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Applications of the Critical Incident Technique in Library and Information Science Research: A Literature Review

Abstract: The critical incident technique is a pragmatic method that yields rich data derived from individuals' specific and related-to-the-truth experiences. This study was conducted to identify and analyze the use of this technique in the field of library and information science (LIS). A review of 523 records retrieved from databases like Web of Science, Scopus, Emerald, LISTA, and Google Scholar revealed that the critical incident technique has been applied in various areas including information-seeking behavior, analysis of positive and negative experiences, reference services, psychological aspects, copyright issues, knowledge management, change management, user satisfaction, the role of resources and information systems in decision-making, as well as the clinical, educational, and research utility of libraries. Researchers have also used this technique to explore users' perceptions about the role of librarians, investigate the educational role of librarians, and examine users' perceptions about the invisible web. Despite the usefulness of this technique, the study identified many research gaps in its applications, suggesting the need for more attention from researchers in this field.

Keywords: critical incident technique; libraries; information services; librarians

1 Introduction

The present study identifies and elaborates on the use of the critical incident technique in LIS research. The critical incident technique (CIT) was first innovated by Flanagan in 1940 during the second World War, however, it was in fact the outcome of a psychology project by the US Air Force aimed at selecting and categorizing staff and pilots, with the goal to examine the real events and behaviors that led to the success or failure of training programs. After World War II, various groups embraced this technique, and professional activities based on it took shape and developed in the psychology department of the University of Pittsburgh. In addition to its application in determining job requirements, the technique was also used in measuring expertise, selecting and categorizing human resources, designing jobs, counseling and psychotherapy, and measuring service outcomes. This technique consists of five fundamental steps: identifying goals, designing a program and specifying its features, collecting data, analyzing and interpreting data, and reporting the results (Flanagan 1954).

The CIT has been used in a wide range of subject areas and for different purposes (Fisher and Oulton 1999). It is a method for gathering important facts about behavior in a given situation (Flanagan 1954) and producing an in-depth and accurate history of events focusing on individuals' first-hand experiences of an event and study of humans' behavior (Gremler 2004). In this method, the participants are asked to depict the event or activity and help researchers understand it by expressing their real experience of that specific event, for example, using the library, asking librarians for help, going to the reference desk, and information searching (Hughes 2012). Due to service-oriented nature of the library and information profession and users' frequent interactions with librarians and information systems, the CIT is an acceptable method for studies in this field and has been used in several studies (Siegel, Rapp, and Lindberg 1991; Lindberg et al. 1993; Rodriguez 2006; Mansourian and Ford 2007; Volentine and Tenopir 2013; Marshall et al. 2014; Sakai et al. 2018). Nevertheless, a review of the literature revealed that no coherent knowledge exists that gives a clear picture regarding applications of this technique in library and information research. It is noticeable that application of this method in the field of LIS has been investigated in several papers including the CIT in information behavior

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studies (Urquhart et al. 2003), evaluating the effect of MEDLINE on using the CIT (Siegel, Lindberg, and Rapp 1991) and the use of the CIT in library and information management research (Fisher and Oulton 1999). However, these studies have only addressed specific areas and have not provided an overall picture in this field. Given the advantages of using this method in librarianship and information research and due to the lack of comprehensive studies in the field, this work aimed at reviewing the studies that employed the CIT.

2 Methodology

This research is a review of the literature focusing on content analysis of the existing studies in the field of LIS which have used the CIT. For this purpose, five information resources—Emerald, Web of Science (WOS), Scopus, LISTA, and Google Scholar—were used until July 31, 2023. The reason for selecting Web of Science and Scopus databases for this research was their broad coverage of articles across various scientific domains. In contrast, specialized databases such as LISTA and Emerald are more focused on articles in the field of LIS. Additionally, Google Scholar, as a scholarly search engine with wide subject coverage and easy accessibility, was considered a useful complementary source for this research.

For searching papers related to the field of LIS, only the keyword of library with an asterisk (*) at the end was used to expand the search domain. However, for selecting appropriate keywords for the CIT, the medical subject headings (MeSH) thesaurus belonging to the PubMed database was used, while the OR and AND Booleans were also used to combine words (Table 1).

The retrieved records consisted of 48 records in the WOS in the "Topic" field, 98 records in Scopus in the "Title, Keywords, and Abstract" field, 233 records in Emerald in "All fields," 55 records in LISTA in the AB field, and 89 records in Google Scholar's scientific search engine.

A total of 523 papers were retrieved from five databases and entered into the Endnote software. Using the software, 62 repeated records were removed and the titles and abstracts of the remaining 461 records were carefully evaluated. Articles that were very clearly unrelated to the field of librarianship were excluded. In contrast, articles that contained the target keywords in the title, abstract, and keywords and were relevant to the research objectives based on the inclusion and exclusion criteria were included in the study. In the cases where it was not possible to make a decision based on titles and abstracts, the researcher referred to the full text. In total, 354 records were removed at this stage as they were not concerned with the research objectives. The full texts of the 107 remaining papers were investigated and 56 other records were removed. Finally, 51 papers that met the inclusion criteria were selected and analyzed (Figure 1).

