Application of Information Systems Theories in Library and Information Science Research: A Content Analysis

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Abstract

There is a widely-held belief that the library and information science (LIS) field does not have theories of its own but borrows heavily from a variety of fields. One of the subject domains from which LIS borrows theories is information systems (IS). The purpose of this study was to examine the extent and nature of application of information systems theories in the library and information science research using content analysis techniques. The study extracted relevant data from the Library, Information Science and Technology Abstracts (LISTA), and Library Information Science Source (LISS) databases using the names of 130 IS theories. Data was analysed to determine the most commonly applied theories; the trend of application of the theories in LIS research; the nature of theory application; and the LIS subject areas in which IS theories are mostly applied. The findings reveal that the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) were the most commonly applied theories in LIS research; theoretical triangulation is rarely applied in LIS research; specific subject areas of IS application in LIS research are diverse with technology acceptance topping the list. Conversely, LIS researchers are increasingly conducting research on areas that relate to ICTs, hence substantial visibility of IS theories in the LIS literature. This pattern has immense implications on LIS research, education and training.

Keywords: *Library and Information Science; Research; Information systems; Theories; Theoretical Models*

1 Introduction

Theory is said to be one of the most fundamental components or elements of research (Creswell, 2014; Lim, Saldanha, Maliadi & Melville, 2013). The application of theory in research is more pronounced at postgraduate level where students are required to include a section on theory or theoretical framework in their dissertations and theses. Worldwide, many universities have developed guidelines, for university students and field supervisors, wherein they advise on how students can address theoretical issues in their theses and dissertations. Equally important and noteworthy mentioning is that, of late, some journals have made it mandatory for authors to explain, in their manuscripts, the theoretical framework that informed their research studies. The student and supervisor guidelines as well as the author instructions require researchers to position their research study within a specific conceptual or theoretical framework. Citing several authors (Barkhi & Sheetz, 2001; Gregor, 2006; Orlikowski & Iacono, 2001), Lim, Saldanha, Maliadi and Melville (2013) reinforce this view by observing that the application of theory helps researchers to ground their arguments and position their studies in the appropriate context.

There have been calls for researchers to engage in multi-, inter- and trans-disciplinary research so as to address myriad socio-economic and political problems that the world faces (Mitchell, 2005). Research that transcends conventional academic boundaries is therefore increasingly becoming common in spite of the challenges associated with such research. This scenario has furthermore brought together researchers from different disciplines and with different worldviews and paradigms (i.e. epistemological and ontological perspectives), resulting in the convergence of theories that were hitherto exclusively applied in one field and now are applied in multiple fields. Hence, it is not uncommon to find researchers in one field borrowing theories from another or other disciplines (e.g. Stock, 1997).

Despite the widely-held view that the LIS field does not have its own theories, a number of theories have increasingly come to be associated with the field. In fact, some scholars have termed these theories LIS theories although they were not originally developed within and for the field. The theories include those that address information as a concept/construct, information behaviour, interactive information retrieval, information search process model, berry-picking theory, information foraging theory, sense-making theory and methodology, information seeking model, information use environment, cognitive models of information seeking and retrieval, everyday information seeking model, anomalous states knowledge, relevance as a theoretical construct, and principle of least effort, just to name a few. The School of Information and Library Science at the University of North Carolina at Chapel Hill (SILS, 2013a) provides a list of theories that it believes have been borrowed from other fields and applied in the LIS field. Among the 'imported' theories, according to SILS (2013b) are: social cognitive theory, sense-making theory, theory of reasoned action, technology acceptance model, diffusion of innovations theory, social network theory, structuration theory, trans-theoretical model of behavior change, reader response theory, activity theory, distributed cognition, and human information processor

model.

Evidently, therefore, the field of LIS is a beneficiary of other disciplines' growth and development. LIS researchers have adopted and/or adapted theories from other fields to achieve a variety of objectives in their studies. While acknowledging that there has been a growth of theory and/or use of theory in the LIS field, Ocholla and Le Roux (2011) observe that LIS largely relies on theories from other disciplines. Similarly, Pierce, as early as 1992, observed that LIS researchers tend to borrow theories from other disciplines (Pierce, 1992). This is evident in the study conducted by Pettigrew and McKechnie (2001) and McKechnie and Pettigrew (2002) who noted that most LIS researchers borrowed theories from social sciences, which posted a total of 45.4% of the articles analysed in the study, followed by information systems (29.9%), the sciences (19.3%) and humanities (5.4%).

