AN EMPIRICAL STUDY OF KEYWORDS IN *ISSUES IN INFORMATION SYSTEMS* (2000-2019)

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ABSTRACT

In 2016, Love & Hirschheim wrote: "We are wise to take pause periodically in order to reflect on our collective work efforts as researchers. Indeed, it is healthy to take stock of our actual performance in relation to our intended and stated goals." This paper seeks to address and embody the spirit of their sage recommendation. Through text mining and keyword analysis, we examine 20 years of scholarly works disseminated in Issues in Information Systems*, an annual publication of the International Association for Computer Information Systems. Nearly 2,100 published papers were examined, revealing more than 5,300 keywords and terms. These topics were then further analyzed to identify foundations, trends and even fads in the body of research. We identify high-volume topics, topic consistency over time, and significant changes over time, in order to define strengths and gaps in information systems research and to encourage meaningful future scholarly study. Our findings reveal three main themes. 1) Throughout the 20 year period of analysis certain research topics such as knowledge management and information security emerge as enduring and foundational. 2) Some unexpected changes occurred, exemplified by a shift from a high number of e-commerce papers early on, to a lower number of papers recently (Dennis, 2017). And 3) Topics have burst onto the scene with a quick rise in the number of papers (e.g. 'Cybersecurity', in the past five years); though not all endured (e.g. 'Virtual Worlds' during the mid-2000's). With this paper, we seek to learn lessons from past inquiry, assess the current state of affairs among our community of scholars, and illuminate opportunities for quality research into the future.*

Keywords: information systems research, technology trends, keyword analysis, digital image processing

INTRODUCTION

Observers of the first two decades of the Twenty-First Century have witnessed rapid changes in the fields of information systems (IS) and information technology (IT). The role of computing in the day to day operations and activities of businesses worldwide, and in essentially every industry, is now ubiquitous. Therefore, research into the practice and pedagogy of IS and IT is of paramount importance to prepare leaders and workers for full participation in Information Age enterprises. For the past 20 years, the International Association for Computer Information Systems (IACIS) has annually published *Issues in Information Systems (IIS).* This publication, which coincides with the association's annual conference each October, provides a scholarly outlet for hundreds of researchers each year.

In this study, we examine the papers published in IIS between the years 2000 and 2019. This comprises IIS volumes one through 20, most of which are available through open access on the association's website (https://www.iacis.org). Our objective in pursuing this analysis of the research is multifaceted. Primarily through the use of keywords in the published papers, and augmented by post-hoc analysis of the corpus of our text data, we identify main topics and themes addressed by IACIS members, along with thematic evolution over time. For example, the theme of 'virtual worlds' became prevalent in the mid-2000's, but becomes much less common (almost non-existent) by the mid-2010's. Such observations can give us insights into more enduring and foundational topics of our discipline, and highlight those that may be more fleeting or faddish. They can also help us to recognize gaps which exist within disciplinary research—gaps that are often unexpected and that may exist due to subconscious assumptions; to wit: we were surprised that for an organization whose name bears the term "Information Systems", the actual keywords 'information systems' are surprisingly uncommon in our collective research over the past two decades. Have we, as a scholarly organization made an assumption that our research is always on the topic of information systems, and if so, does that assumption bear any expected or unintended consequences?

We present here our initial findings of analysis of twenty years of IIS and IACIS research. The prepared data set is rich, provides interesting results, and represents extensive opportunity for additional inquiry. As one illustration, we identify, but do not address in this paper, the existence of 'research social networks'—collaborations between research partners that span multiple years, sometimes on a common theme but often on diverse topics. Our intent with this publication is to provide IACIS members, IIS readers, and other interested constituencies with meaningful reflection, current standing, and future opportunity for research in IS and IT.

LITERATURE REVIEW

Peslak (2018) outlined the publication history of *Issues in Information Systems* and the vision and mission of its publisher International Association of Computer Information Systems (IACIS): "IACIS and IIS are thus a significant and important forum for the exchange of current topics related to information systems, computer science, and related technology in support of business, academia, and other relevant organizations." For the past 20 years, IIS and the associated annual conferences of IACIS have been important scholarly, professional venues for thousands of researchers around the world. The body of knowledge contributed by IACIS member-scholars has been significant, through the creation of research partnerships, collaborations and professional development opportunities. As with any such organization, periodic review of the body of work produced can provide insights into accomplishments, risks, and opportunities for the future.

