

A Bibliometric Review of Agile Methodologies in Information Systems Development

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Article Info	ABSTRACT
<p>Article history:</p> <p>Received August, 2025 Revised August, 2025 Accepted August, 2025</p> <hr/> <p>Keywords:</p> <p>Agile methodologies; Information systems development; Bibliometric analysis; VOSviewer</p>	<p>This study presents a comprehensive bibliometric review of scholarly literature on agile methodologies within the context of information systems (IS) development, covering publications from 2000 to 2025. Using the Scopus database as the primary source, a total of relevant articles, conference papers, and reviews were analyzed through performance analysis and science mapping techniques with VOSviewer. The findings reveal that <i>information systems development</i>, <i>information management</i>, and <i>software engineering</i> are the most central and frequently occurring themes, acting as conceptual anchors for the field. Co-occurrence analysis identifies three thematic clusters: (1) technological and infrastructure dimensions, focusing on computational tools, artificial intelligence, and decision support systems; (2) organizational and managerial aspects, encompassing knowledge management, risk management, and user participation; and (3) software engineering and design methodologies, including agile frameworks and cross-domain applications. Overlay visualization indicates a thematic shift from early technical foundations toward broader socio-technical and strategic considerations, while density mapping highlights emerging areas such as agile manufacturing systems and outsourcing. Co-authorship and country collaboration networks show strong global research connectivity, with the United States, United Kingdom, and China leading in output and collaboration influence. The study contributes to both theory and practice by providing a structured knowledge map that integrates technical, organizational, and strategic perspectives of agile IS development, offering guidance for future research and practical implementation. Limitations include reliance on a single database, keyword-based search constraints, and the quantitative nature of bibliometric methods.</p> <p><i>This is an open access article under the CC BY-SA license.</i></p> <div></div>

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<p>1. INTRODUCTION</p> <p>Agile methodologies have emerged over the past few decades as a transformative</p>	<p>paradigm in software and information systems development. Rooted in the Agile Manifesto published in 2001, principles such as iterative development, customer</p>
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collaboration, and responding to change have shaped the mindset of modern development practices. Frameworks like Scrum, Extreme Programming (XP), Kanban, and Dynamic Systems Development Method (DSDM) exemplify the shift away from rigid, plan-driven approaches toward more flexible, people-centered methods [1], [2].

With organizational environments growing more dynamic, development teams have increasingly turned to agile practices to deliver value quickly and adaptively. These approaches emphasize short cycles (sprints or iterations), continuous feedback, and close collaboration among cross-functional teams, enabling faster time-to-market and reduced risk. Indeed, empirical and anecdotal evidence suggest that agile projects are significantly more likely to succeed and less likely to fail compared to traditional management approaches [2], [3].

Given agile's widespread adoption, it has become a focal point of scholarly research. Bibliometric studies offer quantitative insight into this growing body of knowledge by mapping publication trends, influential authors, collaboration networks, and thematic clusters. [4], for instance, conducted a bibliometric analysis of agile software development and observed a marked growth in publications between 2010 and 2016, peaking in 2015, and noted that literature reviews as well as studies using qualitative and quantitative methods are equally represented.

More recent bibliometric work has expanded both in scope and depth. [5], for example, examined the field of Agile Project Management over the past decade using tools like VOSviewer to reveal thematic shifts, from foundational agile principles toward advanced topics such as risk and cost management and also uncovered emerging research opportunities in integrating agile with cost and risk strategies. Additionally, [6] systematized the agile literature into two complementary perspectives: *agile-as-a-tool* (focusing on process efficiency and contingency) and *agile-as-a-culture* (emphasizing strategic fit and organizational

mindset), and noted a convergence of these perspectives over time. These bibliometric insights are invaluable in charting the field's development, but most existing reviews focus broadly on agile software development or project management as a whole, often without targeting the specific context of information systems development, a domain where organizational complexity, integration with enterprise processes, and legacy system concerns may shape agile adoption differently.

Despite the growth of agile-related bibliometric literature, there remains a notable gap: few, if any, bibliometric reviews have specifically examined agile methodologies within the context of information systems development. The distinct challenges in IS, such as enterprise integration, stakeholder diversity, and legacy system constraints, likely influence the emergence of specialized research themes, journals, collaboration networks, and methodological patterns that differ from general agile development. Without a focused bibliometric mapping, scholars and practitioners lack a comprehensive overview of how agile methods have been studied, debated, and evolved within the IS development field. This gap inhibits deeper understanding of research trends, key contributors, and potential areas for future investigation. The purpose of this study is to conduct a comprehensive bibliometric review of scholarly literature on agile methodologies specifically within information systems development.

