Electronic Theses and Dissertations Programs: A Review of the Critical Success Factors

Behrooz Rasuli, Sam Solaimani, and Mehdi Alipour-Hafezi

Electronic Theses and Dissertations (ETDs) programs have been recognized as one of the most effective channels through which theses and dissertations can be made available to academic communities and beyond. ETD program management, however, needs to be aware of the Critical Success Factors (CSFs) throughout the process of design and development of ETDs. As the name implies, CSFs are those considerations decisive in achieving the projects' mission and goals. Based on a structured review of the existing literature about ETDs, this study identifies the CSFs that are crucial for the implementation of ETD programs. By comparing and classifying the identified CSFs, the study conceptualizes a generic framework comprising five generic dimensions: management and organization, participation, content, technology, and service. The framework can help the ETDs community, both scholars and practitioners, to make informed decisions on how to allocate effort and resources to the development, implementation, or improvement of ETD programs.

Introduction

Advancement of research and education depends on replication of scientific findings,[1] so that developing methods and tools for sharing such findings among a wider range of users has always been an important concern in theory and practice. Electronic Theses and Dissertations (ETDs) is one of the relatively new channels and was launched in the early '90s to facilitate access to students' theses and dissertations.[2] According to Park, Nam, and Oh, there is an increasing interest in integrated ETDs,[3] and the number of ETD programs, in particular, at an institutional level, is increasing every year.[4]

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Many institutions around the world have emphasized the implementation of ETD programs, and a few countries have attempted to do this at a national level. Nevertheless, design and implementation (including maintenance) of ETD programs is not straightforward. The diversity of various stakeholders, standards, and policies renders the design and implementation ETD programs an arduous and uncertain process. There is a vast set of factors that may cause an ETD program to cease or may lead to feasibility and viability issues. According to Teper and Kraemer, the success of a program is not always short term; more often than not, a long-term perspective should be taken into account.[5]

In the lexicon of management, Critical Success Factor (CSF) refers to those factors that directly affect the realization of a plan or project. The term "success factors" was first used by Daniel,[6] and Rockart[7] evolved it into CSF, a elaborating that it is helpful for executives to define their significant information needs. Ever since, many scholars have provided a definition, but Rockart's definition is one of the most widely accepted: "[CSFs are] the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where 'things must go right' for the business to flourish. If results in these areas are not adequate, the organization's efforts for the period will be less than desired."[8]

Although CSF was originally developed as a way to determine the key information needs of top managers,[9] in recent years this concept has been adopted for various other purposes, including performance evaluation, determination of information requirements, and planning.[10] The most ambiguous part of CSFs is the S; what does "success" actually mean? Clearly, success is a relative measure, completely dependent on the context where it is used, and it is often related to a mission or goal of a system, corporation, or project. Some authors argue that the frequency of views (such as page views per year) and the "width" of ETD users (like scholars, general public, policy makers) indicate the success.[11] Some others, such as Müller et al.,[12] argue that the usability of the portal that makes ETDs accessible determines success. As an example, Müller et al. point to the DiVA Portal, which is a tool for finding the theses of students at 47 institutions. As the DiVA Portal makes research publications accessible through the web, its success depends on methods that make the DiVA Portal useful for the users. Generally, no matter what system is used, the measurement of the success of ETD programs is based on their defined goals and objectives, as well as the control of those factors that may predict this success.

While there are several studies on requirements for implementing ETD programs,[13] there is still a lack of generic frameworks that describe and prescribe effective implementation of ETD programs. This is the gap that this study aims to address. The main objective is to identify the CSFs deemed crucial to the design and implementation of ETD programs.