2 Problem Statement

Information technology, information systems, and related or associated concepts, have for a long time constituted the core components or courses of many LIS schools' curricula/syllabus (Al-Shwabkah, Hamad, Taha & Al-Fadel, 2016; Onyancha & Majanja, 2017). The courses are known by different names, including information technology, computer applications in LIS, information systems, information and communication technologies in information science, computers in libraries, and so on (Al-Shwabkah, Hamad, Taha &Al-Fadel, 2016; Edegbo, 2011; Onyancha & Majanja, 2017). In terms of research, an examination of some of the online research taxonomies reveals that IT-related topics constitute niche areas of LIS research. For example, the Association for Library and Information Science Education (ALISE, 2016) has listed several IT-related areas within which scholars can conduct research. The topics include: database systems, discovery systems, information system design, library technology systems, open source software, social software, and social media, among others. Consequently, LIS researchers are increasingly researching issues associated with the adoption, acceptance, integration, application and management of ICTs in the field/sector of LIS. This has, in turn, led to the introduction and application of IS theories in LIS research. The trends, uptake patterns and context of the application of the IS theories in LIS are however unknown.

This study investigated the extent, patterns and nature of the application of IS theories in LIS research using content analysis techniques with a view to: determining the most commonly applied IS theories in LIS research; finding out the trend of application of IS theories in LIS research; exploring the triangulation of IS theories in LIS research; and establishing the LIS subject areas in which IS theories are mostly applied.

3 Research Methods and Materials

A quantitative content analysis design was adopted to conduct the current study on the extent and nature of application of IS theories in LIS research. Bryman (2012: 710) defines content analysis as "an approach to the analysis of documents and texts that seeks to quantify content in terms of predetermined categories and in a systematic and replicable manner". The content that was analysed in the current study was already organised in the online databases which were used to source the data. The study sought to quantify the data according to the themes or categories reflected in the above-outlined objectives.

The study obtained a list of names of 103 theories from a Wikipedia page sponsored by the Brigham Young University (see https://is.theorizeit.org/wiki/Main_Page). The site provides the names of theories and links for further information about the theories. Information provided include the theories' independent and dependent variables, description of the theories, and studies that have applied the theory. We also consulted published literature on IS theories (e.g. Lim, Saldanha, Maliadi & Melville, 2013) in order to validate and refine the list of theories. The names of the theories were then used as search query terms to retrieve relevant data for the study from two online databases, namely the Library, Information Science and Technology Abstracts (LISTA) and the Library & Information Science Source (LISS). The two databases are the largest storehouses of library and information science documents (including research articles). Once the data was retrieved from the two databases, the data was saved in text (.txt) format, which is compatible with the several computer-aided software (i.e. VosViewer, Microsoft Excel and Ucinet for Windows) that were used to analyse and present the data. The data was analysed to obtain the number of articles in which each theory appears, the number of theories per year, the number of articles in which the theories are jointly applied, and the subject content of the articles in which the theories are applied. The data is presented in tables, line graphs and visual networks.

4 Findings and discussion

This section presents and discusses the findings under the following headings:

- Most commonly applied IS theories in LIS research;
- Trend of application of IS theories in LIS research;
- Theoretical triangulation of IS theory in LIS research; and

- LIS subject areas in which IS theories are mostly applied.

4.1 IS theories most applied in LIS research

Out of the 103 theories that were targeted for the study, 55 (53.4%) were applied in LIS research between the years 1966 and 2017. This study therefore focuses on the 55 theories, thereby excluding those theories that did not yield any article in the LIS research published by 2017. Table 1 shows that *Technology Acceptance Model* (TAM) appeared in most of the articles. Out of the total 1721 articles in which the theories were mentioned, TAM appeared in 371 articles, accounting for 21.56%. In the distant second position is *Theory of Planned Behavior* (TPB) with 97 (5.64%) articles, followed closely by *Game Theory* (GT) (95 or 5.52%), *Actor Network Theory* (ANT) (91 or 5.29%), *Diffusion of Innovation Theory* (DoI) (77 or 4.47%) and *Unified Theory of Acceptance and Use of Technology* (UTAUT) (74 or 4.30%). The information in Table 1 provides the top twenty (20) most commonly applied theories in LIS research. The theories may be used to reveal the topics of LIS research, particularly through the analysis of the variables or constructs of a theory. For instance, the application of TAM would indicate that technology acceptance, ease of use and perceived usefulness of technology in LIS are the key areas of research within the LIS context. Regarding the TPB, LIS researchers' focus might have been the assessment of how an individual's behaviour affects the adoption and use of ICTs, with the main determinants or variables of measurement an individual's attitude toward the ICTs, the subjective norms surrounding the performance of the ICTs, and an individual's perception of the ease with which the ICTs can be used. Studies on machine-human interaction may explain the high ranking of the GT. Generally, it can be said that LIS researchers are more concerned with the individual behaviour and attitude towards ICTs, which behaviour is dependent on several factors, some of which are ICT-inherent.

