Governing knowledge commons in information science

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Abstract

Introduction. The governing knowledge commons (GKC) framework supports analysis and research design regarding the co-production of information and communities, including associated governance mechanisms to structure engagement with the information or community produced in the interactions. However, knowledge commons are more prominent in information science (IS) as a concept than as robust theory to support analysis of commons, as through the GKC framework or other institutional approaches.

Analysis. This paper assesses the use of the GKC framework in IS research via structured and thematic analysis of the IS literature, collected systematically to include all published citations to GKC, the institutional analysis and development (IAD) framework, and commoning theory and references to knowledge commons.

Results. Results are organized to reflect the spectrum of engagement with these concepts and theories in the form of a typology. A guide is presented to apply the GKC framework for use in IS.

Conclusions. Robust theories support understanding and practice in IS research yet are often underutilized with respect to knowledge commons; future applications of the GKC framework will benefit research in knowledge management, information policy and ethics, and collaborative information and technology studies.

Introduction

Knowledge commons and institutional approaches to analysis of information policy and ethics, knowledge production, collaboration around information and technology topics are increasingly prevalent across interdisciplinary social science, including information sciences and informatics. Engagement with social theory in this process is scattered, reflecting a challenge for core information science (IS) objectives. IS focuses on data, information, knowledge, and wisdom throughout their lifecycles and as shaped by the people, contexts, and systems in which they are produced, stored, processed, shared, and used. IS aims to support both practice and deep understanding, often drawing on theoretical and methodological approaches from other disciplines. If engagement with theory regarding knowledge commons is superficial or sparse, this poses a challenge to understanding and practice. We aim to understand how knowledge commons theories and descriptive frameworks that support research design are used in IS and hope to offer guidance on best practices for this approach.

Analysis

A systematic review was conducted to understand: How is the concept of knowledge commons used in IS scholarship? What domains of IS engage with knowledge commons? When is the GKC framework or other robust institutional theory employed to support analysis of knowledge commons?

Data collection

Relevant literature was identified from both Web of Science (WoS) and Google Scholar. For WoS, a keyword search strategy identified relevant resources on knowledge commons (KC). This was further filtered by '*English language*' and filtered by research area '*library and information science*' to result in 25 articles. Considering only English-language publications, results are generalizable only to this realm of publication. More research articles were obtained via Google Scholar using the keyword '*knowledge commons.*' After reviewing the initial results, the terms '*information commons*' and '*learning commons*' were identified as related terms and they helped expand the search. Some of the articles were not related to the LIS research areas, the keywords '*knowledge commons in library and information science*' were used to refine the search results. Exclusion criteria were applied: articles that did not discuss knowledge commons or in relation to LIS were excluded. Keywords like '*information commons*' and '*learning commons*' were found to appropriate the concept of knowledge commons and were considered as distinct. This refined search strategy identified 20 additional research articles.

Content analysis

The full dataset of 45 relevant article were analysed via thematic, inductive coding of keywords and targeted, strategic qualitative analysis of uses of the concept knowledge commons, how citations to GKC approaches served the paper, and subdomains of IS represented in the paper. Coordination among the coders via discussion of coding for every reference ensured consistent application and analysis of themes (Richards & Hemphill, 2018). Iterative co-coding identified an array of uses of the concept of knowledge commons and levels of engagement with theory, resulting in classification of four distinct categories were identified: misuses of knowledge commons concepts; superficial engagement with knowledge commons concepts; analysis of knowledge commons without connection to existing theory; and meaningful theoretical analysis via knowledge commons theory.

Results

LIS subdomains relevant to knowledge commons

Multiple (library and information science) LIS subdomains engage with knowledge commons at some level, offering scope into where researchers might benefit from engagement with theory and clear conceptualization to ensure that scholars and practitioners understand their framing and its implications appropriately.

Library science and spaces as commons

The most common terms used as a substitute for knowledge commons in LIS were information commons and learning commons. Although, many of these references interpreted the terms as equivalents to knowledge commons (e.g., Lippincott & Skinner, 2022; Nwagwu & Matobako, 2022). This literature explores how libraries utilize information commons and learning commons as physical spaces, service models, learning and reading spaces, and spaces where rehabilitation sessions are conducted for students. It is important to acknowledge that '*information commons*' and '*learning commons*' have slightly different connotations within libraries and IS. Information commons often prioritize access to information technology and resources, while learning commons might focus more on collaborative learning spaces and pedagogical support.