Background

According to the literature, CSF has been applied in many domains: for example, education,[14] knowledge management,[15] construction,[16] Internet-of-Things (IoT),[17] and healthcare.[18] However, to the best of our knowledge, it has not been dealt with adequately in the context of Library and Information Science (LIS). Unsurprisingly, a search in the Library, Information Science & Technology Abstracts (LISTA) yielded fewer than 40 articles with a focus on CSFs. The LIS researchers' focus is on various themes, including knowledge management,[19] resource sharing,[20] information centers management,[21] usage of electronic information resources,[22] library gateways,[23] information quality management,[24] digital libraries (DLs),[25] institutional repositories (IRs),[26] and information systems.[27]

There are a few valuable studies on the factors affecting the implementation of institutional repositories but without an explicit focus on CSFs (examples: Cassella,[28] Giesecke,[29] Lihitkar and Lihitkar,[30] Shearer,[31] Thibodeau,[32] Westell[33]). Noteworthy is a study by Fox et al.[34] that links the success of a global ETD program, such as Networked Digital Library of Theses and Dissertations (NDLTD) to adoption of sensible strategies, suitable standards, interoperability,[35] and social issues. Materu-Behitsa and Levey emphasize a functional perspective of ETDs, for example, the provisioning of full text to be of great value for the long-term effectiveness of the Database of African Theses & Dissertations (DATAD) project.[36]

However, within the large body of knowledge on ETD, literature about CSFs in ETDs is relatively scarce, and what exists appears to be highly fragmented. To fill this gap, the present study reports the key topics about CSFs relevant to ETD design and development. Further, the study synthesizes extent knowledge into a coherent framework.

Methodology

To achieve the goal of this study, a systematic literature review was conducted. According to Fink, "research literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners."[37] The review is structured according to the broadly accepted process proposed by Higgins and Green.[38]

- Step 1. **Research question**: What are the CSFs in the development and implementation of ETD programs?
- Step 2. **Searching for studies**: searching ("electronic theses and dissertation*") OR ("electronic thesis and dissertation*") in title/abstract/keywords until June 1, 2016 through bibliographic databases (Library Science Database, Web of Science, Scopus, LISTA, and LISA) and ETDs symposiums' papers.
- Step 3. **Selecting studies**: Selecting journal articles, conference papers, and book sections that include possible success factors of institutional/national/regional/global ETD programs.
- Step 4. **Analyzing data**: synthesizing the data using categorization schemes.
- Step 5. **Presenting results**: critical success factors are presented in a table.
- Step 6. **Interpreting results and drawing conclusions**

As part of the second step, a search query was formulated to screen major (accessible) bibliographic databases. ETD symposiums and conferences are another rich source of insight. However, the proceedings are not always indexed in search engines. Therefore, the repositories of the main symposiums and conferences were found (mainly on the NDLTD platform[39] or, alternatively, through an Internet Archive: Wayback Machine[40]) and explored (see table 1). The time span of the search for symposiums is from 2000 until 2015.

Table 2 shows the number of records extracted from the bibliographic databases and ETD symposiums and the search was conducted in May 2016. As presented in table 2, the systematic search for articles resulted in collection of 1,140 records. In preparing the data for analysis, all of the records were downloaded and imported into a local database created with EndNote (version X7.5). By removing the duplicates, a total of 833 records were selected for further analysis.

All asterisks in search queries are wildcards for searching.

	TABLE 1	
	ETD Symposiums (2000–2015)	
Year	**Location**	**Website**
2000	Florida, USA	http://docs.ndltd.org/dspace/handle/2340/15
2001	California, USA	http://docs.ndltd.org/dspace/handle/2340/14
2002	Utah, USA	http://docs.ndltd.org/dspace/handle/2340/13
2003	Berlin, Germany	http://docs.ndltd.org/dspace/handle/2340/10
2004	Kentucky, USA	http://docs.ndltd.org/dspace/handle/2340/7
2005	Sydney, Australia	https://web.archive.org/web/20050104183151/http://adt.caul.edu.au:80/etd2005/default.html
2006	Quebec City, Canada	http://docs.ndltd.org/dspace/handle/2340/5
2007	Uppsala, Sweden	http://epc.ub.uu.se/etd2007/index.html
2008	Aberdeen, Scotland	https://web.archive.org/web/20081219151623/http://rgu.ac.uk:80/etd/home
2009	Pennsylvania, USA	http://www.library.pitt.edu/etd2009
2010	Texas, USA	https://web.archive.org/web/20140530115946/https://conferences.tdl.org/utlibraries/index.php/utlibraries/etd2010
2011	Cape Town, South Africa	http://dl.cs.uct.ac.za/conferences/etd2011
2012	Lima, Peru	https://web.archive.org/web/20130919151959/http://etd2012.unmsm.edu.pe/en/index.asp
2013	Hong Kong, China	http://lib.hku.hk/etd2013/about.html
2014	Leicester, UK	http://www2.le.ac.uk/library/etd2014
2015	Delhi, India	http://etd2015india.in

In the third step, the publications' title, abstract, and keywords were screened, which has led to the selection of 95 publications from the databases and 68 proceedings from symposiums and conferences that refer or discuss CSFs in the context of ETD development or implementation.