2. METHODS

This study employs a **bibliometric analysis** approach to systematically map and evaluate the body of literature on agile methodologies in information systems (IS) development. Bibliometric analysis is a quantitative research method that uses statistical and network analysis techniques to identify publication trends, influential works, leading authors, and thematic patterns in a specific field. It is particularly useful for

summarizing large volumes of academic literature and revealing structural relationships within a research domain [7]. The methodology integrates two primary analyses: **performance analysis**, which measures research productivity and impact, and **science mapping**, which visualizes conceptual, intellectual, and social structures using bibliometric networks.

The bibliometric dataset was retrieved from the **Scopus** database, selected for its comprehensive coverage of peer-reviewed journals, conference proceedings, and high-quality academic publications in information systems and software engineering. The search strategy combined keywords and Boolean operators to ensure precision and relevance, using terms such as "Agile methodology", "Scrum", "Extreme Programming", and "Kanban" in conjunction with "information systems development" and related synonyms. The search was limited to articles, conference papers, and reviews published between 2000 and 2025, reflecting the period after the Agile Manifesto's introduction. Duplicate records and irrelevant publications were removed through manual screening of titles, abstracts, and keywords, ensuring the final dataset exclusively focused on IS development contexts.

Data analysis was conducted using **VOSviewer** for constructing and visualizing bibliometric maps, including co-occurrence of keywords and co-authorship networks. Science mapping techniques were applied to detect thematic clusters and track their evolution over time, enabling the identification of both established and emerging research topics.

3. RESULTS AND DISCUSSION

Keyword Co-Occurrence Analysis

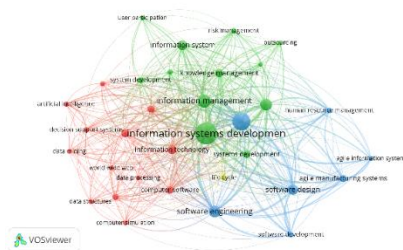


Figure 1. Network Visualization

Source: Data Analysis

Figure 1 presents a **co-occurrence network map** of keywords from the bibliometric dataset on agile methodologies in information systems development. The network is organized into three main color-coded clusters, **red**, **green**, and **blue**, each representing a thematic grouping of research topics that frequently appear together in the literature. The size of the nodes reflects the frequency of a keyword's occurrence, while the thickness of connecting lines indicates the strength of co-occurrence between keywords. At the center, the largest node, "**information systems development**", serves as the dominant focal term, suggesting it is the core theme around which other research topics are connected.

The **red cluster** appears to represent the **technological and infrastructure dimension** of IS development. Keywords in this cluster include *artificial intelligence*, *decision support systems*, *data mining*, *cloud computing*, *data warehouse*, *information retrieval*, and *life cycle*. These terms indicate a strong association between agile methodologies and enabling technologies that support decision-making, data management, and computational capabilities. This cluster highlights how agile practices intersect with evolving technologies, showing that research often addresses the integration of agile methods with data-driven systems and computational tools.

The **green cluster** is oriented toward the **organizational and managerial aspects** of information systems development. Keywords such as *knowledge management*, *risk management*, *human resource management*, *outsourcing*, and *user participation* signal an emphasis on the human and organizational processes that influence agile adoption and effectiveness. The presence of *information management* and *information system* within this cluster suggests a focus on governance, coordination, and strategic alignment of agile projects within organizations. This reflects a growing research interest in how agile methodologies can be embedded within

complex corporate environments to improve adaptability and performance.

The **blue cluster** encapsulates the **software engineering and design-focused themes**. It contains keywords like *software design*, *software development*, *software engineering*, and *agile manufacturing systems*. The inclusion of *agile manufacturing systems* alongside software-related terms suggests cross-domain influences, where agile principles are applied beyond traditional IT contexts into manufacturing and product development. This cluster reinforces the methodological roots of agile, where iterative development, modular design, and cross-functional team collaboration are central.

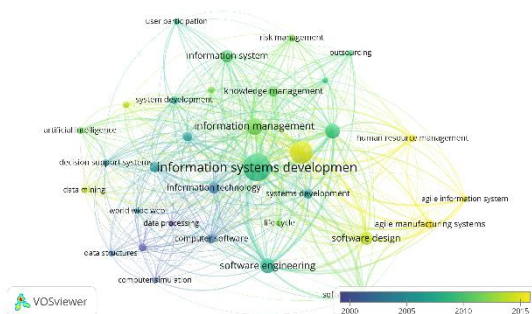


Figure 2. Overlay Visualization

Source: Data Analysis

Figure 2 depicts the temporal evolution of research themes related to agile methodologies in information systems development. The color gradient (from dark blue (older publications, around 2000) to yellow (newer publications, closer to 2015)) shows when particular keywords became more prominent in the literature. Central terms like **“information systems development”**, **“software engineering”**, and **“information management”** are shown in greenish hues, indicating their sustained relevance over a long period, bridging earlier foundational studies and more recent works. These central nodes suggest that core concepts have consistently anchored the research field while serving as a link between older, foundational topics and newer, emerging themes.