Empirical retrospectives into the work product of scholarly groups has long been recognized as an important method of research validation and gap analysis (Foley-Nipcon & Lee, 2012; Stanciu, Ionescu, Aleca & Milhai, 2010). Close examination of organizational research can help to identify significant collaborations and collaborators, which can establish subject matter expertise and strengthen synergies between professionals in the discipline; including critical cultivation of new colleagues (Borromeo, Schleyer, Becich, & Hochheiser, 2014; Ghobadi & Robey, 2017; Serenko, 2013). Such analyses include identification of biases, specifically Selection Bias (Richardson, 2013), Anchoring (Zou & Sun, 2020), and Availability Heuristc (Li & Zhao, 2015); as well as the more positive benefits of improved disciplinary standardization (Beck, Koch, & Weiskopf, 2016), elemental focus (Cheng, Huang, Yu, & Wu, 2018; Choi, Yi, & Lee, 2011; Jiang-Liang, & Fong-Hsin, 2004), and congruence of future directions for the field (Coşkun, Özdağoğlu, Damar, & Çallı, 2019; Maisonobe, 2019).

Empirical retrospective analysis of research within professional organizations is well-established and extensive. Dwivedi, Lal, Mustafee, & Williams (2009) established a method for profiling research in information systems, however this type of examination is not unique to any one discipline (Armfield, , Edirippulige, Caffery, Bradford, Grey, & Smith, 2014; Davidson, Baird, & Prince, 2018; Zhang, Huang, Yu, & Yang, 2017). Specifically within the fields of information systems and technology, retrospectives of ten (Ghobadi & Robey, 2017; Tian, Wen & Hong, 2008), twenty (Beydoun, Abedin, Merigó, & Vera, 2019; Li & Zhao, 2015), and even fifty years of research (Merigo, Pedrycz, Weber & de la Sotta, 2018; Shukla, Merigó, Lammers & Miranda, 2020) have summarized salient themes, topics and trends (Love, & Hirschheim, 2016). Close examinations of scholarly organizations' research over time has led to significant, fruitful collaborations—to the benefit of the involved parties and their audiences (Ghobadi & Robey, 2017; Kuo-Chung, Hsin-Ke & Wen-I, 2018; Sohn & Jung, 2015).

Identifying and creating effective collaborations is not the only, nor perhaps even the most important outcome of research corpus analyses. Scholars should hold themselves to the highest standards of accuracy, integrity and objectivity when publishing their work. Research retrospectives assist in this critical aspect of scholarly work by identifying weaknesses, limitations and errors in previously published works (Du, Ke, Chu & Chan, 2017; Pereira, Verocai, Cordeiro & Gomes, 2016). They also help to ensure that past, current and future publications within a given discipline develop and adhere to consistent terminology, practices and expectations (Du, et al., 2017; Kipp, 2005; Stauffer, 2017).

In this paper, we seek to build upon the literature cited in this section to the benefit of the IACIS research community, including engendering an environment that will welcome new scholars to the fold. An honest, thorough and objective review of our own work will contribute to a stronger and more vibrant intellectual community (Larsen, Monarchi, Hovorka & Bailey, 2008). It can help us to develop better methods for identifying potential research partners and forming collaborations (Liu, Yang, Ma, Xu & Hua, 2019; Mezzanzanica, Mercorio, Cesarini, Moscato & Picariello, 2018). And it can assist in ensuring that the work we collectively produce is of sufficient quality to

leave a meaningful legacy within our discipline (Piryani, Madhavi, & Singh, 2017; Zhu, Kong, Hong, Li & He, 2015).

