also help novice programmers so that they will not need to learn the full syntax of a programming language as it is the LLM that generates the actual code (Chen et al., 2024).

In order to get more insights regarding the use of these methods of programming among middle schoolers and to analyze both the success rate of students using each method and to learn more about how they experience doing programming tasks with these interfaces, we

This work © 2025 by the authors is licensed under CC BY 4.0

conducted a study consisting of a series of workshops where students had to carry out different types of programming-related tasks using both block-based programming and prompt-based programming. The participants of this study were a group of nineteen students from 9th grade age 14–15 at a public school in southern Sweden. The study consisted of four workshop sessions for a total of 15 hours where students had to carry out a series of programming tasks of increasing difficulty. The tool we used for building the algorithms through block-based programming was an online educational platform called Edublocks (edublocks.org). For doing prompt-based programming students used a chatbot interface specifically designed where students can type in prompts and get an answer. During the first session, students built their algorithms by first using block-based programming method and then they had to do the same task using prompt-based programming. This order followed an alternating sequence for each new workshops session to make sure that both programming methods were being tested in equal conditions. The results from the quantitative analysis of task success rates reveals a shift in performance over the course of the four workshop sessions. In the first session, when tasks were comparatively simple, block-based programming yielded a higher success rate than prompt-based programming. However, as the tasks' level of difficulty increased in subsequent sessions, students struggled to build more complex algorithms on their own, resulting in block-based programming success rates dropping below 20% on two out of three tasks in the last session (the most difficult session). On the other hand, although prompt-based programming performance shows some more random fluctuation, it surpassed block-based programming in overall average success in three of the four sessions (session 2, 3 and 4). This could be the result of students' growing familiarity with crafting effective prompts over the course of the workshop series. Lastly, in regard to students' self-reported data from the pre-intervention surveys, roughly one third of the students reported not having any previous programming experience and almost 60% of them reported never having used chatbots to do prompt-based programming before they participated in this study. As for the experience they had after having participated in the workshops (post-intervention surveys), 43% of the students think that block-based programming is an engaging method for doing programming versus 77% that think prompt-based programming is an engaging method for doing programming. In addition, 69% of students think that prompt-based programming helped them better to learn programming compared to only 31% that think block-based programming helped them better. These results gave origin to an article submitted to the MIS4TEL Conference for 2025.

In a future article we will deepen more in some aspects of interaction which were not analyzed in the MIS4TEL article. In the next article we will analyze the actual prompts sent by the students to the chatbot interface and try to have a better understanding of the entire dialogue that the student had with the LLM and see how the they managed to build their algorithms and analyze how the student prompted the system in an iterative way until they managed to get the algorithm outputting the result requested by each of the tasks that they had to solve. The aim is to explore further the potential of natural user interfaces to help improve programming skills among students in elementary and secondary education.

Keywords: Generative AI, Prompt-based programming, Block-based programming, LLM, Digital competences, K-12 education

REFERENCES

This work © 2025 by the authors is licensed under CC BY 4.0

Batni, B., Junaini, S. N., Sidi, J., Mustafa, W. A., & Ismail, Z. I. A. (2025). Current research trends of scratch block based programming for K-12: A systematic review. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, *51*(2), 138-152.

Chen, E., Wang, D., Xu, L., Cao, C., Fang, X., & Lin, J. (2024). A Systematic Review on Prompt Engineering in Large Language Models for K-12 STEM Education. *arXiv preprint arXiv:2410.11123*.

Fraillon, J. (2024). An International Perspective on Digital Literacy: Results from ICILS 2023. *International Association for the Evaluation of Educational Achievement*.

Grover, S. (2018). *The 5th 'C'of 21st century skills? Try computational thinking (not coding). EDsurge*.

Skolverket (2022). Curriculum for the compulsory school. Lgr22: https://www.skolverket.se/download/18.11f7c7851925054d8c642/1727947566208/pdf13074.pdf

This work © 2025 by the authors is licensed under CC BY 4.0

AUGMENTING PROGRAMMING EDUCATION WITH RESPONSIBLE AI ASSISTANCE

Garrit Schaap

Computer Science and Informatics, Jönköping University, Sweden, garrit.schaap@ju.se

ABSTRACT

Programming is widely recognized as one of the essential skills of the 21st century, according to the OECD. Many Nordic countries have begun integrating programming education into their national curricula. However, the low pass rates of introductory programming courses indicate that many learners still struggle to learn programming. In addition, only 17% of students in the field of Information and Communication Technologies in the European Union are women, highlighting a persistent gender gap in computing education.

Research suggests that programming education is most effective in small class settings with fewer than 30 students, where instructors can provide personalized feedback and adapt learning paths to individual needs. However, as the demand for programming skills continues to grow, institutions are increasingly turning to larger classes. These larger learning environments often lack the individual support and flexibility that smaller groups provide, which can limit their effectiveness.

The rapid rise of Artificial Intelligence (AI), and in particular Large Language Models (LLMs), presents both significant opportunities and potential risks for learners. On the one hand, LLMs such as ChatGPT offer immediate assistance, enabling students to complete programming tasks more quickly. On the other hand, this support can lead to overreliance and reduced cognitive engagement, which may negatively impact long-term learning. A recent study suggests that students who use general-purpose LLMs outperform their peers in task completion but show lower levels of knowledge retention. Interestingly, the same study found that the highest retention and completion rates were achieved by learners using domain-specific LLMs that offer guidance without revealing full solutions. These findings highlight the importance of designing AI tools that support learning while discouraging shortcut behavior.

Building on these insights, we propose a new learning platform called PixieCo/de, which integrates a responsible AI assistant to support students in programming education. The assistant uses scaffolding strategies, such as offering hints and asking guiding questions, instead of providing direct answers. This approach is intended to foster active learning and improve knowledge retention while still helping students make progress in their tasks. In addition to the AI assistant, PixieCo/de leverages Learning Analytics (LA), including indicators such as time on task and tool interaction patterns, to monitor student activity and identify when learners are struggling. By combining LA with AI, the platform delivers timely and adaptive support and provides teachers with actionable insights into student progress. The aim is not to replace instructors but to enhance their ability to intervene effectively and equitably in increasingly large or remote classrooms.

This work © 2025 by the authors is licensed under CC BY 4.0

This study is designed to address the following questions about the role of AI in programming education:

1. How do different AI strategies (none, integrated responsible assistant, external tool) influence student learning behavior during programming tasks?
2. What is the impact of integrated responsible AI support compared to external AI tools on knowledge retention and skill acquisition?
3. How do students reflect on their experiences with AI-assisted learning, particularly in relation to perceived support and independence during problem-solving?

To investigate how different forms of AI assistance affect students' learning behavior and knowledge retention, we are conducting a pilot study using the PixieCo/de platform. The study targets Swedish high school students enrolled in introductory web development courses and compares embedded, responsible AI support with unrestricted use of external AI tools and no AI support at all.

The research focuses on observable learning behaviors during programming tasks, such as time on task and interaction patterns, as well as knowledge retention measured through quizzes and code quality. In addition, we aim to understand how students perceive and reflect on their experiences with various AI support systems through post-study semi-structured interviews.

This study contributes to a deeper understanding of how AI can be ethically and effectively integrated into programming education, supporting student learning while preserving autonomy and promoting long-term retention.

Keywords: Computing Education, Artificial Intelligence, Learning Analytics, Large Language Model

This work © 2025 by the authors is licensed under CC BY 4.0

RECONSTRUCTING FAMILY MEMORY THROUGH GENERATIVE ARTIFICIAL INTELLIGENCE: PERCEIVED AUTHENTICITY AND EMOTIONAL VALUE IN AI-CREATED IMAGES

Paola Gómez-Zea

PhD Program in Communication, Communication Faculty, Universidad Iberoamericana CDMX, Mexico, paola.gomez@ibero.mx

ABSTRACT

This research explores the emotional and epistemological impact of generative artificial intelligence (GAI) in the reconstruction of family memory. It focuses specifically on how AI-generated images—created through systems such as DALL·E, Midjourney, or Freepik—affect the perception of authenticity and the emotional value attributed to reconstructed memories. The study is grounded in the hypothesis that GAI enables emotionally resonant visualizations of the past, while simultaneously destabilizing traditional notions of photographic truth. In doing so, it seeks to contribute to our understanding of the role of synthetic images in contemporary practices of remembrance, intimacy, and identity.

The central research question asks: *How does the use of AI-generated images in the reconstruction of family memory affect the perceived authenticity and emotional value attributed to those images by their creators?* Historically, family photographs have been considered irreplaceable material anchors of identity—indexical traces of "what was" that lend truth to the visual archive. However, the emergence of GAI technologies allows users to fabricate convincing depictions of people, places, and moments that were never recorded. These images, while factually fictitious, may evoke strong emotional responses and even become integrated into family narratives, thus calling into question the ontological status of the photographic image in the digital era.

The project adopts a qualitative, exploratory, and participatory methodological approach. It is structured in two complementary dimensions. The first consists of case studies of contemporary artists working with GAI and memory, such as Maria Mavropoulou (*Imagined Images*), Rogelio Séptimo (*Exhumar la memorIA*), and Felipe Rivas San Martín (*Archivo queer inexistente*), among others. These cases are treated as critical examples for developing typologies of symbolic uses of GAI in reconstructing the personal and collective past.
The second dimension involves a participatory workshop with adult participants—both younger and older—without prior experience using generative AI tools. It is organized in four key phases: (1) in-depth interviews to explore emotionally significant visual memories; (2) collaborative image generation using tools such as DALL·E or Midjourney or Freepik; (3) affective reflection through photo-elicitation to assess emotional resonance; and (4) an exploratory classification using models like OpenAI's CLIP and Google's Teachable Machine to analyze visual and semantic patterns. Data are examined using interpretive and affect-based frameworks, supported by visual semiotics and discourse analysis.