Table 1: IS theories with the highest number of articles in LIS research (N = 1721)

No	Theory/Model	No. of articles	% of total articles
1	Technology acceptance model	371	21.56
2	Theory of planned behavior	97	5.64
3	Game theory	95	5.52
4	Actor network theory	91	5.29
5	Diffusion of innovations theory	77	4.47
6	Unified theory of acceptance and use of technology	74	4.30
7	Institutional theory	69	4.01
8	Social network theory	69	4.01
9	Theory of reasoned action	67	3.89
10	Social cognitive theory	66	3.83
11	Structuration theory	47	2.73
12	Task-technology fit	43	2.50
13	Social capital theory	41	2.38
14	Design Theory	35	2.03
15	Flow theory	34	1.98
16	Chaos theory	33	1.92
17	Social exchange theory	33	1.92
18	Stakeholder theory	33	1.92
19	Agency theory	31	1.80
20	Contingency theory	25	1.45

Source: Research Data

The study also sought to determine the IS theories that have been applied the longest in LIS research and noted that *General Systems Theory* (GST) was first and last applied in 1966 and 2016, respectively, thereby spanning 50 years of informing and hence developing the LIS field. Proposed in 1936 by a biologist, Ludwig von Bertalanffy, and further developed by Ross Ashby, the theory holds that the output of a system is a function of several factors, including input, throughput, feedback, control, and environment goals. In the second position in Table 2 is *Equity Theory* (EqT) which was first applied in LIS research in 1967 and latest in 2016. In terms of the regularity with which the theories are applied per year, TAM led the pack with 18.55 articles per year followed by UTAUT (6,73), TPB (4.41), SCogT (4.40), SCaT (4.10), ANeT (3.96), DoI (3.85), SNeT (3.83) and InsT (3.63) and TRA (3.53), just to name the theories that appeared in at least 3 articles each.

Table 2 further shows that most of the theories are still relevant in LIS research. It is, however, not clear why the *SERVQUAL* theory is no longer in application in LIS research as it was last applied in 1996. We, however, think that the non-usage of the theory could be due to the emergence of other quality service assessment tools/models that have broader application, for example, web-based services. The protocols include SITEQUAL, E-SERVQUAL, WEBQUAL and DigiQUAL.

Table 2: IS theories with longest period of application in LIS research

Theory/Model	Start year	Last year	Av articles per year	Years of application
General systems theory	1966	2016	0.26	50
Equity theory	1967	2016	0.18	49
Game theory	1970	2017	2.02	47
Behavioral decision theory	1979	2012	0.18	33
Socio-technical theory	1978	2011	0.09	33
Design Theory	1985	2017	1.09	32
Contingency theory	1985	2016	0.81	31
Information processing theory	1985	2015	0.50	30
Complexity theory	1988	2017	0.83	29
Agency theory	1989	2017	1.11	28
Cognitive dissonance theory	1989	2017	0.21	28
Chaos theory	1993	2017	1.38	24
Actor network theory	1994	2017	3.96	23
Theory of planned behavior	1995	2017	4.41	22
Structuration theory	1995	2017	2.14	22
Technology acceptance model	1997	2017	18.55	20
Diffusion of innovations theory	1997	2017	3.85	20
Task-technology fit	1997	2017	2.15	20
Elaboration likelihood model	1997	2017	1.10	20
Institutional theory	1998	2017	3.63	19

Source: Research Data

4.2 Trend of application of IS theories in LIS research

The trend of application of IS theories in LIS research was tracked since 1966 when the GST first appeared in a LIS publication to 2017. Figure 1 shows a slow and lull period between 1966 and 1984. Collectively, the period between 1966 and 1984 yielded 10 papers. None of the years yielded more than one paper bearing at least one IS theory. Nine of the 19 years recorded zero number of theories. Although there was an upsurge in the number of papers in which IS theories were applied in 1985, which recorded four papers, it was not until 1988 when there were glimpses of moderate application of IS theories. The period between 1988 and 2003 yielded a total of 83 papers, accounting for an average of 5 papers per year. The situation changed drastically after 2003. Unlike the period 1988-2003 in which some years recorded no study applying any IS theory, the least number of papers in which IS theories appeared in any given year after 2003 was seventeen (17). The total number of LIS papers that incorporated IS theory in them was 399, thereby averaging 29 papers per year.