RESEARCH METHODOLOGY

Our research focuses on the corpus of articles published in *Issues in Information Systems* from 2000 to 2019. The breadth and depth of the journal's coverage as well as its open access publishing format provided a strong foundation for the analysis of keywords described below. The data were collected with a Python program for extracting keywords from PDF files followed by a manual data cleansing process for error correction. The program downloaded the target page for a specific volume and issue of the journal such as http://www.iacis.org/iis/iis_articles.php?volume=20&issue=4. The code parsed the target page with the Beautiful Soup library to extract the title and download link for each paper. For each PDF file on the target page, the program performed the following steps. First, the Wand library (wrapper for ImageMagick) converted PDF files to a series of JPG images, one per page. Second, the pytesseract library (wrapper for Tesseract-OCR Engine) extracted the keywords and other metadata from the first JPG image. Finally, the extracted keywords and metadata were stored in a MySQL database for further processing. The manual correction process included correcting OCR (Optical Character Recognition) extraction errors, addressing shifts in editorial policy and article formatting, and reviewing keywords from articles where automatic extraction was not possible. Table 1 summarizes the results of the extraction process by publication year.

Table 1. Summary Statistics for Image Processing per Publication Year

Publication Year	Total # of Articles	Articles Requiring Manual Processing	Articles with no Keywords	Distinct Keywords
2000	76	10	1	298
2001	74	16	0	296
2002	101	9	0	393
2003	115	5	0	449
2004	108	2	0	409
2005	113	1	0	453
2006	141	1	0	499
2007	123	10	8	444
2008	118	9	8	457
2009	114	15	3	436
2010	124	10	7	437
2011	93	9	5	362
2012	93	7	3	383
2013	107	3	0	398
2014	102	6	0	443
2015	110	3	1	443
2016	110	2	3	431
2017	82	0	0	363
2018	96	1	1	425
2019	91	0	0	375
TOTAL	**2091**	**119**	**40**	**5354**

Research Question 1 (RQ1): What are the keywords with the highest total usage?

To address research question 1, we aggregate a simple count of keywords across all volumes and issues of the journal to establish the highest total usage. The question casts light on the research themes in IIS overall and provides an important point of comparison with other research studies (Beydoun, Abedin, Merigó & Vera, 2019; Dwivedi, Lal, Mustafee & Williams, 2009).

Research Question 2 (RQ2): What are the keywords used most consistently over time?

Research question 2 considers the influence of specific keywords over time by highlighting the long-running conversations in the journal. We tally the number of publication years in which a keyword appears at least once. If a keyword receives a score of 20, this means that the keyword appeared at least once in all 20 publication years under review for this study. In essence, the question aims to find the keywords representing the continuity of scholarship in a journal.

Research Question 3 (RQ3): What are the keywords with the greatest change in usage over time?

Research question 3 tracks the keywords with rapid changes in usage. We calculate the difference (delta) between the maximum number of references in a publication year and the minimum number of references in a publication year (excluding zero values) for each keyword. The resulting keywords represent changes in scholarship over time related to specific areas of research.

RESULTS

This section places the results for each research question in context by comparing results to pertinent research specific to IIS as well as other journals in the field.

Research Question 1 (RQ1)

Our results for RQ1, overall, bear similarities to other research on the publication history of *Issues in Information Systems*. Table 2 presents the top twenty-one keywords according to total references. The results share many common elements with Peslak's analysis of titles in IIS from 2000-2017 (2018). For example, six of seven single-word keywords in Table 2 overlap with the one-word occurrences identified by Peslak (2018, p. 45), including: privacy, security, ERP, curriculum, internet and cybersecurity. Furthermore, eight of 19 keywords in Table 2 overlap with the two-word occurrences in Peslak's study, including: information systems, e-commerce, information technology, e-learning, knowledge management, higher education, business intelligence and social media.

The results demonstrate a similar thematic unity with other information systems publications. Love and Hirschheim (2016) identified thematic clusters for the AIS Senior Scholars' Basket of Journals (SSB8) from 1991 to 2013. Their work identified e-commerce, knowledge management and security/risk/privacy as thematic clusters with clear analogues in our keyword list. Moreover, their specific analysis of *Information Systems Journal* includes thematic clusters such as security and ethics/critical research (Love & Hirschheim, 2016). In their study of *Information Systems Frontiers* from 1999 to 2008, Dwivedi, Lal, Mustafee and Williams (2009) identified knowledge management, security, information systems and information technology among the journal's top 23 keywords. A later study of *Information Systems Frontiers* from 1999 to 2018 also identified knowledge management as a top theme (Beydoun, Abedin, Merigó, & Vera, 2019).