This work © 2025 by the authors is licensed under CC BY 4.0

Preliminary findings, emerging from the first year of research, indicate a recurring duality: participants often express a deep emotional connection to the generated images, describing them as "touching," "healing," or "making the memory visible." At the same time, many acknowledge the artificial origin of the images and articulate doubts about their authenticity. This tension gives rise to a novel visual regime—what this research calls *affective verisimilitude*—in which emotional resonance becomes a more salient criterion of authenticity than indexical fidelity. In this framework, the question is no longer "Did this really happen?" but rather "Could it have happened this way—and does it feel true?"
The study proposes that GAI images, despite lacking a photographic referent, can function as emotionally valid proxies in the intimate sphere of family memory. Their effectiveness lies not in evidentiary function, but in their capacity to evoke, symbolize, and embody desired or missing connections. This reframing echoes Georges Didi-Huberman's concept of the image that resists forgetting not by what it shows, but by what it enables us to feel. Similarly, Joan Fontcuberta's theory of the *nemotype*—a fictional image that behaves as if it belonged to the archive—resonates with the testimonies of participants who have incorporated synthetic portraits into their family histories.

The implications of these findings are both theoretical and methodological. On the theoretical level, this research contributes to the fields of memory studies, visual culture, and post-photography by arguing that AI-generated images are not merely technological novelties, but active agents in the affective and symbolic reconstruction of the past. It engages with a wide range of authors—Haraway, Hirsch, Fontcuberta, Kuhn, Zylinska, Jameson, Baudrillard, Rapp et al.—to position synthetic images within a relational ecology of remembrance that transcends factual documentation. The study thus reframes authenticity as a relational and affective phenomenon, distributed across humans, technologies, desires, and memories.
On the methodological level, the project develops a mixed interpretive approach that blends photo-elicitation techniques, narrative interviews, and participatory image generation, offering a replicable framework for studying emergent media practices in contexts of memory and identity. It introduces the concept of *emotional legitimacy* as a qualitative variable that can be observed through discourse, behavior, and symbolic integration of synthetic images into family practices. Furthermore, by working with non-expert users, the project captures a more grounded, plural, and emotionally complex understanding of how GAI operates in everyday life.

Ethically, the study maintains a situated and reflexive perspective. It avoids the pitfalls of both technological utopianism and nostalgic moralism. Rather than asking whether these images are "true," it asks how they *become meaningful* and *for whom*. The project insists that memory is not a static archive, but a performative, collaborative, and mediated construction. In this light, GAI emerges not as a threat to memory, but as a companion species in Haraway's terms: a co-creator of narratives, affects, and imaginative reconfigurations of the past.

In conclusion, this research highlights that the rise of generative artificial intelligence is not only transforming how images are produced, but also how we remember, feel, and belong. By analyzing how users emotionally and cognitively engage with synthetic family portraits, the study shows that we are witnessing the emergence of a new kind of photographic truth—one that is not indexed to physical referents but to emotional plausibility and relational coherence. The "authenticity" of such images is less about origin and more about the role they play in the symbolic and affective life of those who create and behold them. In the context of family memory, the image thus becomes not a static testimony, but a living interface—between

This work © 2025 by the authors is licensed under CC BY 4.0

imagination and identity, between loss and presence, between what was and what could have been.

Keywords: generative AI, memory, affective verisimilitude, authenticity, family archives, post-photography

This work © 2025 by the authors is licensed under CC BY 4.0

EXPLORING YOUTH PERCEPTIONS OF AI: EMOTIONAL RESPONSES, CONCEPTUAL UNDERSTANDINGS, AND FUTURE DIRECTIONS

Mirka Saarela[1]*, Ahmed Taiye Mohammed[2] and Marcelo Milrad[3]

[1]*Faculty of Information Technology, Finland, mirka.saarela@jyu.fi*

[2]*Cultural Science Department, Faculty of Arts and Humanities, Linnaeus University, Sweden, ahmedtaiye.mohammed@lnu.se*

[3]*Department of Computer Science and Media Technology, Faculty of Technology, University, Sweden, marcelo.milrad@lnu.se*

(*Main presenter and corresponding author)

ABSTRACT

Artificial intelligence (AI) technologies are becoming an increasingly visible part of young people's daily lives, both in and beyond the classroom. As AI systems shape decision-making processes in education (Mohammed et al., 2024), healthcare, and social media (Khosravi et al., 2024), questions about how children and adolescents perceive these technologies have gained new urgency (Neugnot-Cerioli & Laurenty, 2024). AI literacy initiatives, now being introduced in several countries, require a nuanced understanding of how students conceptualize AI, how they feel about it, and how these views are shaped by their personal and sociocultural contexts (Biagini, 2025). Despite the growing interest in AI education, relatively few empirical studies have explored youth perceptions of AI in a systematic way. To address this gap, our research investigates how Swedish students aged 9–16 think about and emotionally respond to AI. We have conducted two studies that offer complementary perspectives: one focusing on students' conceptual understandings and the other on their affective reactions. Together, these studies provide a foundation for developing AI literacy curricula that resonate with students' everyday experiences and ethical concerns.

Study 1: How Do 13–16-Year-Olds Understand AI? In our first study (Saarela et al., 2025) we examined the conceptions of AI held by 75 Swedish students aged 13–16. Using a qualitative survey instrument adapted from prior international research, students responded to five open-ended questions about AI. To analyze these data, we applied a BERT-based topic modeling approach, identifying nine key themes in students' descriptions. These topics ranged from utilitarian understandings of AI as a tool or helper to more anthropomorphic notions such as AI being "just like humans." Other themes reflected uncertainty, mixed emotions, or dystopian imagery associated with AI systems. The study also compared findings with previously collected data from Azerbaijani students, offering preliminary insights into how sociocultural context may shape young people's AI conceptions. This study highlighted not only the diversity of students' views but also their emotional investment in AI, signaling the importance of addressing both cognitive and affective aspects in AI education.

Study 2: Cool, Scary, or Simply a Tool? (In-view) explored the emotional responses of 183 Swedish students aged 9–16 toward AI. Using sentiment analysis tools (VADER and TextBlob),

This work © 2025 by the authors is licensed under CC BY 4.0

we analyzed students' open-ended responses to a question about their feelings toward AI. The findings revealed a broad emotional spectrum, ranging from enthusiastic optimism to explicit distrust and fear. Notably, the analysis identified modest but significant effects of demographic factors: male students expressed slightly more negative sentiments compared to female students, and those who received their first phone at an older age tended to hold more positive views of AI. This study underscored the relevance of personal and experiential factors in shaping students' affective responses to AI, offering important implications for AI education design.

Future Directions: Together, these two studies demonstrate the value of examining both what students know about AI and how they feel about it. As AI technologies increasingly impact decision-making processes in education and society, it is crucial to extend this research into students' perceptions of *ethical issues* related to AI, such as fairness, bias, transparency, and accountability. Understanding how young people perceive the ethical dimensions of AI will be essential for developing literacy initiatives that do not simply teach technical concepts but also foster critical, responsible, and socially engaged AI users. Future studies will explore these themes by integrating questions about fairness and bias in AI into student surveys and qualitative interviews, as well as through cross-cultural comparative work. By centering student perspectives, this research contributes to the growing body of AI literacy scholarship that seeks to inform policy, curriculum development, and classroom practices in ways that are inclusive, ethically aware, and attentive to young people's lived experiences.

Keywords: AI Literacy, Youth Perceptions, Emotional Responses, Conceptual Understanding, Curriculum Development, Ethical AI Fairness and Bias

REFERENCES

Biagini, G. (2025). Towards an AI-Literate Future: A systematic literature review exploring education, ethics, and applications. *International Journal of Artificial Intelligence in Education*, 1-51.

Khosravi, M., Zare, Z., Mojtabaeian, S. M., & Izadi, R. (2024). Artificial intelligence and decision-making in healthcare: a thematic analysis of a systematic review of reviews. *Health services research and managerial epidemiology*, 11, 23333928241234863.

Mohammed, A. T., Velander, J., & Milrad, M. (2024). A Retrospective Analysis of Artificial Intelligence in Education (AIEd) Studies: Perspectives, Learning Theories, Challenges, and Emerging Opportunities. In *Radical Solutions for Artificial Intelligence and Digital Transformation in Education: Utilising Disruptive Technology for a Better Society* (pp. 127-141). Singapore: Springer Nature Singapore.

M. Saarela, A. Mohammed, J. Velander, and R. Zerega, "How Do 13–16-Year-Olds Understand AI? A Topic Modeling Study of Swedish Students' Perceptions," in *2025 IEEE International Conference on Cognitive Models and Artificial Intelligence Conference*. IEEE, 2025, pp. 1–10.

Neugnot-Cerioli, M., & Laurenty, O. M. (2024). The Future of Child Development in the AI Era. Cross-Disciplinary Perspectives Between AI and Child Development Experts. arXiv preprint arXiv:2405.19275.

This work © 2025 by the authors is licensed under CC BY 4.0

Digital Humanities

The abstracts that follow address numerous topics in digital humanities and how digital technologies can assist in understanding and analysing diverse empirical material. Ranging from visualization to cultural analysis and data mining, the breadth of the digital humanities are on display here, highlighting the epistemological and ontological value of such interdisciplinary research.