Table 3 further shows that during the period of investigation, i.e. from 1966 to 2017, the majority of theories were applied in 2016 whereby a total of 35 (2.1%) theories featured. Thirty-four theories were applied in the years 2015 and 2017, thirty-two in 2011 and 2013 while thirty-one theories featured in 2008, 2009 and 2014. There were eight (8 or 17%) years in which IS theories were not applied in LIS research, meaning the years went by without any application of any of the IS theories in LIS research. All the years in which no IS theory was applied in LIS research were before 1988. Thereafter, each year yielded at least one paper in which at least one IS theory was mentioned. The trend of publication of LIS papers mentioning IS theories shows that there was little reliance on IS theories in LIS research in the early years (i.e. 1966-1988). The years 1989 to 2003 witnessed a moderate growth in the number of papers while the greatest intensity of IS theory application was recorded after 2004. The trend of IS theories application in LIS research reveals three time periods, namely low (1966-1988), medium (1989-2003) and high intensity (2004-2017) periods of application. Although there could be several factors or reasons to explain the aforementioned pattern, we believe that the rapid growth of ICTs after the mid-1990s is one such factor.

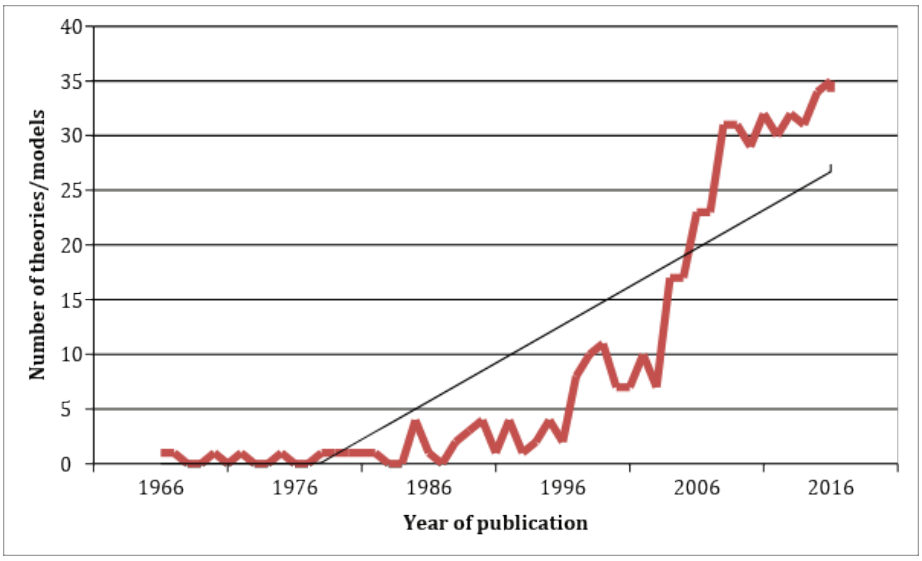

Figure 1: Trend of application of IS theories in LIS research, 1966-2017

Source: Research Data

Table 3: Number of IS theories applied in the years between 1966 and 2017

Number of publication years	Number of theories	Percent (N=47)	Cumulative Percent
8	0.00	17.0	17.0
10	1.00	21.3	38.3
3	2.00	6.4	44.7
1	3.00	2.1	46.8
4	4.00	8.5	55.3
3	7.00	6.4	61.7
1	8.00	2.1	63.8
2	10.00	4.3	68.1
1	11.00	2.1	70.2
2	17.00	4.3	74.5
2	23.00	4.3	78.7
1	29.00	2.1	80.9
1	30.00	2.1	83.0
3	31.00	6.4	89.4
2	32.00	4.3	93.6
2	34.00	4.3	97.9
1	35.00	2.1	100.0
47		100.0	

Source: Research Data

Specifically, the emergence and introduction of the Internet (including the World Wide Web, Email, and social media technologies) in diverse areas of information and knowledge management processes might have tremendously resulted in high research production revolving around ICTs in the late 1990s and beyond. Onyancha and Majanja (2017), in their study which partly sought to track the subject focus of LIS research in sub-Saharan Africa, observed that ICT-related subject terms have increased in number among the top most common topics of research in LIS. Among the ICT-associated terms that have recently emerged as topmost researched concepts in LIS include *information and communication technologies* which was 4th ranked in 2011-2015 period in Onyancha and Majanja's (2017) study, followed by *information technology* (7th), *Internet* (11th), *digital libraries* (18th), *social media* (20th) and *electronic information resources* (20th). Similar revelations have been observed by Garg and Sharma (2017) and Udo-Anyanwu (2018), among others.