The analysis, in the fourth step, is based on full-length reading and coding of CSFs in the selected publications. Also in this step, a few publications were excluded mainly because these publications appeared to have a different emphasis than that which was initially indicated in the abstract. The final sample of publications included 39 publications (28 journal articles, 7 conference proceedings, and 2 book chapters). Next, all of the identified CSFs were categorized in various dimensions. The CSF models proposed by Lagzian, Abrizah, and Wee[41] were used as the initial frameworks for the categorization. These models provide CSFs of DLs and IRs that are not too different from ETDs. However, in the categorizing process, the authors excluded changes, creating themes to cover all of the identified codes that emerged in this study. To reach a consensus on how the extracted CSFs should be interpreted, labeled, and structured, the authors organized several meetings. In these meetings, the authors' common understanding and differences of opinion were extensively discussed. In a collaborative way, the authors strove to organize various factors along higher-level dimensions. Iteratively, the dimensions and the underlying factors were adjusted and reshaped to the point that all factors were covered and no further adjustment was necessary (in other words, the saturation point).

TABLE 2 Searching for Literature Process		
Database	**Search Query**	**Records #**
Web of Science (Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI)	TOPIC: ("electronic theses and dissertation*") OR TOPIC: ("electronic thesis and dissertation*")	79
Library Science Database (ProQuest)	all("electronic theses and dissertation*") OR all("electronic thesis and dissertation*")	81
LISA: Library & Information Science Abstracts (ProQuest)	ab(("electronic theses and dissertation*" OR "electronic thesis and dissertation*")) OR ti(("electronic theses and dissertation*" OR "electronic thesis and dissertation*")) OR su(("electronic theses and dissertation*" OR "electronic thesis and dissertation*"))	130
Scopus	(TITLE-ABS-KEY ("electronic theses and dissertation*") OR TITLE-ABS-KEY ("electronic thesis and dissertation*"))	162
LISTA: Library, Information Science & Technology Abstracts (EBSCO)	TI ("electronic theses and dissertation*" OR "electronic thesis and dissertation*") OR SU ("electronic theses and dissertation*" OR "electronic thesis and dissertation*") OR AB ("electronic theses and dissertation*" OR "electronic thesis and dissertation*") OR KW ("electronic theses and dissertation*" OR "electronic thesis and dissertation*")	183
The ACM Digital Library (ACM Full-Text Collection)	Any Field ("ETD*" OR "Electronic Thesis and Dissertation*" OR "Electronic Theses and Dissertation*")	14
Sub-total	After removing 307 duplicates	342
Retrieved studies presented in ETD symposiums	Retrieving papers presented in ETD symposiums	491
Total	Database and ETD symposium unique records	833

Findings

The first remarkable descriptive finding is that the attention of the ETDs community for CSFs has been increasing in the period from 1997 to 2015 (see figure 1). Furthermore, the *D-Lib Magazine* (3 articles), *Library Hi Tech* (3 articles), *Library Management* (3 articles), and *Interlending & Document Supply* (2 articles) together accounted for about 30 percent of the total of the selected articles.

With respect to the main contribution of this study, 45 CSFs were repeatedly underscored as impactful in the design and implementation of ETD programs. These CSFs were clustered in five coherent dimensions, namely: Management and Organization, Participation, Content, Technology, and Service (see figure 2). The five dimensions are detailed below.