Knowledge management and knowledge production

In knowledge commons discourse, the concepts of knowledge management and knowledge production were often explored. Knowledge commons was perceived as a means of producing and managing knowledge (e.g., Nishikawa, 2020). They can also serve as platforms for new knowledge creation through collaborative efforts and information exchange. This subdomain was referenced in studying the theories of knowledge management in one resource, and the need for enhance knowledge management to help mitigate the risk of information sharing.

Information policy and ethics

The policy and ethical considerations of knowledge commons is an important area of study. The resources surveyed in this literature raise issues of copyright and intellectual property, alternative rights regimes, and open access issues. Resources like those examined by Fisher and Fortmann (2010) were concerned with how data was being shared, owned, and governed within the knowledge commons, and, in this light, Peng (2013) discusses issues of open content licenses. They assume that since the knowledge commons is a shared resource and that there might be conflicts between what owns the contents and data shared. Knowledge commons theory provides a structural mechanism to disentangle these issues.

Collaborative information and technology studies

Studies of computer supported cooperative work and innovation studies address collaborative issues around information and technology. This subdomain raises questions related to open access. However, the knowledge resources examined herein are often less public or more microlevel knowledge commons as shared resources. These works emphasize the need for innovations to take place within knowledge commons. Concepts and terms like '*innovation-centric knowledge commons*', '*collaborative knowledge sharing*' emerge (Ramakrishnan et al., 2021). This subdomain focuses more on the technical aspects of collaboration and information technologies that might be used to support knowledge commons. The emphasis here is more on the social and organizational aspects of shared knowledge.

A Spectrum of engagement with knowledge commons

Across each of these domains, content analysis revealed a wide spectrum of engagement with knowledge commons as a concept and via social theory.

Misuses of knowledge commons

Various references demonstrate how knowledge commons, as shared information and resources that are collaboratively constructed, can be conceptually conflated with other concepts. These sources were so categorized often because they employed knowledge commons as synonymous with open resource, without social or collaborative sharing. For example, Nwagwu and Matobako (2022) apply the concept to describe a technology-equipped space in the library where people have access to digital resources and develop their digital literacy skills. This use of knowledge commons, rather than technology commons, is not unique to this study, but was prevalent in libraries and universities. While LIS as a field might recognize this as a distinct meaning of the concept, it is problematic when references are mistakenly cited with the opposite implication. Other resources were so classified because they treated knowledge commons as interchangeable with learning commons, with no clarity about how knowledge is contributed or accessed. For example, Raish and Fennewald (2016) interpreted knowledge commons as any learning space.

Superficial engagement with knowledge commons

Other resources did not engage with knowledge commons at an analytical level; these references considered knowledge commons without defining their meaning or analyzing the commons. Repositories as knowledge commons were studied (Nishikawa, 2020) to understand how research data were governed. Although repositories were identified as a knowledge common, there was no mention of a particular repository as a common. In parallel, Pang (2013) provides a brief understanding of knowledge commons, but analyzes primarily issues of copyright and licensing. Open licensing was suggested as an alternative, including via knowledge commons, but not explicated. Ferreira (2012) engages with knowledge commons at a surface level, by providing a good definition of knowledge commons, citing literature relative to how they function, and articulating key challenges, based on background literature. However, this article also did not analyze the commons within the data or consider deeper aspects like governance or power dynamics. Ferreira (2012) was an edge case for this category.

Analyzing knowledge commons without theoretical grounding

Some resources were categorized because they defined the concept of knowledge commons and could identify a knowledge commons but did not analyse it using institutional theory. Lippincott and Skinner (2022), for example, focused on analysis of the accountability in the Next Generation Library Publishing (NGLP), a knowledge-commons for scholarly publishing, using the FOREST framework for values-driven scholarly communication. The paper identifies the actors (scholars and scholarly communication stakeholders) and that governance principles that should be implemented but does not discuss them in detail. Kostakis and Papachristou (2014) discuss the potential of Commons-based Peer Production (CBPP) for 3D printing that enables local production in physical manufacturing. Though it does not engage substantially with theory, the authors argue that CBPP principles can enable collaborative design and empower local communities. Fisher and Fortmann (2010) employed a non-institutional theoretical framework to analyze FLUXNET, an example of a knowledge commons where scientific communities share data and control its governance. The paper, and its framework, do not detail the commons, but rather applies design principles from the common property theory (CPR) for successful commons management.