Exclusion Criteria: repetitive documents; instrumentation papers; non-English papers; review papers; non-research papers; no thematic relevance; non-application of the CIT.

Inclusion Criteria: Documents that had used the CIT to conduct research in the field of LIS were included in the current study.

For answering the research questions, important parts of the papers, such as research methodology, objectives, and findings, were studied. For extracting the data, a form was used eliciting the authors' names, date of publication, sample size, data collection method, objectives, type of research, and findings. For determining purposes for which the CIT has been used in LIS, thematic areas of the selected papers were identified and the papers which were similar in terms of theme were categorized. This revealed the purposes for which the CIT has been used more frequently. After extracting the data from the selected papers, the results were reported.

Table 1: Search strategy.

Google scholar	libra* ("Task Performance and Analysis" OR "Critical Incident Technique" OR "Incident Technic, Critical" OR "Incident Technics, Critical" OR "Technic, Critical Incident" OR "Technics, Critical Incident")
WOS	libra* (Topic) and "Task Performance and Analysis" OR "Critical Incident Technique" OR "Incident Technic, Critical" OR "Incident Technics, Critical" OR "Technic, Critical Incident" OR "Technics, Critical Incident" (Topic)
Scopus	(TITLE-ABS-KEY(libra*) AND TITLE-ABS-KEY ("Task Performance and Analysis" OR "Critical Incident Technique" OR "Incident Technic, Critical" OR "Incident Technics, Critical" OR "Technic, Critical Incident" OR "Technics, Critical Incident"))
Emerald (journal articles)	libra* AND ("Task Performance and Analysis" OR "Critical Incident Technique" OR "Incident Technic, Critical" OR "Incident Technics, Critical" OR "Technic, Critical Incident" OR "Technics, Critical Incident")
LISTA via EBSCOhost	TX libra* AND TX ("Task Performance and Analysis" OR "Critical Incident Technique" OR "Incident Technic, Critical" OR "Incident Technics, Critical" OR "Technic, Critical Incident" OR "Technics, Critical Incident")
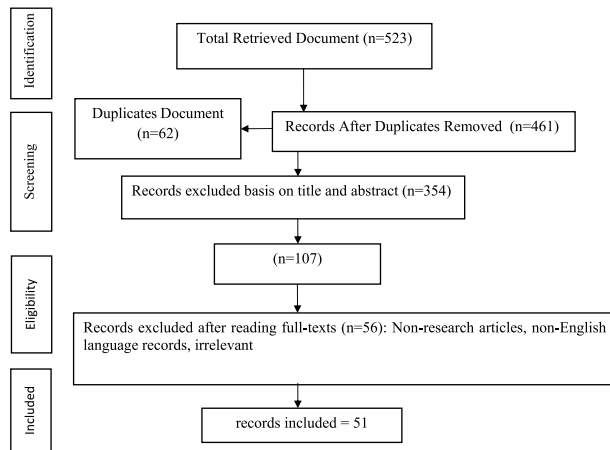
Figure 1: Flowchart regarding selection process of the studies.

3 Results

The results showed that the CIT can be used in both quantitative and qualitative research and has been used for a variety of purposes, as indicated in Table 2. Critical incident technique is used in the reviewed articles because the output of this method is rich and deep information that is based on recalling important, memorable, and recent events that the individual has experienced in a specific situation, each of which may have been pleasant or unpleasant.

3.1 Evaluating the Information-Seeking Behavior

Modeling and studying individuals' information-seeking behavior is one of the applications of the CIT. Information-seeking is referred to as a set of activities that individuals perform to meet their information needs including information search, search method, search problems, and the factors influencing it (Wilson 2000). Numerous studies have been conducted in this field and on various groups, which are mentioned below.

3.2 Health/Medical Information-Seeking Behavior

Sadeghi, Nowkarizi, and Tajafari (2023) investigated the information needs, sources, and seeking behavior of physicians and residents during clinical decision-making and the patient care process using the CIT. D'Alessandro, Kreiter and Peterson (2004) also assessed the information-seeking behavior of pediatricians in using computers and digital