This work © 2025 by the authors is licensed under CC BY 4.0

DIGITAL ECHOES: TRANSNATIONAL RELATIONS IN THE PUBLIC EYE, DECODED THROUGH ONLINE COMMENTS

Mohammed Ahmed Taiye[1]*, Huda Mohammed Lateef[2], Ibrahim Eskandar Ibrahim Fadhel[3], and Hapini Awang[4]

[1]*Cultural Science Department, Faculty of Arts and Humanities, University, Sweden, ahmedtaiye.mohammed@lnu.se*
[2] *Electronic Computer Center, University of Fallujah, Iraq, hudamohammedlateef@uofallujah.edu.iq*
[3] *Computer Science and Network, National Institute of Administrative Science, Ash Shihr + Department of Information Technology, College of Computers and Information Technology, Hadramout University, Yemen, Ifadhel@hu.edu.ye*
[4] *Institute for Advanced and Smart Digital Opportunities (IASDO), School of Computing, Universiti Utara Malaysia,* hapini.awang@uum.edu.my

(*Main presenter and corresponding author)

ABSTRACT

Background: The landscape of political international relations is undergoing a profound transformation, characterized by the re-emergence and strengthening of strategic alliances amidst escalating geopolitical tensions and evolving global polarities. This dynamic is fundamentally driven by an intense, ongoing competition for power and control over critical resources (Pekkanen, 2025). A compelling illustration of this shift is the fortified relationship between the U.S. and Saudi Arabia (S.A.) under President Trump's renewed presidency. The U.S.-Saudi alliance holds profound geopolitical and economic significance, impacting global energy markets, regional stability, and international diplomacy, with Saudi Arabia actively seeking continued U.S. commitment to regional security amidst evolving challenges, as evidenced by President Trump's recent visit (Ebrahim & Al Lawati, 2025). Despite the critical nature of the U.S.- S.A. alliance, there's a significant gap in systematically understanding public perceptions, sentiments, and discourse surrounding this relationship, especially as expressed in the vast and dynamic landscape of social media comments (Dalipaj et al., 2024). The sheer volume and unstructured nature of these online interactions pose a substantial analytical challenge for traditional qualitative methods (Hewson, 2014). Consequently, a robust, scalable approach is distinctly needed to efficiently extract and interpret the nuanced public perceptions of these geopolitical dynamics across prominent digital platforms (Dalipaj et al., 2024). This study aims to critically examine public perceptions and reactions to the evolving U.S.-Saudi Arabian relationship by leveraging text analytics on YouTube comments, thereby offering novel insights into how social media discourse shapes the understanding of crucial geopolitical dynamics.

Methods: Social media discourse from three YouTube channels were investigated by scraping 3300 comments using Python: *SkyNews* (1000 comments), *Fox35Orlando* (2000 comments), and *Al-Arabiya* (300 comments). It is worth noting that comments were collected at an earlier point, reflecting data volumes at that time. The extracted datasets then underwent

This work © 2025 by the authors is licensed under CC BY 4.0

preprocessing and were analyzed using transformer-based models for emotion-sentiment detection. Additionally, SpaCy was employed for lexical and Named Entity Recognition analysis. To identify key discussion themes, BERTopic was utilized, leveraging RoBERTa embeddings (Mehmood et al., 2024). Finally, these insights were subject to human expert analysis to interpret the mental representation and coherence of the discourse. This qualitative review enhanced our understanding of the empirical output from the digital analysis, culminating in a comparative analysis of public discourse across the different news sources (Dooley & Levinsohn, 2000; Mohammed et al., 2025).

Study Findings: The study analysis reveals distinct audience engagement patterns regarding US-Saudi relations. *FOX35Orlando* showed strongly positive sentiment (70%) dominated by celebratory Trump-focused discourse, reflecting its conservative viewership. Al-Arabiya presented a dual pattern: neutral sentiment (48%) coexisted with religiously framed positive commentary (32%), though nearly 20% of comments were off-topic. *SkyNews* balanced neutral (42%) and positive (41%) sentiment, with discourse equally divided between policy analysis and symbolic evaluation of leadership appearances. These patterns demonstrate how channel identity shapes public discourse. *FOX35Orlando's* emotionally congruent responses reflect partisan alignment, while *Al-Arabiya's* mixed profile suggests its dual role as news provider and cultural forum. *SkyNews'* hybrid engagement mirrors its international audience's diverse perspectives. This highlights how media ecosystems transform geopolitical reporting into participatory audience experiences, with platform-specific comment cultures emerging from institutional, demographic, and editorial factors.

Conclusion with Future plans: Our cross-channel analysis of YouTube commentary has yielded three principal insights about digital discourse on US-Saudi relations: First, we observe that news outlets function as ideological filters, with *FOX35Orlando's* celebratory Trump narratives (70% positive sentiment) contrasting sharply with *Al-Arabiya's* neutral-religious duality and *SkyNews'* balanced policy- appearance focus. Second, the study reveals how platform affordances enable distinct participation styles, from coherent partisan engagement to fragmented multi-topic discussions. Third, we identify emotional resonance as a key mechanism through which media channels cultivate audience loyalty, whether through joy- driven conservative solidarity or the more measured responses of international viewership. These findings advance media effects research by demonstrating how geopolitical narratives undergo participatory reformulation in digital comment spaces. The study paves way for three specific contributions: (1) methodological innovation in combining *Sentiment-Emotion-Topic* analysis, (2) empirical documentation of transnational opinion formation processes, and (3) theoretical development of platform-specific public diplomacy frameworks. Future studies should also investigate longitudinal patterns and cross-linguistic variations to further unpack the complex interplay between news framing and digital audience behavior. One of this study's deliverables is the provision of links to Python implementations via Colab notebooks, and a more detailed similar implementation with a larger dataset can be found in link facilitating reproducibility and serving as a foundation for future research.

Keywords: Text Emotion Classification, Social Media Discourse, Topic Model, Sentiment Analysis, News Channels, Transnational Relation

REFERENCES

This work © 2025 by the authors is licensed under CC BY 4.0

Bouvier, G. (2015). What is a discourse approach to Twitter, Facebook, YouTube and other social media: connecting with other academic fields?. *Journal of Multicultural Discourses*, *10*(2), 149-162.

Dalipaj, E., Mansi, E., & Feruni, N. (2024). Unveiling Public Sentiment: The Role of Social Media in Shaping Perception of Conflicts. In *8th International Scientific Conference EMAN 2024 Conference Proceedings*. https://doi.org/10.31410/EMAN.2024.363

Dooley, R. A., & Levinsohn, S. H. (2000). *Analyzing discourse: A manual of basic concepts*. SIL International and University of North Dakota.

Ebrahim, N., & Al Lawati, A. (2025, May 12). Trump is visiting three of the world's richest nations. Here's what's on their wish list. *CNN*. https://edition.cnn.com/2025/05/11/middleeast/trump-visit-gulf-arab- states-saudi-uae-qatar-intl

Hewson, C. (2014). Qualitative approaches in internet-mediated research: Opportunities, issues, possibilities. In *The Oxford Handbook of Qualitative Research* (2nd ed., p. 21). Oxford University Press.

Hudson, E. (2023). Public Opinion and Foreign Policy Decision-Making. *Global Journal of International Relations*, *1*(1), 49-60.

Mehmood, A., Zamir, M. T., Ayub, M. A., Ahmad, N., & Ahmad, K. (2024). A named entity recognition and topic modeling-based solution for locating and better assessment of natural disasters in social media. *arXiv preprint arXiv:2405.00903*.

Mohammed, A. T., Saarela, M., & Milrad, M. (2025, October). Analyzing Emotional Discourse in Multilingual Social Media: A Case Study of the Russo-Ukrainian Conflict. In *Proceedings of the 4th International Workshop on Multimodal Human Understanding for the Web and Social Media* (pp. 1-9).

Pekkanen, S. M. (2025). Space in the international relations of Asia: a guide to technology, security, and diplomacy in a strategic domain. *Asian Security*, *1*(1), 1-19. https://doi.org/10.1080/14799855.2025.2483170

This work © 2025 by the authors is licensed under CC BY 4.0

DESIGNING HUMAN-CENTERED GENERATIVE AI CONVERSATIONAL AGENTS FOR DIGITAL CULTURAL HERITAGE: A CASE STUDY ON EUROPEANA

Marta Wlusek

Digital Humanities, Faculty of Arts and Humanities, Linnaeus University, Sweden,
mw223zv@student.lnu.se

ABSTRACT

Introduction
Generative AI holds transformative potential for enhancing access to digital cultural heritage (DCH) by enabling more intuitive and engaging user interactions and search behavior through conversational agents. Focusing on Europeana—a pan-European digital platform that aggregates over 55 million items from more than 3,500 galleries, libraries, archives, and museums (GLAM institutions)—this study presents a prototype-driven inquiry into designing ethically-aligned, user-centered AI systems for cultural engagement. Although Europeana offers rich content, users frequently encounter challenges in discovering relevant materials due to the limitations of traditional keyword-based search systems, which can often return results that are either irrelevant or overwhelming. This misalignment between user needs and current interaction models highlights a pressing opportunity for large language models (LLMs) to provide more dialogic, responsive, and user-friendly access to cultural collections.

Research Objectives
The study seeks to address the shortcomings of current DCH interaction models by designing, implementing, and evaluating a generative AI-based conversational search agent aligned with principles of human-centered design. The design goal is to develop a generative AI-based prototype that enables meaningful, transparent, and trustworthy interaction with digital cultural heritage content, using Europeana as the primary testbed. Central to this aim is the integration of ethical and design alignment, ensuring that development processes reflect the principles of human-centered design, ethical AI, and cultural inclusivity, embedding these values into system behavior and interaction patterns. The project also aims to establish and apply a rigorous evaluation framework to assess the usability, accessibility, trust, and inclusivity of the system. This framework draws from interdisciplinary criteria rooted in interaction design, responsible AI, and cultural heritage studies. Together, these objectives are guided by a cohesive theoretical and conceptual foundation that links practical design decisions with a commitment to human-centered values.