4.3 Triangulation of IS theories in LIS research

The use of multiple theories in a single study seems to be gaining acceptance and popularity among researchers. Lim, Saldanha, Maliadi and Melville (2013) as well as Nevo and Wade (2010) posit that studying how theories are used together in a single research (or research paper) can provide insights into how theories can be merged to generate new knowledge or explain a phenomenon. Cairney (2013) explains that the combination of multiple theories may produce new perspectives and new research agenda. However, Cairney (2013) warns that the process of combining theories is not straightforward as the practice raises important ontological, epistemological, methodological and practical issues.

There are three approaches, according to Cairney (2013: 1) through which one can combine theories in a research, that is:

- Synthesis - in which we produce one theory based on the insights of multiple theories;
- Complementary - in which we use different theories to produce a range of insights or explanations; and
- Contradictory - in which we compare the insights of theories before choosing one over the other.

Some scholars (Johnson, 1997; Olsen, 2004; Hussein, 2009) have described the application of multiple theories in a single study as theoretical triangulation. They define theoretical triangulation as the use of multiple methods, mainly quantitative and qualitative methods, in studying a phenomenon for purposes of increasing study credibility or validity (see Johnson, 1997; Olsen 2004; Hussein 2009).

In its analysis of the use of multiple IS theories in LIS research, this study found that a total of 131 (out of 1711) titles applied more than one theory each. Twenty eight (28), out of the 55 theories, were found to be combined in a single study. Of the theory combinations, the majority were two-theory combinations which accounted for slightly over half (50.9%) of the IS theories investigated in the current study. As Figure 2 and Table 4 demonstrate, the *Theory of Reasoned Action* (TRA) and the *Theory of Planned Behavior* (TPB) were co-applied eight times each while *Technology Acceptance Model* (TAM), *Diffusion of Innovation Theory* (DoI) and *Social Cognitive Theory* (SCOGT) were each co-used in six (6) studies. The co-appearance of theories in LIS articles could imply many things. These include the complexity with which the discipline has become to be associated with, the rise of multidisciplinarity and interdisciplinarity of the discipline, or the LIS researchers' increased use of mixed methods research in their studies.