Table 2. Top Twenty-One Keywords (Total References)

Keyword	Total References
information systems	69
information technology (IT)	68
e-commerce	62
information technology	57
security	56
knowledge management	48
privacy	43
social media	42
e-learning	41

Keyword	Total References
ERP	38
ethics	37
internet	37
information security	36
project management	36
curriculum	35
higher education	34
cybersecurity	33
online learning	32
distance education	30
data mining	29
business intelligence	29

While the results suggest robust participation in the main themes of information systems research broadly, they also suggest some specific areas where IIS contributes uniquely to information systems research. For example, five of the 21 top keywords relate to education: e-learning, curriculum, higher education, online learning, and distance learning. Neither the SSB8 thematic clusters nor the *Information Systems Journal* thematic clusters (Love & Hirschheim, 2016) nor the *Information Systems Frontiers* keywords (Beydoun, Abedin, Merigó, & Vera, 2019; Dwivedi, Lal, Mustafee & Williams, 2009) identified education as a significant research theme. Somewhat surprisingly, project management also received no explicit reference in the studies reviewed although some components of project management are mentioned such as IS management, requirements/specification process, development methodology, IS design/development, and development (Love & Hirschheim, 2016).

Research Question 2 (RQ2)

Research question 2 aims to reveal the long-running, continuous conversations in IIS by identifying the keywords used most consistently over time in the journal. Table 3 summarizes these long-running conversations by sorting the keywords based on the number of publication years in which they are mentioned. In other words, a value of 20 would mean that the keyword was used at least once in every publication year of IIS under review (2000-2019). These results represent the enduring and foundational aspects of our research community, if not always the most popular research themes overall.

In a few cases, the enduring and foundational topics in IIS reflect those in the IS literature at large. As discussed in the previous section, knowledge management constitutes an important research theme broadly in the information systems literature. The results of our study demonstrate that knowledge management is referenced as a keyword in every publication year but one, and only the keyword 'information systems' is used as regularly over time. Similarly, keywords related to security are mentioned in almost every publication year: security, privacy, and information security.

Table 3. Top Twenty-One Keywords (Total Number of Years Referenced)

Keyword	# of Years	Max #	Min #	Delta	Total
information systems	19	6	1	5	69
knowledge management	19	6	1	5	48
security	18	10	1	9	56
information technology	18	6	1	5	57
project management	18	3	1	2	36
e-learning	17	11	1	10	41
curriculum	17	6	1	5	35
ethics	17	5	1	4	37
privacy	17	5	1	4	43

Keyword	# of Years	Max #	Min #	Delta	Total
e-commerce	16	13	1	12	62
data mining	16	6	1	5	29
online education	16	4	1	3	24
information technology (it)	15	10	1	9	68
ERP	15	6	1	5	38
business intelligence	15	5	1	4	29
distance education	15	3	1	2	30
online learning	14	5	1	4	32
information security	14	5	1	4	36
assessment	14	5	1	4	24
e-government	14	4	1	3	22
pedagogy	14	3	1	2	21

Some of the journal's long-running conversations highlight the unique contributions of IIS. Seven of the 21 keywords in Table 3 relate to education: e-learning, curriculum, online education, distance education, online learning, assessment and pedagogy. Project management is as consistently referenced over time as the keywords security and information technology. Finally, e-government provides the most dramatic example of an on-going conversation in the journal without the peaks and valleys of more faddish topics. Figure 1 shows the longitudinal usage of each keyword in Table 3. E-government routinely appears once or twice in most publication years with only a small peak in 2008 and 2009.