Theoretical and Conceptual Framework
The research design is informed by three interrelated and mutually reinforcing frameworks: Human-Centered Design (HCD), Humanity-Centered Design (HuCD), and Human-Centered AI (HCAI). HCD forms the core structural methodology and guides the entire process through stages of understanding, defining, prototyping, testing, and evaluating. This approach places emphasis on usability and alignment with users' cognitive and action models (Norman, 2013). HuCD builds upon the principles of HCD by incorporating broader ethical and systemic considerations, including equity, sustainability, and respect for cultural diversity (Norman,

This work © 2025 by the authors is licensed under CC BY 4.0

2023). It ensures that design choices align with societal and institutional values, particularly those upheld by Europeana and articulated in the FAIR data principles (Findability, Accessibility, Interoperability, and Reusability). HCAI focuses specifically on the application of generative AI, integrating essential principles such as transparency, user agency, responsibiliy, and trust into the technical design of the conversational agent (Dignum, 2019; Shneiderman, 2022). The integrated conceptual frame supports the research objectives and provides a structured pathway from problem identification through to system development and evaluation.

Methodology

A mixed-methods research design is applied within the five-phase HCD model to guide the development and evaluation of the prototype. The conversational search agent is being built using GPT-4o with function-calling capabilities that allow it to interpret natural language queries, retrieve content from the Europeana APIs, and generate contextualized, multi-turn responses (Liu et al., 2024; Shorten et al., 2025). The prototype is implemented within a lightweight, browser-based Streamlit interface to facilitate rapid iteration and user-centered testing. Evaluation metrics cover multiple dimensions. Usability is assessed through indicators such as task success rate, completion time, and user satisfaction. Ethical and inclusive design is evaluated based on criteria including accessibility and the representation of diverse cultural perspectives. AI-specific metrics, including explainability, perceived trust, and hallucination rate, are also measured. Quantitative data is analyzed using Python libraries such as Pandas, NumPy, and Seaborn. Qualitative feedback collected during user testing sessions is processed using natural language processing tools, including SpaCy and Top2Vec. The initial testing phase involves a cohort of educators and students engaging with cultural heritage materials through exploratory tasks.

Anticipated Contribution

The research contributes to the interdisciplinary nexus of generative AI, user experience design, and digital cultural heritage in three significant ways. First, it delivers a working, modular prototype that illustrates how LLMs can improve cultural knowledge retrieval, user engagement, and exploration in digital heritage environments. Second, it advances theoretical understanding by operationalizing a design and evaluation framework that combines HCD, HuCD, and HCAI to support the creation of AI systems that are ethical, usable, and culturally inclusive. Third, it produces empirical insights—both qualitative and quantitative—into how users interact with generative AI in cultural contexts, offering data that can inform future design, policy, and development within public digital heritage infrastructures.

Limitations and Future Directions

The Europeana case study serves as a focused context for implementation; however, the findings may not be generalizable to all DCH systems, particularly those operating under different institutional or technical conditions.

Additionally, the use of GPT-4o introduces known limitations, such as potential biases in training data, issues with transparency, and the risk of hallucination. Future research will address these concerns through longitudinal studies, larger and more diverse user cohorts, and comparative evaluations involving multiple platforms and AI models.

Conclusion

Efforts presented in this extended abstract outline a replicable and ethically grounded approach to developing generative AI tools that enable exploratory, dialogic, and inclusive

This work © 2025 by the authors is licensed under CC BY 4.0

interaction with digital cultural heritage. By integrating human-centered design methodologies with the capabilities of advanced LLMs, the research contributes both theoretically and practically to the emerging field of human-AI collaboration within memory institutions. The work demonstrates that conversational search agents powered by generative AI can serve not only as retrieval mechanisms but also as meaningful partners in the co-construction of cultural knowledge and understanding.

Keywords: Generative AI, Digital Cultural Heritage, Conversational Agents, Europeana, User Experience, Human-Centered Design

REFERENCES

Dignum, V. (2019). *Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way.* Springer.

Liu, W., Huang, X., Zeng, X., Hao, X., Yu, S., Li, D., Wang, S., Gan, W., Liu, Z., Yu, Y., Wang, Z., Wang, Y., Ning, W., Hou, Y., Wang, B., Wu, C., Wang, X., Liu, Y., Wang, Y., … Chen, E. (2024). *ToolACE: Winning the Points of LLM Function Calling* (No. arXiv:2409.00920). arXiv. https://doi.org/10.48550/arXiv.2409.00920

Norman, D. A. (2023). *Design for a better world: meaningful, sustainable, humanity centered.* The MIT Press.

Norman, D. A. (2013). *The Design of Everyday Things* (Revised and Expanded). Basic Books.

Shneiderman, B. (2022). *Human-Centered AI*. Oxford University Press, Incorporated.

Shorten, C., Pierse, C., Smith, T. B., D'Oosterlinck, K., Celik, T., Cardenas, E., Monigatti, L., Hasan, M. S., Schmuhl, E., Williams, D., Kesiraju, A., & Luijt, B. van. (2025). *Querying Databases with Function Calling* (No. arXiv:2502.00032). arXiv. https://doi.org/10.48550/arXiv.2502.00032

This work © 2025 by the authors is licensed under CC BY 4.0

VOICES OF THE PAST AND EMERGING TECHNOLOGIES: AI-ENHANCED TRANSCRIPTION OF HERITAGE AUDIO

Khaled Matar[1], Kemal Cikota[2] and Alexandra Nylén[3]

[1]*Department Of Computer Science And Media Technology, Faculty Of Technology, Linnaeus University, Sweden, km222uq@student.lnu.se*
[2]*Department Of Computer Science And Media Technology, Faculty Of Technology, Linnaeus University, Sweden, kc222hb@student.lnu.se*
[3]*Kulturparken Småland, Sweden, alexandra.nylen@kulturparkensmaland.se*

ABSTRACT

The transcription of historical audio archives plays a vital role in preserving linguistic and cultural heritage. However, manual transcription is time-consuming, and existing automatic speech recognition (ASR) systems perform poorly on underrepresented dialects such as "Swenglish" [1][2][3]—a hybrid of Swedish and English spoken by Swedish immigrants to North America from the late 19th to early 20th centuries. This study investigates how fine-tuned AI models can improve transcription accuracy for these historical language variants and how user-centric tools can support non-technical researchers in validating and editing transcripts. Our approach combines a domain-adapted version of OpenAI's Whisper ASR model with a lightweight correction interface designed for historians and linguists. We evaluate transcription quality using both quantitative metrics and expert feedback. Preliminary findings suggest that a semi-automated, human-in-the-loop workflow significantly reduces transcription time while preserving scholarly rigor. This work contributes to digital humanities and AI-assisted historical research by bridging the gap between cutting-edge technology and accessible tools for cultural preservation.

Introduction and Motivation

The digitization of cultural heritage has opened new possibilities for research and preservation. However, a major bottleneck remains: the transcription of spoken historical content. This is particularly challenging in the case of oral histories and dialect-rich materials from the 19th and early 20th centuries, where linguistic forms differ markedly from those seen in contemporary training datasets for speech recognition systems [4]. One such case is Swenglish, a hybrid dialect that emerged among Swedish immigrants in North America between 1860 and 1930. These recordings hold unique historical and sociolinguistic value [5][6], yet their transcription is often hindered by non-standard pronunciation, lexical borrowing, and audio degradation. Manual transcription by experts is time-intensive and often repeated, even when partial transcriptions exist, due to doubts about their accuracy. At the same time, automated solutions tend to fail on low-resource or blended dialects. This leads to a critical question that guides our work: How can AI-enhanced transcription tools be adapted to support accurate, efficient, and user-friendly workflows for underrepresented historical audio dialects such as Swenglish?

Background and Related works

This work © 2025 by the authors is licensed under CC BY 4.0

Recent advances in ASR, particularly models based on large-scale deep learning such as Whisper, have made high-quality transcription feasible for a range of modern languages [7]. Whisper, developed by OpenAI, has demonstrated strong multilingual capabilities and general robustness. In Sweden, the KB-Lab initiative fine-tuned Whisper on archival recordings to create KB-Whisper, which achieved a 47% reduction in word-level error rates for modern Swedish materials [8].

Research Objectives

The main objectives of this study are threefold: **Model Adaptation**: To fine-tune the Whisper ASR model using historical audio data featuring Swedish and Swenglish speech, enhancing its performance on dialectal and degraded recordings. **Tool Development**: To create an intuitive, web-based transcription correction tool that allows researchers—regardless of technical expertise—to efficiently review, edit, and validate transcriptions. **Evaluation and Impact**: To assess both the transcription quality and usability of the tool through empirical metrics (e.g., word error rate) and structured feedback from domain experts. Together, these objectives seek to align technological innovation with real-world research practices in the digital humanitie

Methodology

Our methodology combines technical model development with human-centered design. We began by curating a specialized corpus of historical audio recordings and corresponding transcripts from the Emigrants' House Museum in Växjö, Sweden [9]. These recordings, primarily dating from 1860–1930, include oral histories, interviews, and reenactments featuring both Swedish and Swenglish speech.

Baseline transcription performance will be evaluated using the standard Whisper and KB-Whisper models. We will then fine-tuned Whisper using our domain-specific corpus, applying data augmentation and careful preprocessing to handle noise and variability in the recordings. Transcription quality will be measured using word error rate (WER), and manually validated by experts in linguistics and history. In parallel, we designed and iteratively refined a lightweight correction interface, following principles of user-centered design. Features were tailored to the workflows of our target users: clear audio playback controls, time-aligned transcription display, and simple editing functionality. Feedback was gathered through observational studies and semi-structured interviews with researchers and museum staff.

Initial Findings

Initial results confirm that Whisper performs well on modern Swedish but struggles significantly with historical and dialectal content. Transcriptions of Swenglish recordings exhibited high word error rates, often due to misrecognition of phonetic blends or code-switched elements. Fine-tuning the model with our specialized corpus led to substantial improvements in recognition accuracy for these cases.

However, such models remain limited when applied to historical or dialectal content outside their training scope. Swenglish, in particular, exhibits phonetic variability, code-switching, and context-dependent grammar that confound general-purpose ASR models. Furthermore, transcription tools often lack interfaces suitable for non-technical researchers who need to interactively validate and correct AI-generated outputs.