The darker blue terms, such as **“data structure”**, **“life cycle”**, and **“computer software”**, represent the earliest research foci, reflecting the initial technical foundations of

agile and IS development literature in the early 2000s. During this period, studies concentrated on structured development approaches, computational techniques, and foundational system design concepts. As the timeline moves toward green and yellow, newer themes emerge—terms like **“agile manufacturing systems”**, **“knowledge management”**, and **“human resource management”**—indicating the expansion of agile methodologies beyond purely technical domains into organizational, managerial, and cross-industry applications.

Recent years, as highlighted by yellow nodes like **“outsourcing”**, **“risk management”**, and **“user participation”**, reflect a shift toward strategic and collaborative dimensions of agile adoption in IS development. This evolution suggests that the field has matured from focusing solely on technical efficiency to incorporating human factors, organizational structures, and globalized work models. The strong interconnections among these newer terms and older, core concepts reveal a convergence of technical and managerial perspectives, underscoring agile’s role as a holistic paradigm that integrates technology, processes, and people within information systems projects.

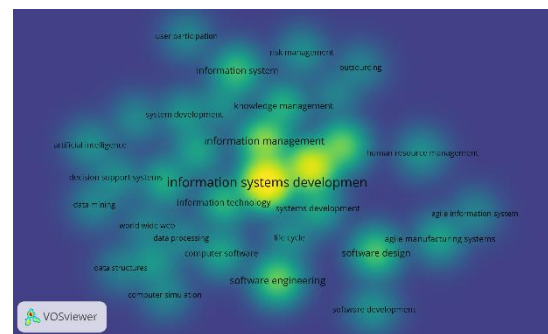


Figure 3. Density Visualization

Source: Data Analysis

Figure 3 illustrates the concentration of research activity in agile methodologies for information systems development. Areas with bright yellow and green shading—such as around **“information systems development”**, **“information management”**, **“information system”**, and **“software engineering”**—represent high-frequency

keywords that have been extensively studied and cited. These hotspots indicate the thematic core of the field, where scholarly attention has been most concentrated. The prominence of these terms underscores their central role in shaping the intellectual structure of agile-related research within IS development, suggesting that these areas serve as key anchors for both technical and managerial discussions.

In contrast, keywords located in cooler blue regions, such as “**agile manufacturing systems**”, “**user participation**”, “**outsourcing**”, and “**risk management**”, reflect topics that, while connected to the core, have relatively lower publication density. These areas may represent more specialized or emerging themes within the domain, offering opportunities for future research expansion. The spatial proximity of these peripheral topics to the core terms indicates their conceptual relevance, suggesting that integrating these emerging areas more deeply into mainstream agile-IS research could broaden the field’s scope and practical applicability.

Co-Authorship Analysis

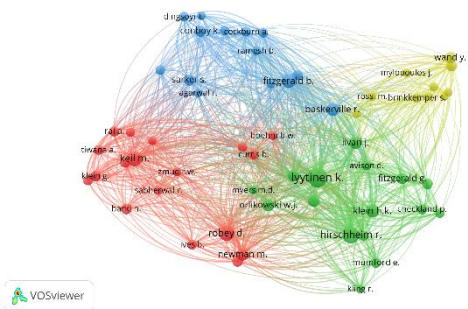


Figure 4. Author Visualization
Source: Data Analysis

Figure 4 shows clusters of researchers who frequently collaborate in the field of agile methodologies and information systems development. Each color represents a distinct collaboration group, with node size indicating the author’s productivity or influence, and the connecting lines showing the strength of their co-authorship links. The **green cluster**, with central figures such as **Lyytinen K.** and **Hirschheim R.**, appears to dominate in terms of network centrality, suggesting strong

influence and collaboration reach. The **red cluster**, including authors like **Klein H.** and **Robey D.**, seems to represent another cohesive scholarly community, likely focused on specific sub-themes within IS development. The **blue cluster**, anchored by **Fitzgerald B.** and **Cockburn A.**, appears to align with agile methodologies’ practical and methodological foundations. Meanwhile, the **yellow cluster**, although smaller, includes authors like **Wand Y.**, who may bridge to other disciplines or niche topics.