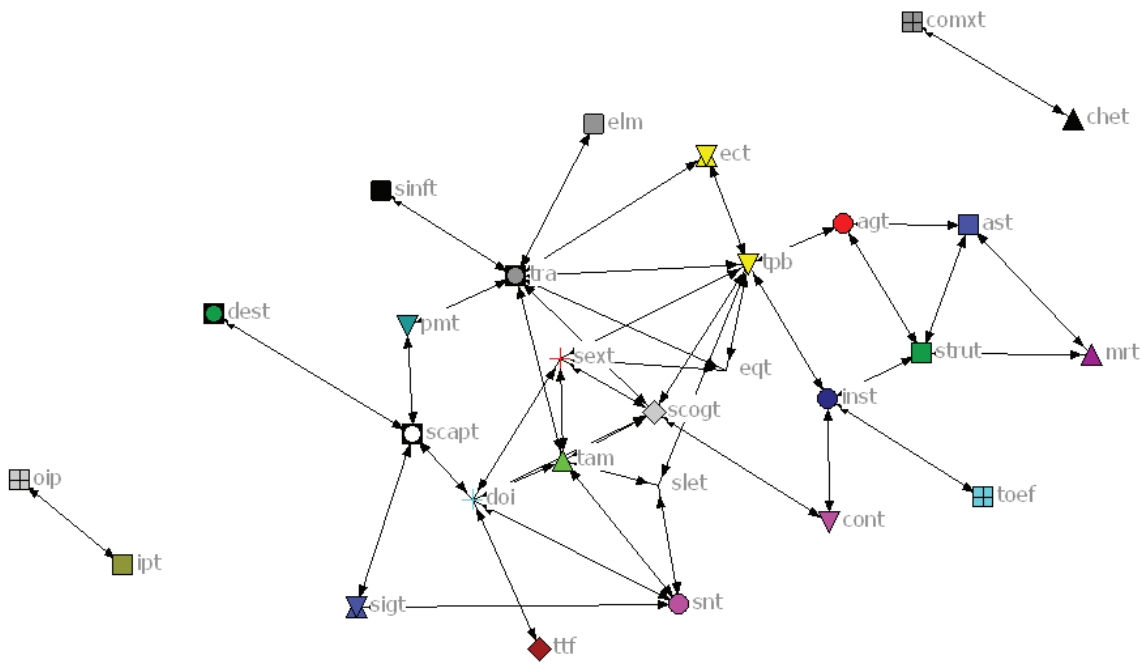

Figure 2: Map of multiple application of IS theories in LIS research, 1966-2017

Source: Research Data

Table 4: Multiple application of IS theories in LIS research, 1966-2017

	Cluster	Links	Total link strength	Frequency
Technology Acceptace Model (TAM)	1	6	34	30
Theory of reasoned action (tra)	1	8	27	26
Theory of planned behavior (tpb)	1	8	18	29
Diffusion of innovations theory (doi)	1	6	17	16
Social cognitive theory (scogt)	1	6	16	14
Structuration theory (strut)	2	4	14	12
Adaptive structuration theory (ast)	2	3	13	11
Institutional theory (inst)	4	4	8	9
Social exchange theory (sext)	1	5	8	9
Equity theory (eqt)	14	3	4	3
Social capital theory (scapt)	13	4	4	5
Social network theory (snt)	17	4	4	3
Agency theory (agt)	6	3	3	3

	Cluster	Links	Total link strength	Frequency
Contingency theory (cont)	4	2	3	3
Social learning theory (slet)	16	3	3	3
Chaos theory (chet)	3	1	2	2
Complexity theory (comxt)	3	1	2	2
Expectation confirmation theory (ect)	9	2	2	4
Information processing theory (ipt)	5	1	2	3
Media richness theory (mrt)	11	2	2	2
Organizational information processing theory (oip)	5	1	2	2
Protection motivation theory (pmt)	12	2	2	2
Signaling theory (sigt)	15	2	2	2
Social Influence Theory (sinft)	19	1	2	2
Design Theory (dest)	7	1	1	1
Elaboration likelihood model (elm)	10	1	1	1
Technology-organization-environment framework (toef)	18	1	1	1
Transactive memory theory (ttf)	20	1	1	12

Source: Research Data

4.4 LIS subject areas in which IS theories are mostly applied

This section presents and discusses the findings regarding LIS subject areas in which IS theories have been mostly applied. This analysis can assist to further debate on the relationship between information science and information systems. The application of IS theories in specific LIS research areas may have implications on how IS is helping to shape LIS research and the curriculum as well as other aspects or sub-fields of LIS.

Table 5: Subject areas in which IS theories are mostly applied: author-supplied keywords (N = 1721)

No	Author-supplied keyword	Number of Publications	%
1	Technology Acceptance	49	2.85
2	Trust	42	2.44
3	E-Government	38	2.21
4	Knowledge Sharing	37	2.15
5	Internet	36	2.09
6	Knowledge Management	31	1.80
7	Social Capital	30	1.74
8	Technology Adoption	29	1.69
9	Perceived Usefulness	29	1.69
10	Adoption	29	1.69
11	Social Media	27	1.57
12	Institutional Theory	27	1.57
13	Social Networks	26	1.51
14	E-Learning	25	1.45
15	Consumer Behaviour	23	1.34
16	Facebook	20	1.16
17	Information Technology	18	1.05
18	Information Management	18	1.05
19	Perceived Ease of Use	18	1.05
20	Self-Efficacy	17	0.99

Source: Research Data

Table 5 presents the analysis of the author-supplied keywords while Table 6 lists the top 20 subject terms. This analysis is done in a bid to determine research areas in which the IS theories are mostly applied in LIS research. *Technology acceptance* had the most frequency of occurrence (2.85%) in the author-supplied keywords. This was followed closely by *Trust* 2.44%), *E-Government* (2.21%), *Knowledge sharing* (2.15%), and *Internet* (2.09%). Whereas such author-supplied keywords as *technology acceptance, social capital, technology adoption, perceived usefulness, adoption,* and *perceived ease of use* are concepts drawn from the variables of IS theories, the rest of the keywords are LIS-specific. It is illustrative that the LIS research areas are associated with core activities or processes associated with the LIS profession (e.g. *Knowledge sharing, Knowledge management,* and *information management*.)

Table 6: LIS subject areas in which IS theories are mostly applied: subject terms (N = 1721)

No	Subject term	Number of Publications	%
1	Information Technology	159	9.24
2	Structural Equation Modeling	101	5.87
3	Knowledge Management	87	5.06
4	Mathematical Models	85	4.94
5	Internet	83	4.82
6	Information Resources Management	76	4.42
7	Technological Innovations	70	4.07
8	Internet in Public Administration	67	3.89
9	Electronic Commerce	63	3.66
10	Factor Analysis	54	3.14
11	Information Storage & Retrieval Systems	53	3.08
12	Research	53	3.08
13	Diffusion of Innovations	52	3.02
14	Information & Communication Technologies	52	3.02
15	Self-Efficacy	50	2.91
16	Decision Making	50	2.91
17	Information Sharing	46	2.67
18	Information Resources	45	2.61
19	Consumer Attitudes	41	2.38
20	Social Media	40	2.32

Source: Research Data

The picture is replicated in Table 6 where a number of LIS-specific subject terms constituted the top twenty (20) areas of research in which the IS theories are utilised. The research areas include *information technology, knowledge management, information resources management, information storage & retrieval systems, information sharing,* and *information resources*.