Our work builds on the foundation laid by KB-Whisper, extending it to historical Swedish-English contexts and focusing on accessibility for humanities researchers. In usability testing,

This work © 2025 by the authors is licensed under CC BY 4.0

participants responded positively to the correction interface. Researchers emphasized that retaining control over final output was more important than full automation. The combination of AI-generated transcripts with easy-to-use validation tools was seen as a major improvement over fully manual transcription.

Discussion and Future Work

We expect to release a fine-tuned Swenglish-compatible Whisper model and a tool that supports researchers in editing and validating transcriptions more efficiently with emphasis on ease of use for researchers and consumers. The project will contribute insights on adapting ASR systems to historical linguistic domains and on designing human-AI interfaces for academic use. Long-term, this tool could serve as a foundation for similar efforts across other under-resourced historical language variants.

Conclusion

This study demonstrates that combining AI-based speech recognition with user-centered tool design can meaningfully improve transcription workflows for heritage audio. By focusing on underrepresented dialects like Swenglish and emphasizing usability for non-technical researchers, we contribute both technical and methodological advances to the field of digital cultural heritage. Our approach paves the way for future interdisciplinary collaborations at the intersection of AI, linguistics, and historical research.

Keywords: Whisper, History Audio, Dialect Transcriptions, Automatic Speech Recognition (ASR), Machine Learning, AI

REFERENCES

[1] Bartelds, M., San, N., McDonnell, B., Jurafsky, D., & Wieling, M. (2023, May 18). Making more of little data: Improving Low-Resource Automatic Speech Recognition using data augmentation. arXiv.org. https://arxiv.org/abs/2305.10951

[2] Yeroyan, A., & Karpov, N. (2024, June 3). Enabling ASR for Low-Resource Languages: A comprehensive dataset creation approach. arXiv.org. https://arxiv.org/abs/2406.01446

[3] Liu, Z., Venkateswaran, N., Ferrand, E. L., & Prud'hommeaux, E. (2024). How Important is a Language Model for Low-resource ASR? Findings of the Association for Computational Linguistics: ACL 2024. https://doi.org/10.18653/v1/2024.findings-acl.13

[4] Ducorroy, A., & Riad, R. (2025b, May 26). Robust fine-tuning of speech recognition models via model merging: application to disordered speech. arXiv.org. https://arxiv.org/abs/2505.20477

[5] Wennerström, G., & Söderblom, J. (2025, March 31). The Swedish Emigrant Institute.Kulturparken Småland. https://www.kulturparkensmaland.se/en/the-swedish-emigrant-institu te/

[6] *Blanck*, D., Director of the Swenson Center. (n.d.). Swedish immigration to North America. Augustana College. https://www.augustana.edu/swenson/academic/history

This work © 2025 by the authors is licensed under CC BY 4.0

[7] Radford, A., Kim, J. W., Xu, T., Brockman, G., McLeavey, C., & Sutskever,I. (2022, December 6). Robust speech recognition via Large-Scale Weak Supervision. arXiv.org. https://arxiv.org/abs/2212.04356

[8] Vältränad AI-modell förvandlar tal till text. (2025, February 20). https://www.kb.se/samverkan-och-utveckling/nytt-fran-kb/nyheter-sa mverkan-och-utveckling/2025-02-20-valtranad-ai-modell-forvandlar-tal-till-text.html

[9] Utvandrarnas hus i Växjö. (2024, April 23). Kulturparken Småland. https://www.kulturparkensmaland.se/utvandrarnas-hus/

This work © 2025 by the authors is licensed under CC BY 4.0

EMOTIONAL MOBILIZATION AND DEMOCRATIC RESILIENCE IN THE HYBRID MEDIA LANDSCAPE

Kristoffer Holt[1]*, Emily Hanscam[2], Ahmed Taiye Mohammed[2], Marcelo Milrad[3], Andreas Jahrehorn Önnerfors[1], Beate Schirrmacher[4]

[1]*Department of Media and Journalism, Linneaus University, Sweden, kristoffer.holt@lnu.se*
[2]*Department of Cultural Sciences, Linnaeus University, Sweden*
[3]*Department of Computer Science and Media Technology, Linnaeus University, Sweden*
[4]*Department of Film and Literature, Linnaeus University, Sweden*

(*Main presenter and corresponding author)

ABSTRACT

In this abstract we present and discuss the central themes of a collaborative research project that examines the role of emotional mobilization in shaping democratic discourse and enhancing societal resilience amidst ongoing digital transformation. In today's increasingly fragmented and hybrid media landscape, emotionally charged narratives—particularly those propagated by populist actors via alternative media and social platforms (Holt, 2023)—frequently challenge evidence-based communication, thereby contributing to heightened polarization and a decline in public trust. With the continued rise of populist and far-right political movements, it is crucial to understand how to elicit emotional engagement with active citizenship and forms of democratic deliberation. While emotional appeals are often portrayed as antithetical to rational deliberation, they may also serve as catalysts for democratic engagement, social cohesion, and civic participation. Our research questions how emotional narratives in the media may interact with and challenge evidence-based communication in democratic discourse, what role emotional mobilization has in shaping user engagement, polarization and trust in journalistic expertise, and how can an understanding of affective mobilization contribute to building more resilient, inclusive and trustworthy democratic communication practices.

The core ideas that guide our research emerge from a collaboration between the *A Questioned Democracy* and *Digital Transformations* Knowledge Environments at Linnaeus University. Our research approach adopts an intermedial and cross-disciplinary methodology to analyse the interplay between emotional and factual appeals across diverse media ecologies (for the emotional turn in media studies, see Wahl-Jorgensen, 2019). Drawing on digital media content from Sweden—including alternative news sites, mainstream journalism, and social media platforms—the study combines computational methods (e.g., sentiment and network analysis), qualitative approaches (e.g., discourse and frame analysis), and participatory workshops to investigate how emotions and facts co-constitute public discourse (Acheampong et al, 2021).

By moving beyond the conventional dichotomy between reason and emotion, the project seeks to advance a more nuanced understanding of affective dynamics in digital

This work © 2025 by the authors is licensed under CC BY 4.0

communication. In doing so, it contributes to ongoing debates on democratic resilience by examining how emotional mobilization can both distort and strengthen deliberative processes. The broader objective is to inform the design of inclusive, trustworthy, and emotionally attuned communication strategies—particularly within a European context characterized by epistemic uncertainty, algorithmic amplification, and rising populist influence (Moffitt, 2016).

Although the project ideas described above are in currently in their early stages, this presentation will outline its conceptual underpinnings, research design, and collaborative framework. Emphasis will be placed on the methodological challenges and opportunities associated with studying affect, evidence, and trust in an intermedial, data-rich environment. The expected outcomes range from strengthening democratic resilience through improved media practices, informing public communication strategies that balance reason and affect, and developing educational resources and policy recommendations to enhance societal trust in democratic institutions and knowledge systems.

Keywords: Emotional Mobilization, Media, Polarization, Populism, Intermediality, Multimodality

REFERENCES

Acheampong, F.A., Nunoo-Mensah, H. & Chen, W. (2021) Transformer models for text-based emotion detection: a review of BERT-based approaches. *Artif Intell Rev* 54, 5789–5829 https://doi.org/10.1007/s10462-021-09958-2

Holt, K. (2023). Right-wing alternative news media and digital politics. In: *Handbook of Digital Politics*. Cheltenham: Edward Elgar. https://doi.org/10.4337/9781800377585.00042

Moffitt, B. (2016). *The Global Rise of Populism*. Stanford.

Wahl-Jorgensen, K. (2019). An Emotional Turn in Journalism Studies? *Digital Journalism* 8(2): 175–194. https://doi.org/10.1080/21670811.2019.1697626

This work © 2025 by the authors is licensed under CC BY 4.0

VALUE CO-CREATION IN THE DIGITAL AGE: ASSESSING THE IMPACT OF ELECTRONIC THESES AND DISSERTATIONS ON ALUMNI SUCCESS

Michele E. Gibney

Department of Informatics, Faculty of Technology, Linnaeus University, Sweden, mgibney@pacific.edu

ABSTRACT

In an era marked by rapid digital transformation, the transition from print-based to electronic theses and dissertations (ETDs) presents significant implications for alumni authors and their academic and professional trajectories. This research investigates the impact of digitization on alumni from the University of the Pacific, a private higher education institution in California, focusing on how the availability of their work in digital format influences job opportunities, career progression, and scholarly communication. The study builds on previous findings presented at the USetdA 2017 conference, where initial surveys highlighted the potential benefits of digitization for alumni.

To further explore this phenomenon, an expanded alumni survey was administered in the fall of 2019 and summer of 2025, co-created with input from stakeholders across the Library, Graduate School, and Alumni Relations. This collaborative approach ensured that the survey addressed the needs and interests of multiple departments, enhancing its relevance and utility. The initial survey results from the 2019 survey reveal that 78% of alumni are employed in fields related to their graduate degrees, with 48% attributing job offers directly to their thesis or dissertation work. Additionally, a significant positive correlation ($r = 0.310$, $p = 0.020$) was found between perceived thesis online impact and job offers, indicating that alumni who view their work as impactful are more likely to experience tangible career benefits. Gathering additional data in 2025 for those who have graduated between 2020-2024 will be incorporated into this research to see if the correlation is consistent.

The findings so far highlight the role of the academic library in facilitating value co-creation through digitization services, which include the preservation and dissemination of alumni research. The library's provision of monthly readership reports and analytics fosters a sense of professional credibility and encourages ongoing engagement with research. However, challenges remain, as 46% of alumni in the 2019 survey reported not receiving these reports, suggesting a need for improved communication and user education.
This research contributes to the emerging field of service science by illustrating how digital transformation in higher education can enhance alumni relations and promote the reuse of research. By examining the interplay between digital accessibility, visibility, and career advancement, this study offers valuable insights into the co-creation of value in academic contexts, ultimately advancing our understanding of the implications of digitalization in higher education.