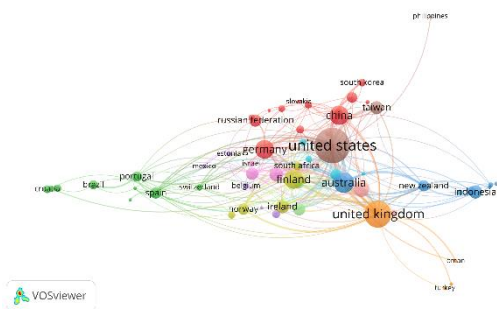


Figure 5. Country Visualization
Source: Data Analysis

Figure 5 highlights the geographical distribution and international partnerships in agile methodologies and information systems development research. **United States**, **United Kingdom**, and **China** emerge as the most prominent contributors, indicated by their larger node sizes, reflecting high publication output and centrality in global collaborations. The **green cluster** connects European countries such as **Germany**, **Finland**, **Portugal**, and **Ireland**, suggesting strong intra-European research ties. The **red cluster**, dominated by **China**, includes collaborators from countries like **South Korea**, **Taiwan**, and **Russia**, indicating a regional network with growing global linkages. The **orange cluster**, centered on the **United Kingdom**, shows notable partnerships with countries such as **Australia**, **New Zealand**, and **Indonesia**, hinting at Commonwealth-driven academic ties.

Practical Implication

The findings of this bibliometric review provide actionable insights for practitioners, project managers, and policy-makers involved in information systems development. By identifying the most

influential themes, authors, and countries, the study helps organizations benchmark their agile adoption strategies against global best practices. The thematic clusters reveal that agile success in IS projects requires not only technical excellence but also strong integration with organizational processes such as knowledge management, risk management, and user participation. Practitioners can leverage this knowledge to design more adaptive, cross-functional teams, align development practices with organizational goals, and explore emerging areas, such as agile integration in manufacturing systems and AI-driven decision support—that have growing academic attention but are not yet fully exploited in industry. Furthermore, the visualization of country and author collaboration networks can guide institutions in forming strategic international partnerships to enhance innovation and knowledge exchange in agile IS projects.

Theoretical Contribution

This study advances the theoretical understanding of agile methodologies in the specific context of information systems development by synthesizing a fragmented body of literature into a coherent, data-driven knowledge map. The bibliometric analysis reveals the intellectual structure of the field, bridging core IS development theories with agile principles rooted in software engineering and organizational change management. It contributes to theory-building by showing how agile has evolved from a purely technical development method into a multidimensional paradigm encompassing managerial, strategic, and socio-technical perspectives. The identification of thematic clusters, spanning technological infrastructure, organizational processes, and methodological foundations, provides a conceptual framework for future research. This framework can serve as a basis for extending agile theory into hybrid models that integrate digital transformation, enterprise architecture, and human-centered design.

Limitation

While this bibliometric review offers a comprehensive mapping of agile IS development research, it is subject to certain limitations. First, the study relied solely on the **Scopus** database, which, although extensive, may exclude relevant publications indexed in other repositories such as Web of Science, IEEE Xplore, or Google Scholar. Second, the keyword-based search strategy, despite careful design, may not capture all relevant studies due to variations in terminology and indexing practices. Third, bibliometric analysis emphasizes quantitative patterns, such as publication counts and citation frequencies, without directly evaluating the quality or depth of the studies included. Finally, the temporal scope (2000–2025) captures two and a half decades of research but may not fully reflect the most recent, yet unpublished or in-press works. Future studies could address these limitations by using multi-database searches, incorporating qualitative content analysis, and applying longitudinal methods to capture evolving research trajectories.

4. CONCLUSION

This bibliometric review provides a comprehensive overview of the research landscape on agile methodologies in information systems development, revealing its intellectual structure, thematic evolution, and global collaboration patterns over the past two decades. The analysis shows that the field has progressed from early, technically focused studies on software engineering and system life cycles toward a broader, interdisciplinary paradigm integrating organizational management, user participation, and emerging technologies such as artificial intelligence and data-driven decision support. Core concepts like *information systems development*, *information management*, and *software engineering* remain central anchors, while newer topics—such as agile integration in manufacturing systems, risk management, and outsourcing—signal expanding applications and future research frontiers. The findings not only consolidate

dispersed scholarly work into a coherent knowledge map but also offer valuable direction for both academic inquiry and practical adoption of agile in complex IS environments. By highlighting key contributors, thematic clusters, and

international partnerships, this study sets a foundation for deeper theoretical development and more strategic, globally informed implementation of agile practices in information systems development.

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