libraries before and after educational intervention by interviewing 41 residents and 11 professors in two groups of treatment and control using the CIT. Naveed, Batool, and Anwar (2021) investigated resident university students' everyday-life information seeking behavior in Pakistan, with the results showing university libraries did not play a role in meeting the information needs of the participants' daily life and the lack of information sources was one of the obstacles to their finding information. In another study, Stokes and Urquhart (2015) used a semi-structured interview using the CIT to identify nursing students' information profiles in order to make them aware of the information literacy programs. Analysis of qualitative data showed seven types of profiles including deep identifier, deep investigator, deep adventurer, strategic collector, strategic all-rounder, surface skimmer, and surface co-coordinator. Tenopir, King, and Bush (2004) also investigated medical professors' use of printed and electronic journals using a questionnaire and the CIT. The results showed that medical professors spent more time studying than those in other fields. They typically used (70 %) the newly published papers and printed magazines more. User-friendliness and recency were features of the resources that they needed. D'Alessandro et al. (2004) used a telephone semi-structured interview based on the CIT, identified the information needs of 58 residents and pediatricians at the University of Iowa, and categorized the questions that were put to them at the time of visiting patients. Scarton et al. (2018) explored cancer survivors' information needs and information-seeking behavior for complementary medicine in a combined study by surveying 70 people and interviewing eight others using the CIT. Based on the results they identified several concepts such as lack of psychological and motivational support during treatment, using the trained experts and online resources as distinguished complementary medical information and identifying problems like reliability of resources, contradictory information about effectiveness of ordinary medicines, and unknown information.

3.3 Professors/Staff/Students' Information-Seeking Behavior

Mansourian et al. (2008) modeled graduate students' information-seeking behavior and the factors influencing it using a questionnaire and interview based on the CIT and a focus group, where they identified two categories of macro and micro factors that influenced their information-seeking behavior. In another study, Wildemuth (2020) assessed the urgency and importance of an active information seeking task influencing the interruption of

Table 2: Subject area of the reviewed articles.

Subject	Paper	How to use the CIT
Information seeking behavior	Al-Muomen, Morris, and Maynard 2012; Barry 1997; Buchanan and Tuckerman 2016; Chaudhry and Al-Sagheer 2011; D'Alessandro, Kreiter and Peterson 2004; D'Alessandro et al. 2004; Makri and Blandford 2012; Mansourian and Ford 2007; Mansourian et al. 2008; Naveed, Batool and Anwar 2021; Sadeghi, Nowkarizi and Tajafari 2023; Scarton et al. 2018; Stokes and Urquhart 2015; Talim, Cendón, and Sérgio 2016; Tenopir et al. 2009; Yi 2015	Identifying previously experienced scenarios of information needs, location of information search, resources used and search strategy developed by the participants in the research (Al-Muomen, Morris, and Maynard 2012); thinking and recalling serendipitous experiences (Makri and Blandford 2012); the reminder of recent successful or unsuccessful information search experiences, the challenges of information retrieval, and the evaluation of the searched information (Yi 2015); identification and description of information behaviors of disadvantaged and disengaged adolescents (Buchanan and Tuckerman 2016); description of journalists' recent information seeking experience, questions about the last time information was needed, the type of information needed, how to search, the sources used, and the challenges they faced (Chaudhry and Al-Sagheer 2011); investigating daily information seeking behavior of graduate students, reasons for information seeking, sources used, level of satisfaction and barriers to information seeking (Naveed, Batool, and Anwar 2021); evaluating the effect of training sessions on information seeking (Talim, Cendón, and Sérgio 2016); the focus of participants on studying the latest scientific article and answering questions about the time spent, how to study, the format of the study, the purpose of the study, and the importance and value of reading to discover patterns of information seeking and reading (Tenopir et al. 2009)
Analysis of positive and negative experiences	Andrews 1991; Cordes 2012; D'Alessandro et al. 1998; Laplante 2014; Wong 2013; Wang and Shah 2017	Understanding how teenagers retrieve information from social networks to do homework (Laplante 2014); recalling the last time the health sciences digital library was used, the purpose of searching, and the challenges of using it (D'Alessandro et al. 1998); request to recall a specific event of using the library and express successful and unsuccessful experiences of using the library)Andrews 1991)
Reference services	Radford et al. (2017)	Expressing the positive and negative experiences of interaction with librarians (Radford et al. 2017)
Psychological aspects	Al-Muomen et al. 2012; Kracker and Wang 2002; Naveed 2016	To recall the newest and most memorable experience of conducting research, writing an article, and expressing negative and positive emotions (Kracker and Wang 2002)
The role of information resources/systems in decision-making	Ashcroft 1998; MacDonald, Bath, and Booth 2011; Oulton et al. 1996; Siegel , Rapp, and Lindberg 1991	Identifying specific situations requires information and evaluating the impact of information searched from library resources on clinical decision-making (Ashcroft 1998)
The clinical, educational and research utility of libraries	Click 2018; Ibragimova and Korjonen 2019; Lindberg et al. 1993; Lonsdale and Armstrong 2006; Marcella, Rowlands, and Baxter 2013; Marshall et al. 2014; Radford 2006; Rodriguez 2006; Sakai et al. 2018; Stoloff et al. 2006; Volentine and Tenopir 2013; Wong 2013; Wu and Chen 2010	The question is about the recent study of professors and questions such as the value and result of scientific study, the extent to which the collection of resources in university libraries supports the research and educational activities of professors; the difference in the patterns of reading articles, books, and other materials and the role that the collection of university library resources has played in education and learning (Volentine and Tenopir 2013); investigating the information behavior of medical staff and asking questions about information needs, used information resources, search locations, access points, and information-seeking strategies (Sakai et al. 2018); request to recall when physicians needed information beyond what was in the patient's record in the last six months (Marshall et al. 2014); reviewing the role of information systems in improving health and safety management by investigating the information-seeking behavior