5 Conclusion and Recommendations

The utilisation of IS theories in LIS research, according to the data obtained from the two databases, is relatively a recent occurrence, spanning about 47 years. The study found that most IS theories have been applied quite recently with the majority of them spanning 15 to 20 years of utilisation in LIS research. The uptake of the IS theories started slowly and became more intense after the mid-1990s, coinciding with the coming into being of the Internet. It was, however, not until 2004 that LIS research witnessed a sharp increase in the intensity of the usage of IS theories whereby the number of studies applying the theories averaged 29 per year in the period 2004-2017. This period has witnessed the emergence and introduction of diverse ICTs in information and knowledge management in LIS. We also noted that some theories that were utilised in the 1970s and 1980s were seldom used in the 1990s and 200s, signalling a shift in focus on research too, from issues related to information systems (e.g. library integrated systems, automation systems and management information systems) to those issues associated with adoption, acceptance and use of ICTs. This pattern is reinforced through the analysis of subject of LIS research whereby information and knowledge management and information resources management as well as technology acceptance and perceived usefulness dominated the top most commonly researched LIS areas.

Whereas the Technology Acceptance Model (TAM) is the most utilised in LIS research, the Unified Theory of Acceptance and Use of Technology (UTAUT) seems to be gaining popularity among LIS researchers. This trend can be attributed to the fact that the UTAUT is a consolidation of a number of previous models namely Theory of Reasoned Action (TRA), TAM, Motivational Model, Theory of Planned Behaviour (TPB), a model combining TAM and TPB Model of PC Utilisation, Diffusion of Innovation Theory (DoI), and the Social Cognitive Theory (Bozan, Parker & Davey, 2016; Khechine, Ndjambou & Lakhal, 2016; Kiwanuka, 2015; Attuquayefio & Addo, 2014; Shen & Khalifa, 2010; Oye, Iahad & Rahim, 20014; Venkatesh *et al*., 2003). As a result of its broad scope and coverage, the UTAUT model is likely to continue drawing more attention from LIS researchers in the future.

Although this study did not delve into the purposes or rationale for the application of IS theories in LIS research, we have noted that a number of scholars have observed that the application of theory in research depends on the nature of research as the purpose for which theory is applied in research differs from one research to another. For instance, Creswell (2014: 51) argues that quantitative researchers "test theories as an explanation for answers to their questions" while in qualitative research, "the use of theory is much more varied… [as the] inquirer may generate a theory as the final outcome of a study" or the theory may "come at the beginning and provide a lens that shapes what is looked at and the questions asked". The theories can be discussed or explained within the literature review (Creswell 2014: 51) or on a

separate section of research papers or theses and dissertations. Further research is therefore recommended to investigate how the IS theories are applied in LIS research to answer such questions as: are the theories applied as lenses or do the LIS researchers use the theories to test hypotheses or to test and validate the theories themselves?

Regarding theoretical triangulation, the study found minimal application in LIS research. As was the case with the trend of IS theories' utilisation, it was noted that theoretical triangulation is a recent occurrence. We, however, are likely to witness more cases of multiple theory applications in LIS research as research problems become more complex and therefore requiring multidisciplinary approaches.

6 References

Al-Shwabkah, Y., Hamad, F., Taha, N. & Al-Fadel, M. (2016). The integration of ICT in library and information science curriculum analytical study of students' perception in Jordanian Universities. *Library Review*, 65(6/7): 461-478.

Association for Library and Information Science Education (ALISE). (2016). ALISE research taxonomy. https://www.alise.org/alise-research-taxonomy (Accessed 1 March 2019).

Attuquayefio, S. & Addo, H. (2014). Review of studies with UTAUT as conceptual framework. *European scientific Journal,* 10(8):249-258.

Barkhi, R. & Sheetz, S. D. (2001). The state of theoretical diversity. *Communications of the Association for Information Systems*, *7*(1), 6.

Bozan, K, Parker, K. & Davey, B. (2016). A closer look at the Social Influence Construct in the UTAUT model: an institutional theory based approach to investigate health IT adoption patterns of the elderly. In *System Sciences (HICSS)*, 2016, 49th Hawaii International Conference on IEEE, pp. 3105-3114.

Bryman, A. (2012). *Social research methods*. 4th ed. Oxford: Oxford University Press.

Cairney, P. (2013). Standing on the shoulders of giants: how do we combine the insights of multiple theories in public policy studies?. *Policy Studies Journal*, *41*(1), 1-21.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*. Sage Publications.