Keyword	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Years
information systems	3	1	2	4	3	2	6	4	3	3	6	3	5	0	2	3	5	4	5	5	19
knowledge management	2	3	1	0	1	3	4	3	2	2	1	3	1	4	3	2	6	3	2	2	19
security	1	1	2	4	1	0	3	4	3	3	4	3	4	1	1	4	6	1	0	10	18
information technology	4	1	2	3	4	4	3	0	5	5	2	4	2	3	1	6	1	3	4	0	18
project management	2	1	1	1	2	2	2	1	2	2	3	3	0	0	1	2	3	3	3	2	18
e-learning	0	1	2	0	1	11	1	2	2	2	2	1	2	1	3	3	3	0	3	1	17
curriculum	1	1	2	3	3	2	6	2	1	0	2	2	2	1	0	1	2	3	0	1	17
ethics	0	1	1	1	2	1	4	5	0	3	3	2	1	1	5	1	3	1	2	0	17
privacy	0	0	1	4	1	0	1	1	2	2	4	2	2	2	2	5	5	2	3	4	17
e-commerce	6	13	8	6	6	4	7	1	1	2	2	1	2	0	0	0	0	1	1	1	16
data mining	1	0	2	2	2	1	0	6	1	2	2	1	2	1	0	2	1	0	1	2	16
online education	0	1	1	2	2	1	2	1	0	0	1	3	1	1	1	0	4	1	1	1	16
information technology (it)	0	0	0	1	0	1	5	8	7	1	3	3	5	7	5	4	10	3	5	0	15
erp	1	3	3	0	1	2	6	3	3	3	1	3	0	0	0	2	0	2	2	3	15
business intelligence	0	0	0	0	1	2	1	2	1	5	2	2	3	0	2	3	1	1	2	1	15
distance education	3	2	3	2	1	3	3	2	1	1	1	2	3	0	0	0	0	1	2	0	15
online learning	2	1	0	0	0	5	2	2	1	0	4	3	2	0	1	3	2	1	3	0	14
information security	0	1	0	0	0	3	2	0	2	3	4	1	2	3	2	5	4	1	0	3	14
assessment	0	1	1	0	3	1	5	4	2	1	1	1	1	0	1	1	0	1	0	0	14
e-government	0	0	2	1	0	1	2	1	3	4	1	1	1	2	1	1	1	0	0	0	14
pedagogy	1	2	2	1	1	3	1	1	0	1	0	0	0	0	1	3	1	0	1	2	14

Figure 1. Top Twenty-One Keywords (Total Number of Years Referenced) by Publication Year

Research Question 3 (RQ3)

In contrast to research question 2, RQ3 addresses the rapidly shifting trends and terms associated with emerging developments in the field. Table 4 displays the top nineteen keywords based on their delta score, the difference between their maximum and minimum usage in a publication year. The keyword 'e-commerce' serves as an important example of how changes over time provide insights into the development of an academic discipline. Figure 2 presents the number of papers referencing each keyword per publication year. Journal articles discussed e-commerce intensely in the 2000s with 13 references in 2001. By 2013, however, the keyword is used considerably less often. The results are remarkably consistent with Peslak's findings: "The largest decline in mentions is for e-

commerce....Clearly there is a maturing of this topic and new research has slowed dramatically." (2018, p. 43; see also Dennis, 2017). This shift can also be explained, at least partially, by shifts in societal perception—what was explicitly e-commerce in 2005, is today assumed to be just regular commerce (Dennis, 2017). Cybersecurity, on the other hand, demonstrates a topic very much on the rise. With no mentions prior to 2014, cybersecurity earned 33 attributions in just 5 years.

The results highlight other examples of falling and rising trends. Collaboration, for example, spiked in 2004 and maintained a robust presence in the journal until 2009, but only one paper referenced the keyword in the last ten years. Social networking also experienced a bump in 2010 that significantly leveled off by 2015. Similarly, cloud computing and big data had usage increases in 2015. Higher education demonstrates the most consistent and recent growth in keyword references with robust discussion beginning in 2016 and continuing to 2019. The discussion section of the paper will expand upon these results to place them in the proper critical perspective.