Table 2: (continued)

Subject	Paper	How to use the CIT
		of oil and gas company specialists (Marcella, Rowlands, and Baxter 2013); focusing on students' information behavior during dissertation writing (Wu and Chen 2010); request for recalling recent successful or unsuccessful searches performed by the individual or others to meet an information need (Lindberg et al. 1993); discovering how to conduct research by students and utilizing library resources (Click 2018); collecting doctors' reports of the reason or motivation for searching in the Medline database, and the impact or lack of impact of the retrieved information on professional decisions and actions (Lindberg et al. 1993)
Users' perception of the librarians' role	Bickley and Corrall (2011)	Asking students to express their experiences of interacting with library staff
Users' satisfaction	McKeown et al. (2017)	Evaluation of the quality of literature searching services provided by librarians for hospital staff
The educational role of librarians	Carr (1980)	Reporting the interactions between the librarian as an educator and the user as a learner
Knowledge management	Burnette (2017)	The participants in the research were asked to express their experiences related to knowledge sharing
Management	Kophuting and Mutshewa (2017)	Collecting narratives of library staff regarding the change management process during the implementation of electronic resources projects
Invisible web	Ford and Mansourian 2006; Mansourian and Ford 2007; Mansourian et al. 2008; Seadle and Mansourian 2008	The participant in the research was asked to describe a recent and significant experience in interacting with the web environment (Mansourian and Ford 2007); the participants in the research were asked to express their feelings and successful or unsuccessful experiences related to the recent search for information on the web (Ford and Mansourian 2006)
Copyright	Olaka and Adkins (2013)	Thinking and recalling their experiences when librarians were faced with copyright issues

information encountering episodes. Barry (1997) also tracked changes in university students' information-seeking behavior while they inserted electronic information resources. In a study, Sullivan-Windle (1993) employed an interview using the CIT to study students' perception about the factors influencing the use of libraries. In addition to revealing the students' perception about libraries and library staff regarding the effective use of libraries, the results of his study also showed students' challenges in using library facilities, problems in accessing libraries, lack of knowledge about library services, methods of learning to use libraries, and library anxiety. Al-Muomen, Morris, and Maynard (2012) also used a questionnaire and interview using the CIT along with a focus group to model information-seeking behavior of Kuwaiti's graduate students, where they identified two types of macro and micro factors influencing students' information-seeking behavior.

Elsewhere, Ford and Mansourian (2006) used a semi-structured interview along with CIT to study the factors influencing success or failure of information search on the web. The results demonstrated that in most cases (82.4 %) searching depended on an internal factor, such as individuals' abilities or efforts or an external factor like shortage or lack of information. Talim, Cendón, and Sérgio (2016) also explored the relationship between training information-seeking skills in electronic environments and information behavior of 82 students using a questionnaire and the CIT. The results showed a positive relationship between training and information behavior. In addition to the above-mentioned studies, some of the selected papers had focused on specific aspects of information-seeking behavior including information searching. In other research, Tenopir et al. (2009) studied information and study behavior patterns of faculty members in the fields of social sciences, medicine, and technology from 1970 to 2009 using a questionnaire based on the CIT. The results showed that journal papers (93.9 %) had been used more than other documents, and information search and study patterns had

been changed and increased over time. Furthermore, the average number of papers under investigation had increased per person while the time that they had spent for studying had decreased. Makri and Blandford (2012) used an interview with graduate students and research and academic staff based on the CIT to understand the searchers of information where respondents answered questions while remembering their real experiences. Chaudhry and Al-Sagheer (2011) also studied information behavior of Kuwaiti's journalists using a questionnaire and interviews based on the CIT.

3.4 Adolescents' Information-Seeking Behavior

Elsewhere, Buchanan and Tuckerman (2016) investigated information behaviors of the deprived adolescents using the combined approach of observation and semi-structured interviews based on the CIT and focus groups. The results showed that adolescents in such districts faced access and behavior-related obstacles more than young individuals in normal districts.

3.5 Library Patron Information-Seeking Behavior

In a qualitative study, Yi (2015) analyzed health information-seeking behavior of public library users through a semi-structured interview based on the CIT. The results indicated that all interviewees could find health-related information. The obstacles to information-seeking included understanding healthcare terms, locating and accessing information, asking librarians questions, a lack of knowledge about information resources, the published books, web search skills, and the online public access catalogues (OPACs).