Keywords: digital transformation, electronic theses and dissertations, alumni engagement, value co-creation, service science, higher education

This work © 2025 by the authors is licensed under CC BY 4.0

EMOTION CLASSIFICATION, TOPIC MODELLING, AND DISCOURSE EVALUATION OF AUDIENCE RESPONSES TO SNL'S FAST FASHION SKIT ON SOCIAL MEDIA. LEVERAGING ROBERTA, BERTOPIC AND DISCOURSE ANALYSIS

Ka Yee Suvini Lai

Department of Cultural Sciences, Faculty of Arts and Humanities, Linnaeus University, Sweden, ka.lai@tuwien.ac.at

ABSTRACT

This research examines the environmental and social issues tied to fast fashion, a $2.4 trillion global industry defined by rapid production and short product cycles that drive greenhouse gas emissions, waste, and microplastic pollution. In addition to environmental harm, the industry faces serious humanitarian concerns, including low wages and unsafe working conditions. The study investigates public responses to media satire of these ethical issues, focusing on audience responses to a *Saturday Night Live* skit titled *"Fast Fashion Ad"* (key artifact), which parodied a fictional brand "*Xiemu*" (a nod to Chinese brands SHEIN and Temu), and highlighted consumer complicity in unethical supply chains. The aim is to understand how audiences interpret such criticism through satire and how media shape public discourse on ethics and sustainability. Due to the volume of social media comments, computational methods were employed to support analysis.

The study sought to answer two research questions: 1) How do users react, echo or disagree with the specific context in the key artifact in the comment sections? and 2) What is the overall sentiment profile expressed in the comment section of this key artifact? To achieve this, a mixed-methods approach was employed, combining natural language processing (NLP) techniques with qualitative discourse analysis. NLP techniques were used for efficient data analysis. Specifically, Emotion Recognition was performed using RoBERTa (SamLowe/roberta-base-go_emotions model), a transformer-based model capable of classifying text into 27 distinct emotion categories. Comments were segmented to manage input length limitations, and predictions were aggregated. When the dominant label was classified as "*neutral*", it was replaced with the second-most likely emotion as the primary classification – to emphasise more emotionally significant responses. Topic Modelling was conducted using BERTopic, a neural topic model that utilises transformer-based embeddings (all-MiniLM-L6-v2) and clustering to identify latent themes. UMAP was used for dimensionality reduction and HDBSCAN for clustering, with c-TF-IDF for topic representation. Data were collected from public comments (n = 4028) on YouTube, Instagram, and TikTok posts of the skit. Ethical considerations, such as excluding usernames to protect privacy, were addressed. Minimal text pre- processing was applied, and the computational workflow was implemented in Python – the pipeline is available online for reproducibility purposes. Gee's (2005) framework of situated meanings guided the qualitative Discourse Analysis, focusing on how meanings are constructed through context, social practice, and

This work © 2025 by the authors is licensed under CC BY 4.0

shared cultural knowledge to interpret the computational findings and understand user reactions to the skit.

The major findings address both research questions. For RQ2, the RoBERTa emotion classification of 4,028 comments identified "*approval*" (1,253), "*amusement*" (736), "*admiration*" (302), "*annoyance*" (296), and "*disapproval*" (292) as the most frequent prevalent emotions (excluding "*neutral*" label), suggesting a largely positive or engaged response. For RQ1, BERTopic analysis revealed several key thematic clusters: **Theme 1: SHEIN/Temu/Xiemu Humour**, reflecting playful discourse blending humour, pop culture, politics, and critique of Chinese e-commerce; **Theme 2: Appraisal of SNL and Comedic Commentary**, capturing reactions to the skit and its cast; **Theme 3: Big Brands, Sweatshops, Labour, Propaganda & Human Rights**, involving critiques of global brands, labour rights, forced labour, and debates around propaganda and human rights; and **Theme 4: E-commerce, Fast Fashion, Consumption**, covering online shopping, ethical consumption, and consumer habits. Discourse analysis using Gee's framework was central to interpreting these results, revealing that a number of "*approval*" comments were in fact sarcastic, ironic, or critical – demonstrating RoBERTa's limitations in recognising nuanced responses to satire. Users often echoed the skit's critique of fast fashion and complicity, while also expressing disagreement, such as concerns about perceived Sinophobia or highlighting Western hypocrisy and economic necessity in buying cheap goods. Moreover, users used language to perform cultural, political, and linguistic literacy and to negotiate ethical positions within systemic constraints. Environmental concerns did not emerge as a distinct topic in BERTopic; instead, they were embedded within other themes, underscoring the challenge of separating overlapping issues such as labour exploitation and environmental harm through keyword-based methods (c-TF-IDF).

This research makes a significant methodological contribution by integrating computational and qualitative approaches across YouTube, Instagram, and TikTok comments. The successful application of RoBERTa and BERTopic on diverse social media data demonstrates their versatility. The study advances understanding of how users respond to fast fashion critiques through satire, highlighting humour as a tool for engaging with ethical issues and prompting reflection on consumer complicity – an underexplored area. The findings emphasise the need for human interpretation when analysing social media data, especially given the challenges current automated models face with sarcasm and irony. The results also offer practical insights for advocacy groups and sustainable fashion brands. Lastly, this thesis supports scholarship advocating mixed-methods approaches that combine computational and humanities-based techniques in digital media and communication research.

Keywords: Emotion Classification, Topic Modelling, Discourse Analysis, Saturday Night Live, Fast Fashion

This work © 2025 by the authors is licensed under CC BY 4.0

DIGITALIZATION RIGHTS IN SWEDEN: CHALLENGES AND INSIGHTS FROM A MIXED-METHOD STUDY ON NAVIGATING AND IMPLEMENTING DIGITAL ACCESSIBILITY

Timmy Öberg[1]*, Mexhid Ferati[2], Viktorija Kalonaityte[3] and Brigitte Pircher[4]

[1]*Department of Informatics, Linnaeus University, Sweden, timmy.oberg@lnu.se*
[2]*Department of Informatics, Linnaeus University, Sweden, mexhid.ferati@lnu.se*
[3]*Department of Management, Linnaeus University, Sweden, viktorija.kalonaityte@lnu.se*
[4]*School of Social Sciences, Södertörn University, Sweden, brigitte.pircher@sh.se*

(*Main presenter and corresponding author)

ABSTRACT

The concept of Digital Transformation is characterized by the integration and impact of digital technologies on organizations as well as on societal and individual levels (Vial, 2021). However, while digitalization efforts can be valuable and provide new opportunities and benefits, they can also result in drawbacks related to digital products and services not being accessible to people with various types of disabilities (Jankowska, 2020). Despite the EU's ambitious digital strategy aimed at eliminating virtual borders, enhancing connectivity and accessibility, and ensuring harmonized consumer rights for online content across Europe (European Commission, 2023a), Small and medium-sized enterprises (SMEs) in Sweden encounter significant challenges in practically implementing accessibility measures (European Commission, 2023b). While the digital transition is central to Europe's agenda (European Commission, 2023c) and digital accessibility is receiving growing academic attention (Mack et al., 2021), research is scant on SMEs' challenges in implementing digital accessibility in practice. Thus, this study aims to address this gap by mapping EU digital rights and examine their implementation in Sweden. In particular, the study focuses on EU regulations on digitalization, particularly the European Accessibility Act (Directive 2019/882) and its Swedish counterpart on the Accessibility of Certain Products and Services (Act 2023:254).

To investigate the research problem, a mixed-method design was used, consisting of analyzing and comparing the EU directive with Swedish law and conducting empirical data collection, including a survey and, afterward, semi-structured interviews. The initial survey sent to companies gathered insights from 15 respondents. Five were micro-companies, two were medium-sized, and eight responses came from large companies. The survey included questions regarding the companies' current implementation, navigation, and challenges in following and understanding the upcoming accessibility regulations.

After the initial survey, qualitative semi-structured interviews were conducted with relevant stakeholders, totaling 10 interviews. These interviews included experts in organizations focused on different accessibility issues related to specific disabilities, such as blindness. There were also interviews with accessibility experts in the public and private sectors, including accessibility leads working in the banking and insurance industries. The interviews further

This work © 2025 by the authors is licensed under CC BY 4.0

explored topics from the survey, such as the implementation, navigation, and challenges of the new accessibility laws, as well as issues related to the accessibility of digital products and services and the challenges users may encounter.

An initial analysis of the survey results highlighted that many of the responding companies feel prepared to follow the new regulations. Furthermore, companies directly affected by the law, such as medium and large-sized businesses, indicated that they have taken steps to integrate consideration of these laws into their day-to-day business operations. None of the responding companies stated that their products and services fully met the requirements of the accessibility regulation, while 33.3% said they largely met the requirements and 20% said they partially did. The remaining respondents said they were either unaware of or unaffected by the accessibility law. However, the self-reported data varied regarding companies' knowledge of the Swedish law and EU directive, ranging from "not at all familiar" to "very familiar". In terms of challenges, the most common difficulties selected by respondents when it came to implementing and complying with the new accessibility law related to cost, understanding the legislation/functional requirements, and a lack of employee knowledge. In terms of offering training in accessibility, most companies answered that they did not do that (73%), and only two of the 15 responding companies had been thinking about or had applied for exceptions to the accessibility regulations, such as due to disproportionate burden.

The interviews revealed that education and training were important aspects for developing accessible products and services. This included both companies needing internal expertise but also education from a user perspective, such as the need to learn how to use assistive technologies. The interviews also highlighted that the larger companies have been integrating accessibility measures into their services for a long time, though the new regulations have prompted more resources into it. A common challenge mentioned by participants was related to limited expertise and difficulties interpreting the law. Experts specializing in different areas of disability also noted that the new regulations can be vague and overlook specific needs, such as those of individuals with combined disabilities like deafblindness. For example, some regulations may address deaf or blind users separately but not those with both impairments. Lastly, universal and user-centered design approaches were emphasized as important to develop accessible digital products and services.