Table 4. Top Nineteen Keywords (Highest Delta)

Keyword	# of Years	Max #	Min #	Delta	Total
e-commerce	16	13	1	12	62
cybersecurity	5	13	2	11	33
e-learning	17	11	1	10	41
security	18	10	1	9	56
information technology (IT)	15	10	1	9	68
higher education	13	8	1	7	34
big data	7	8	1	7	19
social networking	9	7	1	6	21
collaboration	8	7	1	6	20
information systems	19	6	1	5	69
knowledge management	19	6	1	5	48
information technology	18	6	1	5	57
curriculum	17	6	1	5	35
data mining	16	6	1	5	29
ERP	15	6	1	5	38
IS curriculum	13	6	1	5	25
distance learning	13	6	1	5	27
cloud computing	9	6	1	5	20
enterprise resource planning	8	6	1	5	19

Keyword	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Delta
e-commerce	6	13	8	6	6	4	7	1	1	2	2	1	2	0	0	0	0	1	1	1	12
cybersecurity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	5	4	13	11
e-learning	0	1	2	0	1	11	1	2	2	2	2	1	2	1	3	3	3	0	3	1	10
security	1	1	2	4	1	0	3	4	3	3	4	3	4	1	1	4	6	1	0	10	9
information technology (it)	0	0	0	1	0	1	5	8	7	1	3	3	5	7	5	4	10	3	5	0	9
higher education	0	1	0	1	0	1	2	2	1	1	0	2	0	0	1	0	6	5	3	8	7
big data	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	8	4	0	2	2	7
social networking	0	0	0	0	0	0	0	0	0	2	7	2	3	3	1	0	1	1	1	0	6
collaboration	1	0	0	1	7	1	4	0	2	3	0	0	0	0	0	0	0	0	0	1	6
information systems	3	1	2	4	3	2	6	4	3	3	6	3	5	0	2	3	5	4	5	5	5
knowledge management	2	3	1	0	1	3	4	3	2	2	1	3	1	4	3	2	6	3	2	2	5
information technology	4	1	2	3	4	4	3	0	5	5	2	4	2	3	1	6	1	3	4	0	5
curriculum	1	1	2	3	3	2	6	2	1	0	2	2	2	1	0	1	2	3	0	1	5
data mining	1	0	2	2	2	1	0	6	1	2	2	1	2	1	0	2	1	0	1	2	5
erp	1	3	3	0	1	2	6	3	3	3	1	3	0	0	0	2	0	2	2	3	5
is curriculum	0	0	0	1	2	1	1	0	0	6	2	3	3	1	2	0	1	0	1	1	5
distance learning	6	2	2	2	2	3	2	0	0	0	2	1	1	0	2	1	0	1	0	0	5
cloud computing	0	0	0	0	0	0	0	0	1	1	0	2	0	1	5	6	1	0	1	2	5
enterprise resource planning	0	1	0	0	0	2	6	1	2	5	0	1	0	0	0	0	0	1	0	0	5

Figure 2. Top Nineteen Keywords (Highest Delta) by Publication Year

DISCUSSION

On the whole, our results demonstrate that the research themes in IIS are broadly consistent with those in other information systems publications. The following passage summarizing results for the journal ISF reflects the high-level aspects of our findings for IIS: "The analysis revealed that ISF paper topics fall largely into two groups: one group represents a stable anchor of topics within the traditional IS themes. Another group reflects ISF research adapting and responding to key trends as they emerge." (Beydoun, Abedin, Merigó, & Vera, 2019). The results from RQ1 and RQ2 reveal stable anchor topics (i.e. enduring and foundational topics) in the discipline such as knowledge management, while the RQ3 results capture attempts of the IIS community to adapt and respond to emerging trends in the discipline like cloud computing.