3.6 Analysis of Positive and Negative Experiences

The critical incident technique is often used to analyze both positive and negative critical events (Edvardsson and Roos 2001). Wong (2013) evaluated the quality of services and discovered positive and negative points of public libraries from the users' point of view using the CIT and e-mail inquiries and unstructured interviews with eight users who frequently used library services. The results proved that there were slightly more positive incidents than negative ones and female users of libraries had more positive

experiences than male users. Library access accounted for more than one-third of 47 recorded incidents. Andrews (1991) also used interviews with the CIT to investigate successful and unsuccessful experiences of students in using library services. Their problems were mostly related to library catalogs, locating books on shelves, classification schemes and library layout, library anxiety, and students' reluctance to ask librarians for help. Their positive experiences with the library were related to learning how to use the library from other patrons, collaborating with friends to overcome library use problems, and becoming aware of library services they were previously unaware of.

In another study, the CIT is shown as an appropriate approach for identification of obstacles and challenges, and is employed in many types of research for investigating and exploring challenges of information search and using libraries and digital libraries. For instance, D'Alessandro et al. (1998) used this technique to explore the obstacles in the way rural physicians used the health sciences¯ digital library. The results showed that primary obstacles included inadequate training, time-consuming use, and the distance between the physicians' workplaces and computers. The biggest obstacle in the way of digital library users was quality of information resources and for non-users the biggest obstacle was difficulty in using the digital library. Cordes (2012) also used the same technique to describe and categorize the problems related to using technology and searching for information. In a study by Wang and Shah (2017), the participants expressed their real experiences of failure in searching for information and meeting their information needs. From their points of view, both internal and external factors caused them to fail to find the information they required. Laplante (2014) studied how adolescents used social networks to find information and do homework by interviewing 19 adolescents using the CIT. It was revealed that most adolescents had a rich personal social network but did not make full use of the resources available to do their school work. Accessibility was the most important criterion for deciding on the used approach, and they were more likely to trust their peers, especially their classmates, and asked them for help with their homework.

3.7 Reference Services

This section of libraries often responds to patrons and guides them in finding the resources they need. Thus, there are many interactions here between the librarians and users receiving services (Ranasinghe 2012). As the CIT is a method of evaluating programs and services and depicts memorable aspects of an event and the participants' experience (Radford 2006), it

is an appropriate approach to evaluate the quality of reference services and collect users' feedback based on their real experiences of services. In a study, Radford et al. (2017) interviewed 50 virtual reference desk librarians using the CIT about collaboration, reference performance, and also their attitudes toward question and answer (Q&A) services. The results demonstrated that librarians often referred questions outside of their field of experience to other librarians and sometimes to non-librarian experts. Some obstacles to cooperation were lack of information about the qualified experts/ librarians for referrals, impossibility of validation, and reluctance to cooperate.

3.8 Investigating Psychological Aspects

People's negative and unpleasant feeling of an event can influence their behavior about that event or activity. Anxiety, as a psychological factor, is an unpleasant feeling that has been studied in the field of LIS. Some topics are library anxiety, information-seeking anxiety, computer anxiety, and research anxiety. Library and research anxiety are among the topics of the selected papers in this research that had used the CIT. Naveed (2016) studied information-seeking anxiety of 31 research students of a university in Pakistan using interviews by the CIT. The results pointed out that anxiety among research students has eight dimensions: information overload; resource anxiety; procedural anxiety; competence anxiety; library anxiety; information and communication technology (ICT) anxiety; thematic anxiety; and language anxiety.

Kracker and Wang (2002) also studied research anxiety and students' perception about research using a quantitative and qualitative approach, a questionnaire, and an interview based on the CIT with the participation of 90 technical and professional students. The results confirmed Kuhlthau's stages of information search process (ISP) as well as cognitive and emotional aspects related to writing and research.

In one part of the research conducted by Al-Muomen, Morris, and Maynard (2012), library anxiety was mentioned as one of psychological factors influencing information-seeking behavior including a lack of information about library resources, having anxiety in using libraries, and a lack of computer skills to access library resources.

3.9 Investigating the Role of Information Resources/Systems in Decision-Making

Investigating the role and value of information, information resources, and information systems in decision-

making is a different application of the CIT. Some studies have been conducted in this field using the CIT. In 1998, Ashcroft studied the effect of using information on physiotherapists' decision-making using a questionnaire and the CIT in a study on physiotherapy ward staff working in 37 hospitals. In total, 74 % of the physiotherapists believed that using information shifted their capability to a different type of patient care.

Oulton et al. (1996) also employed a semi-structured interview by the CIT to analyze the information resources that librarians use to make decisions in small and medium-sized libraries. The results showed the effect of the external and internal environment of the library on decision-making, and that the librarians used a wide range of external resources including public, printed, textual, numerical, and oral resources to support decision-making.

Interviewing 552 users of the National Library and MEDLINE by the CIT, Siegel et al. (1991) also evaluated online information systems including MEDLINE. The results revealed that out of 1,158 cases searched in MEDLINE, most of them were related to clinical practices (43 %), research (20 %), training (20 %), self-learning (7 %), government (6 %), and other needs (3 %), respectively. Out of 494 searches for clinical cases, 56 % of consultations were related to the physicians' patients, 28 % of cases were related to other patients, and 15 % of cases were related to diseases that were not specific to a particular person. The highest percentage of the reported searches was related to hospitalized patients (48 %), office patients (33 %), outpatients (12 %), emergency patients (2 %), and miscellaneous cases related to other fields (6 %).