Management and Organization

Management and Organization captures the financial and organizational structure and decision-making process and policies in ETD programs. Developers need to know and regularly meet with key policy-makers and funders throughout ETD programs. Planning a detailed roadmap with clear goals and objectives is required,[42] which includes scheduling and defining

FIGURE 1
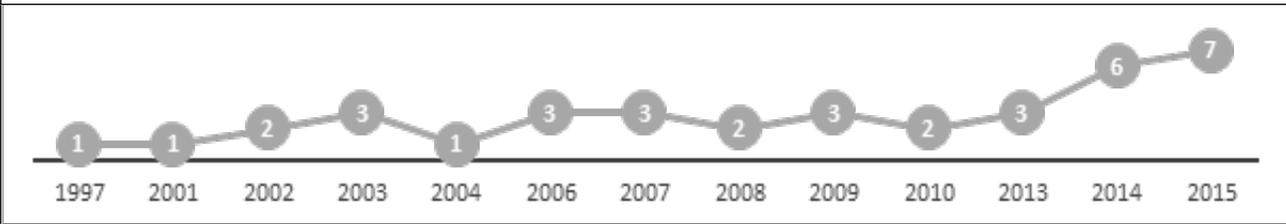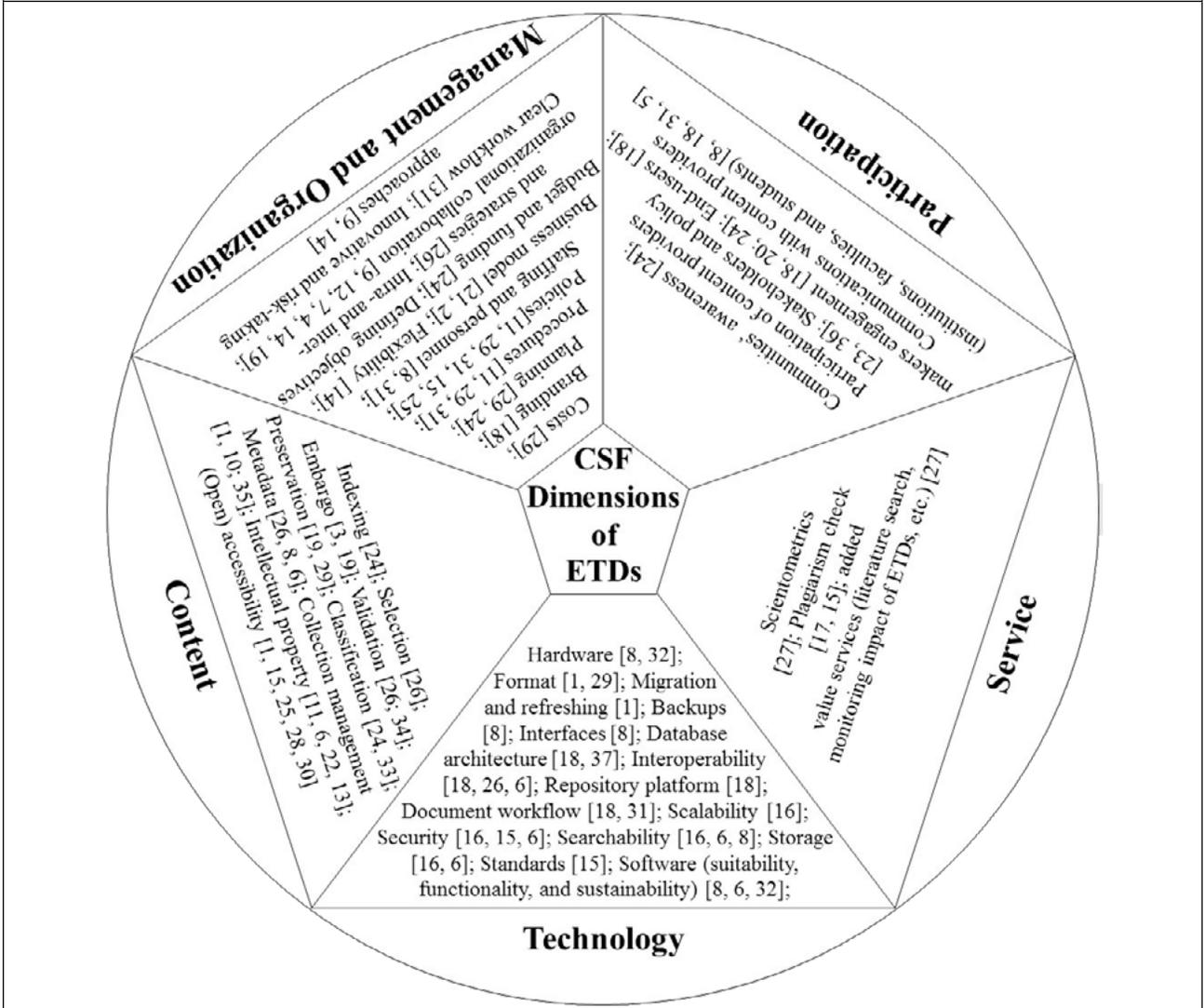**The Distribution of the Selected Articles in Years**