Edegbo, W. I. (2011). Curriculum development in library and information science education in Nigerian universities: issues and prospects. *Library Philosophy and Practice (e-journal)*. 560. http://digitalcommons.unl.edu/libphilprac/560. (Accessed 1 March 2019).

Garg, K. C. & Sharma, C. (2017). Bibliometrics of library and information science research in India during 2004-2015. *DESIDOC Journal of Library & Information Technology*, 37(3): 221-227. DOI: 10.14429/djlit.37.3.11188

Gregor, S. (2006). The nature of theory in information systems. *MIS quarterly*, 611-642.

Hussein, A. (2009). The use of triangulation in social sciences research: can qualitative and quantitative methods be combined? *Journal of Comparative Social Work 2009/1*. http://journal.uia.no/index.php/JCSW/article/viewFile/212/147 (Accessed 6 August 2018).

Johnson, R. B. (1997). Examining the validity structure of qualitative research. *Education,* 118(2): 282-292.

Khechine, H, Ndjambou, P. & Lakhal, S. (2016). A meta-analysis of the UTAUT model: eleven years later. *Canadian Journal of Administrative Sciences,* 33(2):138-152.

Kiwanuka, A. (2015). Acceptance process: the missing link between UTAUT and Diffusion of Innovation Theory. *American Journal of Information Systems,* 3(2):40-44.

Lim, S., Saldanha, T. J. V., Maliadi, S. & Melville, N. P. (2013). Theories used in information systems research: insights from complex network analysis. *Journal of Information Technology Theory and Application,* 14(2): 5-42.

McKechnie, L. & Pettigrew, K. E. (2002). Surveying the use of theory in library and information science research: a disciplinary perspective. *Library Trends*, 50(3): 406-417.

Mitchell, P. H. (2005). What is in a name? multidisciplinary, interdisciplinary and transdisciplinary. *Journal of Professional Nursing*, 21(6): 332-334.

Nevo, S. & Wade, M. R. (2010). The formation and value of IT-enabled resources: antecedents and consequences of synergistic relationships. *MIS Quarterly*, 34(1): 163-183.

Ocholla, D. N. & Le Roux, J. (2011). Conceptions and misconceptions of theoretical frameworks in library and information science research: a case study of selected theses and dissertations from Eastern and Southern African universities. *Mousaion,* 29(2): 61-74.

Olsen, W. K. (2004). Triangulation in Social Research: Qualitative and Quantitative Methods Can Really Be Mixed. In: Holborn, M., and Haralambos, M. (eds). *Developments in Sociology*. Lancashire: Causeway Press.

Onyancha, O. B. & Majanja, M. K. (2017). LIS education. In: Abdullahi, I (ed). *Global library and information science: a textbook for students and educators*. Berlin: De Gruyter Saur, pp 113-140.

Orlikowski, W. J. & Iacono, C. S. (2001). Research commentary: Desperately seeking the "IT" in IT research - A call to theorizing the IT artifact. *Information systems research*, *12*(2), 121-134.

Oye, N. D., Iahad, N. A. & Rahim, N. A. (2014). The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Education and Information Technologies,* 19 (1):251-270.

Pettigrew, K. E. & McKechnie, L. (2001). The use of theory in information science research. *Journal of the American Society for Information Science and Technology*, 52(1): 62-73.

Pierce, S. 1992. Dead Germans and the theory of librarianship. *American Libraries,* 23(8): 641-643.

Shen, K. & Khalifa, M. (2010). A research framework on social networking sites usage: critical review and theoretical extension. In Cellary, W and Estevez, E (eds). *IFIP Advances in Information and Communication Technology*, 341:173-181.

SILS. (2013a). INLS 887, seminar in theory development: examples of theories in information science. https://ils.unc.edu/courses/2013_spring/inls887_001/887-IStheories.html (Accessed 23 July 2018).

SILS. (2013b). INLS 887, seminar in theory development: theories adapted to IS from other disciplines. https://ils.unc.edu/courses/2013_spring/inls887_001/887-ImportedTheories.html (Accessed 23 July 2018).

Stock, J. R. (1997). Applying theories from other disciplines to logistics. *International Journal of Physical Distribution & Logistics Management*, 27(9/10): 515-539.

Udo-Anyanwu, A. J. (2018). A bibliometric analysis of research productivity of librarians published in library and information science journals available in academic libraries in Imo State, Nigeria, 2004-2013. *Research Journal of Library and Information Science*, 2(1): 15-21.

Venkatesh, V, Morris, M. G., Davis, G. B. & Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *MIS quarterly,* 27(3):425-478.

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