MacDonald, Bath, and Booth (2011) studied the process of decision-making by 19 managers faced with low-quality information using the CIT and interviews. The results showed that in such cases, the managers stopped searching and acted on a satisfactory enough basis, making relatively good decisions in the cases of information gaps and/or lack of information.

3.10 Investigating Clinical, Educational, and Research Utility of Libraries

Libraries play an important role in supporting human activities, but each library user may have different experiences of library performances. The CIT is an appropriate approach for analyzing the behaviors leading to successful and unsuccessful results in a task or process (Siegel et al. 1991). This technique had also been used by the researchers for the same purpose in the selected studies.

3.11 Clinical Utility of Libraries

Marshall et al. (2014) investigated the effect of library and information services on the quality of patient care with the participation of 4,520 physicians and residents from the United States and Canada using web-based research and a questionnaire based on the CIT. They discovered that using library and information services created positive changes in patient care, prevented unpleasant events, and saved time. Stoloff et al. (2006) studied the role of digital library in promoting health and healthcare with the participation of 462 health staff at the US Navy using a questionnaire based on the CIT. The results confirmed the positive role of the digital library in improving health. Elsewhere, Ibragimova and Korjunen (2019) also measured the effect and value of librarians in clinical governance programs using a questionnaire based on the CIT and with the participation of 83 individuals from 25 European countries. They proved that the librarians' support plays a role in clinical and research utility (98 %), patient support (84 %), training (96 %), the use of information technology (77 %), staff management (72 %), clinical audit (32 %), risk management (38 %), and support for other aspects of clinical governance (48 %). Sakai et al. (2018) studied the information behavior of health professionals (physicians, residents, and nurses) using a combined approach and a web-based survey in seven hospitals and interviews in five hospitals. In their study, using the CIT, the participants were asked to answer a set of questions including the required information, the used information resources, location of information search, access points, and evaluation of information. The results showed that for searching regarding their clinical questions, physicians and residents more often used PubMed database (80.4 %, 65.5 %), Japanese Medical Bibliographic database (61.8 %, 63.6 %), and UpToDate database (40.4 %, 65.5 %). Physicians mostly used e-journals (37.8 %) while residents used Japanese printed books (38.2 %) and online books (30.9 % Japanese, 32.7 % English) respectively, while nurses used various information resources including Japanese printed books (60.4 %), Japanese Medical Bibliographic database (40.3 %), online books (25.5 %), and the university websites (0.19 %), as they had a close relationship with patients. Lindberg et al. (1993) investigated the effect and value of the physicians' application of the MEDLINE information database on solving their clinical problems. In this qualitative research, the interview questions were asked by phone calls using the CIT. The results showed that the MEDLINE database was used to address a wide range of clinical information needs and was effective in diagnosing, treating, establishing effective patient-physician relationships, and helping to improve

patients' health behavior. Marcella, Rowlands, and Baxter (2013) investigated the role of information systems and information behavior in increasing health and safety in the oil and gas industry by distributing questionnaires among 370 people and interviewing 19 employees. The results confirmed that using the CIT in studying information behavior is applicable both in quantitative studies, for evaluating the quality and effect of information systems and library services, and in qualitative research for identifying the information needs of specific occupational groups.

3.12 Educational Utility of Libraries

Radford (2006) employed an interview by the CIT to study school students' perception about interaction with public libraries and their staff, extracting positive and negative experiences they gained in that regard, as well as investigating the role of libraries in doing their homework. In this study, the students' positive experiences included finding books and information they needed (such as to do homework), using the Internet and computers, taking part in library programs, receiving library cards, enjoyable facilities and physical environment, finding good movies, and access to various forms of information. Negative experiences also included not finding the books or information they needed, delays in returning materials and receiving fines, a lack of computer skills, noise, and library congestion. Elsewhere, Volentine and Tenopir (2013) deployed quantitative and qualitative approaches (interview by the CIT) and the think-aloud technique to explore the value of scholarly study and the extent to which academic library resources support educational programs and research activities with the participation of faculty members from six universities in the UK. The results confirmed the positive effect of scholarly papers and library resources on the quality of university activities. Time and ease of use were also found to be important factors in accessing information. In another study, Lonsdale and Armstrong (2006) studied the role of university libraries in supporting information literacy in high schools in the UK using a combined method of a semi-structured interview and a questionnaire. They found that libraries cooperate with schools in providing them with access to electronic resources, hold workshops on information-seeking skills for summer schools, perform thematic collaborations including organizing workshops on information-seeking skills of historical topics, management, and the like, develop curricula, prepare packages for online information literacy skills, and offer training courses for school librarians. Moreover Rodriguez (2006) investigated the collaboration of libraries with educational goals by

creating a focus group (librarians) and interviewing faculty members and students (20 people) through the CIT.