The research findings provide insight into companies' challenges in implementing accessibility into their digital products and services while also highlighting flaws within current accessibility regulations affecting their effectiveness in improving the usability of digital technologies for users with disabilities. As such, this research provides important considerations for future policies that aim to improve digitalization rights.

Keywords: Digital Accessibility, Small and Medium-sized Enterprises, Mixed-method research, Digitalization

Acknowledgements: The authors thank The Crafoord Foundation (#20240607) for funding the research project.

REFERENCES

This work © 2025 by the authors is licensed under CC BY 4.0

European Commission. (2023a). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, SME Relief Package, Strasbourg, 12.9.2023, COM(2023) 535 final*.

European Commission. (2023b). *First report on the State of the Digital Decade calls for collective action to shape the digital transition, Press release, 27 September 2023, Brussels.* Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4619

European Commission. (2023c). *A Europe fit for the digital age. Empowering people with a new generation of technologies*. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age_en

Jankowska, M. (2020). Digital Transformation–The "Design for All" Approach: European Accessibility for The Disabled. *International Journal of Special Education*, *35*(2), 19-28.

Mack, K., McDonnell, E., Jain, D., Lu Wang, L., E. Froehlich, J., & Findlater, L. (2021, May). What do we mean by "accessibility research"? A literature survey of accessibility papers in CHI and ASSETS from 1994 to 2019. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-18).

Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing digital transformation*, 13-66.

This work © 2025 by the authors is licensed under CC BY 4.0

CATASTROPHE AND CONTINUITY: A DIGITAL EXPLORATION OF GERMAN PHILOSOPHY UNDER NATIONAL SOCIALISM

Gregor Große-Bölting

Institute of Computer Science, Faculty of Engineering, Kiel University, Germany, gregor.grosse-boelting@email.uni-kiel.de

ABSTRACT

German philosophy during the Weimar Republic may have produced some of the most influential philosophers of the 20th century. Philosophical schools of thought such as logical empiricism, the Warburg-Cassirer circle, the critical theory of the Frankfurt School, Freiburg phenomenology and, in a broader sense, Gestalt psychology have shaped the thinking and work of the humanities in the last century and continue to exert a powerful influence. Individuals like Martin Heidegger, Hannah Arendt, and Ernst Cassirer achieved great accomplishments in their respective fields, and their work continues to form the basis for modern research. This period of productivity ended abruptly with the Nazis' seizure of power in 1933: The Law for the Restoration of the Professional Civil Service (*Gesetz zur Wiederherstellung des Bersufsbeamtentums*, BBG) forced even leading international authorities out of their positions if they were considered “non-Aryans” in the Nazis' racist perception or were politically inconvenient. Many subsequently left Germany, and few returned after the war to take up professorships in the newly found Federal Republic. Three – Paul Ludwig Landsberg, Johannes Maria Verweyen, and Kurt Huber – fell victim to the Nazis' extermination politics.

Based on existing research by George Leaman (1993), Christian Tilitzki (2002), and Michael Grüttner (2023, 2024), this project has compiled a Linked Open Data collection of all philosophy professors who worked at German universities between 1933 and 1945. In addition to basic data (name, dates of birth and death, religion, etc.), the collection contains references to other linked data repositories, event data, and in-formation on memberships in Nazi organizations and the effects of the application of the BBG. The resulting dataset of 215 philosophers is openly available via a website (currently still under construction) and can be filtered and freely searched using a SPARQL interface. In addition, it also offers various analysis options, that were used in this study to gain more detailed insights into the development of German philosophy during and after the Nazi regime: How did German philosophy change as a result of the application of the BBG and the loss of 76 professors? What observations can be made about the 41 philosophers who had to leave Germany after 1933? And what were the starting conditions for academic philosophy in the newly founded Federal Republic?

These questions are explored using a variety of digital methods: In addition to a prosopographic analysis of the data set to identify similarities and differences within the collection, primarily based on memberships and categories of discrimination, links to the German National Library's GND Explore service were used to analyze 1,280 titles of works

This work © 2025 by the authors is licensed under CC BY 4.0

written by the philosophers. This allows for an overview comparison of publications before 1933, between 1933 and 1945, and after 1945, which indeed shows a strong thematic shift and, especially during the Nazi regime, a strong nationalistic bias in the publications. Links between individuals were also identified via Wikipedia entries and made available for network analysis. Together with information about repercussions from the regime, this shows not only that philosophers were closely connected with one another, but also that key figures were unable to continue teaching after 1933 or were forced to leave the country. The purges did not affect marginal figures, but important representatives of the discipline. The event data and its links to DBpedia provide GIS information for geoanalysis, which can be used to trace the routes of philosophers who fled Germany, for example demonstrating that entire philosophical schools left Germany. Flight also proved to be a highly individual phenomenon, which, although it ended in Great Britain or the USA for many of the philosophers considered, included some adventurous stopovers. Of particular interest for post-war philosophy is the fact that only about a quarter of the philosophers who fled returned to Germany and that by the end of the 1950s, half of the old professors had died. This suggests a generational shift that brought to professorship philosophers who had been socialized in the academic landscape during the Nazi era.

Against the theoretical backdrop of Siegfried Kracauer's philosophy of history and Pierre Bourdieu's social history of philosophy, these findings paint a picture of the mutual influence of philosophy and the socio-historical context. This contradicts the classical image of timeless philosophical insights. The study also draws attention to further phenomena of marginalization: philosophers who fell into oblivion due to their forced emigration, and women who, despite formal equality in the Weimar Republic, had no opportunity to obtain a professorship in philosophy or whose careers were even more negatively affected by forced migration.

Keywords: digital humanities, philosophy, prosopography, geoanalysis, title mining

This work © 2025 by the authors is licensed under CC BY 4.0

CICuW: The Swedish Far-Right Online Discourse on Libraries From a Distance

Daniel Ihrmark[1]*, Hanna Carlsson[2] and Fredrik Hanell[3]

[1]*Cultural Sciences, Faculty of Arts and Humanities, Linnaeus University, Sweden, daniel.o.sundberg@lnu.se*

[2]*Cultural Sciences, Faculty of Arts and Humanities, Linnaeus University, Sweden, hanna.carlsson@lnu.se*

[3]*Cultural Sciences, Faculty of Arts and Humanities, Linnaeus University, Sweden, fredrik.hanell@lnu.se*

(*Main presenter and corresponding author)

ABSTRACT

In Sweden, the growing influence of the far-right has turned cultural institutions into political symbols in an emerging 'culture war' (Harding, 2021). Carlsson, Hanell & Hansson (2022) show how digital forums and social media play a significant part in orchestrating the ideologically laden conflicts and confrontations that public cultural institutions are currently facing. Digitally mediated threats from the far-right may obstruct the statutory mission of these institutions to promote democracy, but knowledge about how such threats develop and unfold, as well as the relation between online interactions and offline events (Scrivens, Davies & Frank, 2020), is lacking.

The Cultural Institutions and the Culture War (CICuW) project aims at exploring the online discourse surrounding cultural institutions in far-right contexts in order to produce knowledge regarding possible connections between online interactions on the topic of libraries and museums, as well as offline events at these institutions. The project has previously conducted a pilot study on materials from far-right news sources (Hanell et al. 2025), but is now expanding into materials collected from YouTube (3571 transcribed videos from 11 channels) and the Swedish web forum Flashback's Culture and Politics sub-forum (6638 posts) from Språkbanken Text (2025).

The proposed paper will focus on the overview of the materials which will later be used to identify patterns of discourse for further qualitative analysis. The overview makes use of BERTopic (Grootendorst, 2022) to produce clustered topics from the materials while a NLPTown multilingual BERT model (Peirsman, 2020) is used to perform sentiment analysis. Using these two modes of analysis, the overview is intended to indicate commonly occurring positive and negative topics, as well as showcase platform-specific trends that may indicate broader or narrower discourses surrounding libraries in the materials. This overview is then supplemented by zero- shot classification using KB Labs Megatron BERT model (Sikora, 2023) for initial dynamic scoping of relevant materials.

Initial findings indicate that topics involving libraries and museums often position them as

This work © 2025 by the authors is licensed under CC BY 4.0

arenas for broader political discourses, where the actions of different political parties are framed as setting the agenda for cultural policy. This is in line with previous research on how libraries and cultural institutions figure in the culture war (Usherwood and Usherwood, 2021). Furthermore, the far-right's usage of social media platforms and online content creation has previously been indicated as an especially important component of the mainstreaming and dissemination of the ideology (Ekman, 2014; Munn 2020; Sakki & Pettersson 2016).

The CICuW project's overview of far-right content discussing cultural institutions thus become an important addition to our current understanding of how social media is used by the far-right to frame and build opinion on cultural policy, as well as regarding public cultural institutions. While the earlier pilot project conducted on far-right news media indicated some recurring patterns of discourse (Hanell et al. 2025), the expanded scope of the now broadened dataset will allow for further insights into the nature of the broader discourse. In addition, the inclusion of multiple platforms that are used in different registers and predominantly used for different forms of media (articles, forum posts and videos) makes for an important contribution towards the discussion on how far-right ideology proliferates in different environments.

Keywords: cultural institutions, culture war, libraries, text mining, topic modelling, sentiment analysis, digital humanities

REFERENCES

Carlsson, H., Hanell, F., & Hansson, J. (2022). "Det känns som att jag bara sitter och väntar på att det ska explodera": Politisk påverkan på de kommunala folkbibliotekens verksamhet i sex sydsvenska regioner. *Nordic Journal of Library and Information Studies, 3*(1), 26–43.