To learn more about how the IIS corpus relates to research themes in computing , we performed an exact match comparison of IIS keywords with the ACM Computing Classification System taxonomy (Association for Computing Machinery, 2012) to identify the distribution of keywords in the Level 1 categories of the taxonomy. Figure 3 presents the results of this analysis with a clear skew toward topics in information systems and applied computing, and away from themes more closely aligned with information technology or the mathematical foundations of the discipline. While the analysis is flawed as it represents a small sample of the more than 9000 keyword references in the corpus, the results prompt reflection about the thematic content of our research community.
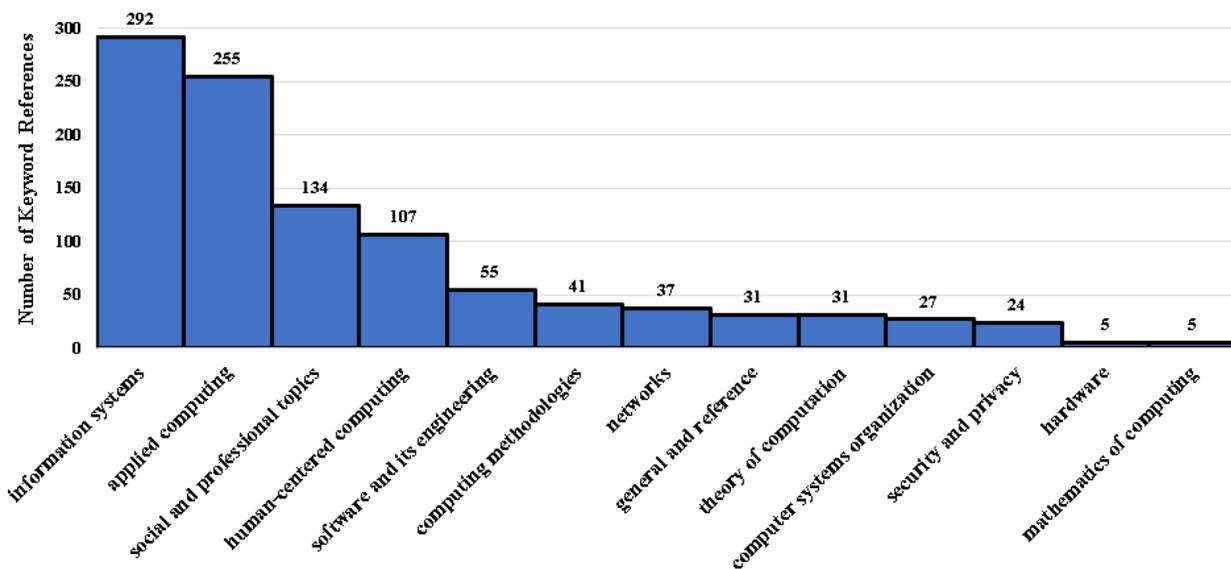

Figure 3. IIS Keyword References by ACM Computing Classification System Level 1 Categories

This discussion would not be complete without an assessment of the limitations of this study. The study suffers from several kinds of bias. First, we have evidence of sampling bias or more specifically an incomplete set of papers related to the corpus. For example, our paper counts do not match the paper counts reported by Peslak (2018). With over 2,000 papers in the corpus we cannot guarantee that every paper was discovered. Second, 40 articles in the corpus did not include keywords at all and we cannot assume that these articles represent a random set in the corpus. Third, the data extraction process with both its automated and manual components is highly effective, yet imperfect. We cannot dismiss the possibility that the approach taken and the technology employed introduced errors in a non-random way. Finally, we noted a conference theme bias in which, not surprisingly, keywords receive bumps in usage when they overlap with conference themes. For example, cybersecurity references spike in 2016 and 2019 when the term was included as a conference theme in those years. This bias in particular challenges our efforts at comparing the IIS corpus with other journals in the discipline.

Linguistic inconsistencies and ambiguities also limit the interpretive value of the study. For example, some keywords will be systematically undercounted due to the many variations available to authors. Information systems was presented in all of the following ways: information systems, information system, and information systems (IS). In some cases, compound keywords are ambiguous. For example, the compound keyword, IT and ethics, placed at the end of a list of keywords might be considered a single compound keyword or two separate keywords (IT, ethics). We cannot rule out the possibility that other kinds of ambiguity also frustrate the interpretation of the data.

CONCLUSION

Our research has identified and analyzed 20 years of scholarly work as published in the volumes of *Issues in Information Systems*. Our identification of primary topical themes as outlined in the above tables will serve to guide scholars' formulation of their individual research agendas, by illuminating foundational versus faddish topics, and through the encouragement of inquiry that adds to the body of knowledge in the information systems profession. We find that our research, and specifically our creation of a corpus of data from *IIS* publications creates opportunities for additional investigation. Although we have identified gaps in research, and topics that burned brightly but then decreased or even vanished, we have not examined *why* such phenomena occurred over the time period examined. Such introspection could emerge from this paper as additional areas of research in order to enhance our collective contribution to our discipline.

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