Theoretical analysis of knowledge commons

A subset of papers engaged with meaningful knowledge commons theory, drawing primarily on the institutional grammar (Crawford & Ostrom, 1995), the IAD framework, or the governing knowledge commons (GKC) framework. Notably, MacNaughton and Rao (2017) analyzed the Open and Collaborative Science in Development Network (OCSDNet) as a knowledge commons via the IAD framework, exploring new innovative mechanisms that can enhance collaborative disaster recovery planning, knowledge management, and learning in the Caribbean. These authors deeply explored action arenas, attributes of the common, and the governance mechanisms, grounded by

theory. Ramakrishnan, Shrestha, and Soar (2021) explore the connection between knowledge commons, innovation, and knowledge management (KM). They focus on proposing a new innovation-centric knowledge commons and analyze a conceptual model for Open Innovation Commons that utilizes KM principles.

Discussion

GKC (Frischmann et al., 2014; Sanfilippo et al., 2018) is at its core a descriptive framework to analyze information governance regarding contextual co-production of knowledge and community. GKC considers the social, economic, and political background in which information is produced and governed, as well as attributes of information and actors. The framework is informed by the longstanding political economic tradition of institutional analysis (Ostrom, 1990) and applies an institutional grammar (Crawford & Ostrom, 1995) to examine of strategies, norms, and rules that shape information throughout its lifecycle. Through a series of questions (Sanfilippo & Ocepek, 2024), it facilitates wholistic analysis of factors relevant to social knowledge production, sharing, use, and governance, as well as structured comparisons of individual supports and constraints within information governance (Figure 1).

Attributes	Aims	Conditions			STRATEGIES
Attributes	Aims	Conditions	Modal Logic		NORMS
Attributes	Aims	Conditions	Modal Logic	Consequences	RULES

Figure 1. An institutional grammar for knowledge governance

The GKC framework has structured diverse empirical research designs across many contexts, including health information (Strandburg et al., 2017), smart cities (Frischmann et al., 2023), and social media (e.g., Sanfilippo & Strandburg, 2021; Won & Klamer, 2021). The questions presented by Frischmann et al. (2014) can themselves define qualitative inquiry across contexts to collect or analyse data regarding data or information resources, social processes of knowledge production, and the efficacy or evolution of associated governance. Framework questions can be translated or applied to interview or survey questions (e.g., Sanfilippo & Strandburg, 2021) or adapted as a codebook for analysis of historical or governance documentation (e.g., Madison, 2021). Quantitative and mixed-method approaches are also supported by the institutional grammar and representative survey approaches (e.g., Shvartzshnaider et al., 2022). Further, given the structured nature of the framework, it can be meaningfully integrated with other social theory to explore specific types of information governance, such as privacy (Sanfilippo et al., 2020; Shvartzshnaider et al., 2022) and misinformation (Sanfilippo & Ocepek, 2024).

The GKC framework also supports rich conceptual analysis or results, by providing structure to compare case studies and understand the formation of new information norms or how actors produce information governance. As Figure 2 presents, the relational nature of categories of questions within the framework supports dynamic and longitudinal analysis of individual cases, as well as support comparisons across cases.
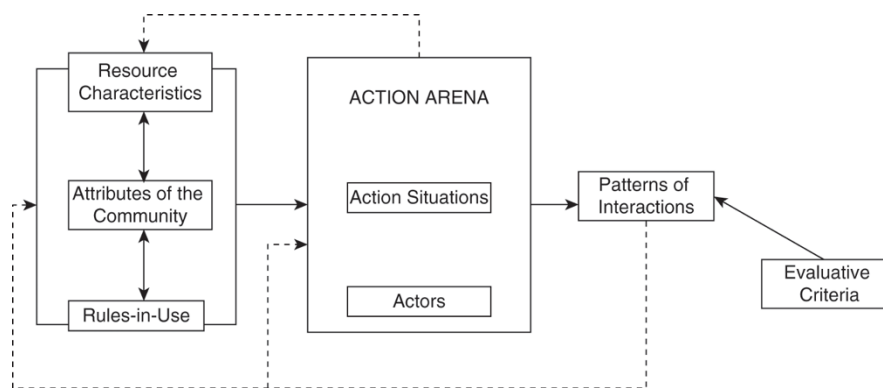
Figure 2. Processes within the GKC Framework

GKC approaches are pragmatic and iteratively developed over two decades of empirical and conceptual research to facilitate interdisciplinary research around social production, use, and sharing of information, core aims of wide swaths of IS research. For example, a current challenge to both KM and information policy subdomains of LIS is posed by generative AI and uncertainty people have regarding veracity and origin of information that influences decision-making, both among experts and everyday individuals. The GKC framework offers structure through which to explore how different communities might grapple with the issue in different ways, with some domains accepting AI-sourced content and others adopting constraints. Further, GKC studies of misinformation offer specific insights that are analogous, given the role of bots and deepfakes in various cases (Sanfilippo & Ocepek, 2024).