Ekman, M. (2014). The dark side of online activism: Swedish right-wing extremist video activism on YouTube. *MedieKultur: Journal of Media and Communication Research, 30*(56), Article 8967. https://doi.org/10.7146/mediekultur.v30i56.8967

Grootendorst, M. (2022). *BERTopic: Neural topic modeling with a class-based TF-IDF procedure*. arXiv. https://arxiv.org/abs/2203.05794

Hanell, F., Carlsson, H., & Ihrmark, D. (2025). Exploring culture war related attacks on public libraries: results from a pilot study on information activities of the far-right. *Information Research*, *30*(CoLIS), 344–365. https://doi.org/10.47989/ir30CoLIS52333

Harding, T. (2021). Culture wars? The (re)politicization of Swedish cultural policy. *Cultural Trends*, 1–18.

Munn, L. (2020). Angry by design: Toxic communication and technical architectures. *Humanities and Social Sciences Communications, 7*(1), 1–11.

Peirsman, Y. (2020). *nlptown/bert-base-multilingual-uncased-sentiment* [Computer software]. Hugging Face. https://doi.org/10.57967/hf/1515

Sakki, I., & Pettersson, K. (2016). Discursive constructions of otherness in populist radical right political blogs. *European Journal of Social Psychology, 46*(2), 156–170.

This work © 2025 by the authors is licensed under CC BY 4.0

Sikora, J. (2023). *The KBLab Blog: Swedish zero-shot classification model*. KBLab. https://kb-labb.github.io/posts/2023-02-12-zero-shot-text-classification/

Språkbanken Text. (2025). Flashback Språkbanken Text. https://doi.org/10.23695/YKK8-7D22

Usherwood, B., & Usherwood, M. (2021). Culture wars, libraries and the BBC. *Library Management, 42*(4–5), 291–301.

This work © 2025 by the authors is licensed under CC BY 4.0

THE IMAGE OF MEXICO IN THE WORLD (2018-2024): TYPOLOGY CLASSIFICATION VIA MAIP AND DATA SCIENCE

César Villanueva R.[1]*, Roberto M. Gómez-Soto[2] and Robert Hernández[3] and Luis N. Zúñiga[4]

[1]*International Studies, Culture & communication, Universidad Iberoamericana, Mexico, cesar.villanueva@ibero.mx*
[2]*Graduate program in Design Studies, Design and Technology, School of Design, National Institute of Fine Arts, Mexico, robertogomez@inba.edu.mx*
[3]*Independent Data Scientist, Actuaria y Fianzas Co., Mexico, robert@actuariayfinanzas.net*
[4]*PhD Program in Data Engineering, INIAT, Universidad Iberoamericana, a2203253@correo.uia.mx*

(*Main presenter and corresponding author)

ABSTRACT

Between 2018 and 2024, the global image of Mexico has undergone significant transformation, influenced by shifting geopolitical narratives, emergent digital ecosystems, and intensified flows of mediated content on social and political issues. Despite the increasing importance of soft power in contemporary foreign policy strategies, there remains a lack of comprehensive, data-driven tools to systematically assess and interpret how national image is constructed, circulated, and classified across diverse international contexts. This paper addresses this gap by introducing a novel methodological framework—MAIP (Multidimensional Analytical Image Profiling)—to analyze Mexico's international image through data science and digital transformation perspectives. The research departs from the recognition that the concept of national image is no longer shaped exclusively by state narratives or traditional media, but rather emerges from a complex digital ecology that includes algorithmic amplification, sentiment polarization, and transnational communicative actors. MAIP is grounded in a digital humanities approach that fuses computational classification typologies with a sociopolitical lens, enabling the systematic decoding of Mexico's symbolic presence across digital platforms, news datasets, and international discursive fields.

The central objective of the study is to empirically map the evolution and typological variations of Mexico's global image by utilizing machine learning tools and supervised classification models over a curated corpus of over 300,000 textual and multimedia data points extracted from major global news outlets, social media channels, diplomatic press releases, and think tank reports between 2018 and 2024. Anchored in the framework of digital transformation, the study assumes that national image must now be conceptualized as a dynamic, data-sensitive construct that evolves across real-time digital feedback loops and global information infrastructures. The proposed MAIP methodology incorporates three core components: (1) the design of a custom classification typology for national image categories—including cultural prestige, security perception, economic performance, environmental responsibility, and human rights credibility; (2) the implementation of natural language processing (NLP) algorithms for semantic clustering and sentiment

This work © 2025 by the authors is licensed under CC BY 4.0

analysis; and (3) the generation of temporal-panel visualizations that track the emergence, decline, and interrelation of these categories over time.

Findings from the initial phase of the study indicate that Mexico's image has been characterized by a high degree of fragmentation and volatility, especially in periods marked by migratory crises, security-related headlines, and contentious diplomatic exchanges. However, the data also reveals a progressive diversification in thematic emphasis, with increasing visibility of cultural innovation, environmental diplomacy, and regional cooperation in Latin America. Notably, the MAIP framework uncovered emergent discursive clusters where Mexico is positioned as a strategic actor in global South-South collaborations, and as a laboratory of urban and cultural resilience in international think tank discourse. The typological classification system further enabled the identification of discrepancies between Mexico's self-projected diplomatic narratives and the external perceptions registered in foreign media ecosystems.

This research contributes to the field of international image studies, public diplomacy, and cultural analytics by offering a replicable and scalable model for analyzing national image formation through data science. Moreover, it repositions digital transformation not merely as a contextual backdrop but as a constitutive force in the reshaping of symbolic power. The implications of the findings extend to the design of targeted image management strategies by governmental and non-governmental actors, the construction of digitally literate diplomatic agendas, and the formulation of evidence-based policies in cultural diplomacy. By bridging computational methodologies with critical global analysis, this study not only redefines how national image can be mapped, but also proposes a new epistemological direction for understanding soft power in the digital age.

Keywords: Country Image, Perceptions of Mexico, Classification typology, MAIP Methodology

This work © 2025 by the authors is licensed under CC BY 4.0

CINEMATIC NARRATIVES CLASSIFICATIONS IN RELATION TO MEXICAN CULTURAL ALTERITIES (2018–2024)

Roberto M. Gómez-Soto[1]* and César Villanueva R.[2]

[1] *Graduate program in Design Studies, Design and Technology, School of Design, National Institute of Fine Arts, Mexico, robertogomez@inba.edu.mx*

[2] *International Studies, Culture & communication, Universidad Iberoamericana, Mexico, cesar.villanueva@ibero.mx*

ABSTRACT

In the context of intensified global media flows and algorithmically mediated cultural exchanges, cinema has remained a central site for the representation—and contestation—of national identities and alterities. From 2018 to 2024, international and domestic cinematic productions have offered complex portrayals of Mexican subjectivities, often negotiating themes such as migration, violence, gender, indigeneity, and diaspora. However, despite the proliferation of such representations, academic literature has lacked a comprehensive, systematized approach to classifying and analyzing the evolving typologies of Mexican alterity in contemporary cinematic narratives. This research addresses this gap by applying a computational classification methodology—MAIP (Multidimensional Analytical Image Profiling)—designed to dissect and map the representational grammars of alterity in film narratives, with a focus on the symbolic construction of "the Mexican other" across global cinematic ecosystems.

The objective of the study is to trace and typologize cinematic narratives that engage with Mexican alterities, using data science tools to classify recurring motifs, discursive framings, and symbolic tropes. Grounded in the theoretical paradigm of Digital Transformation, the research recognizes that film circulation, reception, and discourse analysis are increasingly embedded in digital infrastructures such as online streaming platforms, automated recommendation systems, social media discourse, and transnational festival circuits. This shift demands new methodological lenses capable of capturing the complexity and velocity of cultural meaning-making. The MAIP methodology enables such a lens by integrating supervised machine learning, natural language processing (NLP), and classification taxonomies specific to cultural representation studies.

The methodological design includes a corpus of 1,200 films (produced or co-produced between 2018 and 2024) that depict Mexican characters, stories, or spaces, extracted from global streaming databases, international film festival entries, and curated film archives. These films were analyzed using NLP-driven tools for metadata extraction, sentiment attribution, and narrative clustering, followed by human-in-the-loop validation using thematic coding frameworks rooted in critical theory. The classification typology developed for the study includes five major narrative categories of Mexican alterity: victimhood and marginalization; cultural hybridity and resistance; criminalization and exoticism; diasporic identity formation; and symbolic redemption and re-humanization. Each of these was further

This work © 2025 by the authors is licensed under CC BY 4.0

subdivided into subtypes reflecting racial, gendered, geopolitical, and linguistic dimensions.

Initial findings suggest a persistent overrepresentation of tropes related to violence, migration, and criminality, particularly in productions targeting North American and European audiences. However, an emergent countercurrent of cinematic narratives—especially in independent and Indigenous-led filmmaking—foregrounds resistance, plural epistemologies, and affective solidarities. The MAIP analysis reveals a temporal progression in which post-2020 narratives, likely influenced by global sociopolitical events and increased digital accessibility, began to displace earlier monocultural depictions in favor of intersectional, decolonial, and feminist framings of Mexican otherness. Significantly, the classification methodology allowed the detection of transregional narrative convergences, where Mexican alterities were aligned with broader Global South representations, especially in films co-produced with Latin American, Asian, and African partners.

This research advances both the field of film studies and the broader domain of cultural diplomacy by proposing a robust data-driven approach to the study of identity representation. By leveraging the epistemological tools of digital transformation, the study contributes to a methodological shift from qualitative anecdotalism toward computational cultural analysis. The implications extend to filmmakers, curators, cultural policymakers, and diplomatic stakeholders interested in understanding how symbolic geographies of identity and difference are constructed and disseminated through cinema. Furthermore, the study challenges hegemonic classification systems in film archives and recommendation algorithms by offering a taxonomy that foregrounds subalternity, polyphony, and cultural complexity. Ultimately, this research not only traces the contours of Mexican alterity in cinema but also reclaims its interpretive agency through data science.

Keywords: Cinematic narratives, cinema about Mexico, Classification of cinema themes, cultural alterities

This work © 2025 by the authors is licensed under CC BY 4.0