3.13 Research Utility of Libraries

Click (2018) studied conduction of research assignments by 31 students who used the library and other information resources using an interview based on the CIT. Moreover, Wu and Chen (2010) evaluated the role and effect of electronic information resources on the dissertations of 20 students of the humanities (two students in each field; 17 master's degree and three doctoral students). The results showed that generally 2,550 documents were used for writing dissertations, most of which were books, journals, dissertations, and documents in Chinese, respectively.

3.14 Exploring the Users' Perception About Librarian's Role

Bickley and Corrall (2011) used questionnaires and interviews based on the CIT method to examine students' perceptions of the job and scope of work of the staff of the University of Sheffield's School of Information and Computer Science. They discovered that in general most of the students had no knowledge about the working fields of the staff, and some of their positive experiences were related to information or to the librarians who participated in their workshops.

3.15 Surveying the Users' Satisfaction with Library Staffs¨ Services

McKeown et al. (2017) used a questionnaire based on the CIT to measure the extent of satisfaction of 237 employees of the Ontario Health Sciences Center in Canada. They asked the librarians to help the employees with information searching over a year. They found that the employees' requests were mostly received by online form (32 %), e-mail (44 %), in person (17.5 %), and by phone (6.5 %). Most of the searches were related to research (34 %) and training (20 %).

3.16 Investigating Educational Role of Librarians

Carr (1980) investigated the relationship between independent learners and teacher-librarians in public libraries using an interview and the CIT. In this study, eight critical topics were identified including individuation, mutuality, support, information, expectation, motivation, learning from practice, and clarification.

3.17 Investigating Status of Knowledge Management Among Library Staff

Burnette (2017) studied tacit knowledge sharing among library colleagues using an interview and the CIT. He extracted three important issues from data analysis: the effect of organizational culture and importance of trust on knowledge sharing behavior; value of teamwork and the importance of the instructors' role as an important motive for knowledge exchange; and a better understanding of the nature of tacit knowledge and its relationship with types of knowledge and features of experience and expertise.

3.18 Exploring Change Management Model in Library

Kophuting and Mutshewa (2017) collected experiences of Botswana Library staff about change management process during electronic resources projects using the CIT and with the participation of 13 people (seven managers and six non-managers) who were involved in the implementation of various projects in the library. Based on the results, six strategies were identified—communication, group formation, gaining external support through collaboration, user engagement, capacity building, and purchase of resources—among which communication strategy formed the central core.

3.19 Exploring the Users' Perception About Invisible Web

Mansourian and Ford (2007) assessed the reaction and perception of 37 university staff, research staff, and research students of the Biology Department at the University of Sheffield about missing potentially important information using an open semi-structured interview and the CIT. The most important concern of searchers included the risk of losing important information, the effect of estimating the extent and probable importance of the lost information, and its effect on people's decision to end up searching. Focus was also on identification of four types of perception of information loss risk including being inconsequential, tolerable, damaging, and disastrous, as well as four searching strategies: perfunctory, nervous, minimalist, and extensive. In

another study, these researchers investigated the importance of attribution theory and locus of control in understanding the perception of web searchers. The results indicated the searchers' ability in recalling successful and unsuccessful searches and attributing each search to an internal factor (ability or effort) or external factor (a lack or shortage of information). Seadle and Mansourian (2008) modeled the perception of 52 students of LIS at Tarbiat Moallem University and Iran University of Medical Sciences using a questionnaire and a short interview with participants based on the CIT. They modeled information visibility on the web and the students' conceptualization of success and failure during a web search.

Mansourian et al. (2008) investigated how the web can be used for information searching with a focus on the ways of perceiving failure in information searches, identifying the factors influencing users' perception of failure in information searches on the web, and exploring their strategies and measures in reaction to unsatisfactory search results. They conducted this study with the help of the Association of Biology at Sheffield University using a semi-structured interview based on the CIT. The results confirmed the possibility of empowering web users to better understand the results of information searching through an information visibility model and to help them improve their information literacy skills.

In another empirical research, Ford and Mansourian (2006) studied invisibility of information from a cognitive perspective using the CIT and with the cooperation of 15 academic staff. In this research, a distinction was discovered between objective perception of invisible web (the hidden web includes many types of online resources that normally cannot be found using regular search engines) and subjective cognitive perception based on the searchers' perception of failure in information searching and the empirical model of cognitive invisibility.

3.20 Exploring the Librarians' Strategies in Facing with Copyright Issues

Olaka and Adkins (2013) studied the ways librarians face issues related to copyright using a combined approach and distributing a questionnaire among 253 librarians in 14 universities and also an interview with 32 librarians based on the CIT. They discovered that in dealing with copyright issues, Kenyan librarians paid more attention to users than other stakeholders in the copyright industry. Also, it was found that the strategies used by the librarians to control copyright violations were not standard and were mostly directed by the librarians' personal opinion rather than the copyright policy provided by the library.

3.21 Types of the Used Dominant Methodological Approaches

Evidence shows that the CIT has been used in qualitative and quantitative research. In the majority of the research, questionnaires and interviews have been used as research instruments.