Conclusions

IS research benefits best support understanding and practice when supported by clear conceptualization and robust social theory. This conclusion briefly summarizes answers to our research questions. How is the concept of knowledge commons used in IS scholarship? Many subdomains of English-language IS, and LIS scholarship engage with knowledge commons concepts in order to explore shared knowledge resources, collaborative data and information governance and management, and open resources. What domains of IS engage with knowledge commons? Knowledge commons are explored relative to various domains, including LIS, information policy, KM, and collaboration. When is the GKC framework or other robust institutional theory employed to support analysis of knowledge commons? While many papers acknowledge with or engage rich knowledge commons theory, few fully apply them in their analysis. There is significantly more opportunity to apply the GKC theory and other institutional approaches. Future scholarship would benefit from deeper engagement with the GKC and the potential comparisons and practical policy and governance implications that can be translated through structured methods and analysis. Such an approach will better support refinement of knowledge commons in practice, as well as ensure consistent and clear use of the concept within the literature.

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References

Crawford, S. E., & Ostrom, E. (1995). A grammar of institutions. American political science review, 89(3), 582-600.

Ferreira, S. (2012). Evolution and future of the knowledge commons: emerging opportunities and challenges for less developed societies. Knowledge Management for Development Journal, 8(2-3), 141-168. https://doi.org/10.1080/19474199.2012.717757

Fisher, J. B., & Fortmann, L. (2010). Governing the data commons: Policy, practice, and the advancement of science. Information & management, 47(4), 237-245.

Frischmann, B. M., Madison, M. J., & Sanfilippo, M. R. (Eds.). (2023). Governing smart cities as knowledge commons. Cambridge University Press.

Frischmann, B. M., Madison, M. J., & Strandburg, K. J. (Eds.). (2014). Governing knowledge commons. Oxford University Press.

Kostakis, V. & Papachristou, M. (2014). Commons-based peer production and digital fabrication: The case of a RepRap-based, Lego-built 3D printing-milling machine. Telematics and Informatics, 31(3), 434-443.

Lippincott, S., & Skinner, K. (2022). Accountability in the knowledge commons: lessons from Next Generation Library Publishing and the 2022 Values and Principles Summit. Insights, 35.

MacNaughton, M. & Rao, L. (2017). Governing Knowledge Commons: Applications of an Open Knowledge Broker in Caribbean Disaster Management. Expanding Perspectives on Open Science: Communities, Cultures and Diversity in Concepts and Practices, 245-256.

Nishikawa, K. (2020). How are research data governed at Japanese repositories? A knowledge commons perspective. ASLIB Journal of Information Management, 72(5); 837-852.

Nwagwu, W. E. & Matobako, M. M. (2022). Emerging knowledge commons in the public libraries in South Africa. Library Hi Tech.

Ostrom, E. (1990). Governing the commons: The evolution of institutions for collective action. Cambridge University Press.

Pang, N. (2013). Collaborative Production, the Knowledge Commons and the Application of Open Content Licenses. In Information Management Association (Ed.), Digital Rights Management: Concepts, Methodologies, Tools, and Applications (pp. 1162-1178). IGI Global.

Raish, V., & Fennewald, J. (2016). Embedded Managers in Informal Learning Spaces. Libraries and the Academy, 16(4), 793-815.

Ramakrishnan, M., Shrestha, A., & Soar, J. (2021). Innovation centric knowledge commons—A systematic literature review and conceptual model. Journal of Open Innovation: Technology, Market, and Complexity, 7(1), 35.

Richards, K. A. R., & Hemphill, M. A. (2018). A practical guide to collaborative qualitative data analysis. Journal of Teaching in Physical education, 37(2), 225-231.

Sanfilippo, M., Frischmann, B., & Standburg, K. (2018). Privacy as commons: Case evaluation through the governing knowledge commons framework. Journal of Information Policy, 8, 116-166.

Sanfilippo, M. R., & Ocepek, M. G. (eds.) (2024, in press). Governing Misinformation in Everyday Knowledge Commons. Cambridge University Press.

Sanfilippo, M. R., & Strandburg, K. J. (2021). Privacy governing knowledge in public Facebook groups for political activism. Information, Communication & Society, 24(7), 960-977.

Shvartzshnaider, Y., Sanfilippo, M. R., & Apthorpe, N. (2022). GKC-CI: A unifying framework for contextual norms and information governance. Journal of the Association for Information Science and Technology, 73(9), 1297-1313.

Strandburg, K. J., Frischmann, B. M., & Madison, M. J. (Eds.). (2017). Governing medical knowledge commons. Cambridge University Press.