4 Discussion

The majority of the selected papers were in the area of information-seeking behavior. The use of the CIT in studies on information-seeking behavior is so that in each study a brief but memorable section of the information search is investigated. In these studies, researchers ask participants to present one or more examples of the cases for which they sought information to solve problems or make decisions, their methods of finding information, and assessment of the value and effect of the retrieved information (Marcella, Rowlands, and Baxter 2013).

According to the present study, many topics had been covered by the reviewed papers including information search behavior of graduate students (Mansourian et al. 2008), pediatricians (D'Alessandro, Kreiter and Peterson 2004), adolescents in deprived districts (Buchanan and Tuckerman 2016), information needs and information retrieval behavior of cancer survivors (Scarton et al. 2018), health information-seeking behavior of public library patrons (Yi 2015), nursing students' information behavior (Stokes and Urquhart 2015), journalists' information behavior (Chaudhry and Al-Sagheer 2011), and patterns of information behavior and study patterns of faculty members of social sciences, medicine, and technology (Tenopir et al. 2009). Given that one of applications of the CIT is in perceiving humans' experiences and studying their behavior (Marcella, Rowlands, and Baxter 2013), this issue can be justified.

Analysis of positive and negative experiences was another area in which the CIT had been used in the studies on LIS, such as in several papers including examining the positive and negative experiences of men and women from libraries (Wong 2013), investigating the obstacles to using digital libraries of health sciences (D'Alessandro et al. 1998), examining the pleasant and unpleasant experiences of library patrons (Andrews 1991), describing and classifying problems related to the use of technology and information searching (Cordes 2012), and the reasons behind failure in information searching and meeting information needs (Wang and Shah 2017). In such studies, the people had been

often asked to concentrate on a specific situation while using a service or activity and express the obstacles they faced. As one of applications of the CIT is identifying specific behaviors influencing failure or success (Edvardsson and Roos 2001), using it to investigate such cases can also be justifiable and interpretable. Moreover, according to the results of these studies, origin of reality, individuals' real use, and their narration of a service or activity, the CIT may be utilized in removing the obstacles faced by the patrons and users.

This technique may also be used for assessment of utility, opening a new horizon to researchers in various fields to measure and determine outcome of using a service or activity. The reviewed papers in this study indicated that a considerable number of studies had been done for this purpose including assessing the value of scientific study and the extent of support of university library resources for educational programs and research activities (Volentine and Tenopir 2013), the role of university libraries in supporting high school information literacy (Lonsdale and Armstrong 2006), library collaboration with educational goals (Rodriguez 2006), assessing the value and effect of library and information services on the quality of patient care (Marshall et al. 2014), investigating the role of digital libraries in promotion of health and healthcare (Stoloff et al. 2006), and studying the effect and value of librarians in clinical governance programs (Ibragimova and Korjonen 2019). Given that the results of such studies stem from real use and description of the participants' first-hand experience of a service or activity, the data is very accurate and fact-based, meaning that it can guide practitioners and programmers to promote library and information services. Generally, it may be stated that the CIT could be used to conduct studies in most areas of LIS. However, like most other methods, it has some drawbacks, such as reliance on self-reporting (Farrell and Mason 2014) and individuals' memory, meaning the data gathered from the participants may be incorrect or not reported at all. Accordingly, methods such as semi-structured interviews and other complementary methods should be deployed as much as possible for more accurate inquiries and comprehensive studies on events (Lyrakos et al. 2012). For overcoming the above-mentioned drawbacks, it is noteworthy that most of the papers reviewed in this study used semi-structured interviews and also a combination of methods.

5 Conclusion

The analysis of the reviewed articles indicates that most of the studies conducted using the CIT have focused on information-seeking behavior. Therefore, the CIT is recognized as an established method for exploring this area.

Furthermore, the evidence examined suggests that this method has been used to study the information-seeking behavior of various groups, highlighting the CIT's applicability in understanding the diverse experiences and behaviors of users in LIS. Additionally, the CIT has been effectively utilized to analyze both positive and negative experiences related to library usage. This emphasis on user experiences can aid in identifying barriers and improving library services, making it a valuable approach for evaluating the effectiveness of library services.

Overall, the CIT is a versatile tool that can be applied in various research contexts within LIS. Its ability to capture real user experiences makes it a valuable asset for understanding information-seeking behavior, identifying challenges, and assessing the effectiveness of library services. However, despite these advantages, the study's results revealed that only a limited number of articles employing this method have been published in certain areas of LIS, indicating a need for greater attention from researchers in this field. Moreover, the analysis of results based on geographical context showed that studies have predominantly been conducted in a limited number of countries, suggesting that researchers in other countries may not be well-acquainted with this method and its benefits. Therefore, the findings of this research can assist researchers in deciding to adopt this method and in developing investigations using this approach to enhance library and information center services. Future studies should continue to utilize this technique while also addressing its limitations to further enrich this field.

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