FIGURE 2
Critical Success Factors for the Implementation of ETD Programs*

*[1] Alemneh & Hartsock[91]; [2] Troman, Jacobs, & Copeland[105]; [3] Baccarne[66]; [4] Baro, Godfrey, & Eze [106]; [5] Carbery[107]; [6] Copeland & Penman[68]; [7] Early & Taber[48]; [8] Edminster & Moxley[50]; [9] Feuer[57]; [10] Fox et al.[1]; [11] Song[75]; [12] Jewell et al[47]; [13] Lavrenova & Vezhnevets[71]; [14] Li, Theimer, & Preate[57]; [15] Lippincott[95]; [16] Looi & Yeng[77]; [17] McCutcheon, et al.[108]; [18] Mikeal et al.[51]; [19] Perrin, Winkler, & Yang[66]; [20] Sankar, Sudha, & Kavitha[109]; [21] Rasuli, Alipour-Hafezi, & Solaimani[55]; [22] Ratanya[71]; [23] Sale[49]; [24] Schöpfel & Soukouya[42]; [25] Schopfel et al.[110]; [26] Schöpfel[43]; [27] Schöpfel[93]; [28] Shuto, Manaka, Nakayama, & Uchijima[111]; [29] Teper & Kraemer[5]; [30] Ubogu[36]; [31] Wolverton et al.[45]; [32] Yiotis[13]; [33] Middleton, Dean, & Gilbertson[112]; [34] Gasson[113]; [35] Thomas, Chen, & Clement[114]; [36] El-Bayoumi & Charlong[115]; [37] Gossett.[116]

general policies, strategies, and regulations[43] and creating formal procedures and workflows that facilitate management (that is, collection, arrangement, access, and modification) of the content.[44] Note that the policies, strategies, regulations, procedures, and workflows may be updated according to new conditions over time; hence, periodic review is considered to be necessary.[45] In addition, national policies in a country may (and often do) have an effect on ETDs' implementation: for example, local policies regarding data accessibility of institutional repositories, which will result in providing full-text ETDs or only metadata and abstracts for end-users.[46] Typically, implementation requires collaboration among different groups within an institution or a country,[47] or even beyond. To a great extent, the success of ETD programs depends on effective communication and collaboration within and between the involved stakeholders.[48] It is important that the participants have periodic meetings to review the process of implementing the ETD program.[49] Thus, to enhance creativity and collegiality, a diverse team with members from library and information science, computer science, and intellectual property law is suggested.[50] An image of collective institutions (such as a central library in a university, or a documentation center in a country) is another critical factor that needs to be considered.[51] A trustworthy image helps the branding of ETD programs, which attracts more stakeholders to support and participate in the ETD program.

The financial aspects are another concern of any ETD implementation.[52] One is the management of costs, which mainly involves the costs of preservation, hardware and software, and staff.[53] To cover the costs, seeking funds is a crucial activity.[54] Many ETD programs are open access, and their budget depends on public funding provided by governmental bodies and semigovernmental institutions.[55] An effective management of financial aspects can be achieved by means of a well thought-out business model with a clear structure to both create and capture value[56] and to stimulate the entrepreneurial spirit to foster initiative and risk-taking that are needed for setting up an ETD program.[57]

Participation
ETD programs achieve their full potential when there is active engagement of the stakeholders,[58] especially the content providers. The content providers are individuals or university faculties and departments, or institutions that generate and upload Theses and Dissertations (TDs). Policy makers are other key stakeholders in the ETD network, such as university deans, library directors, and department heads. In general, policy makers are responsible for the project and are involved in the program across various phases of development and implementation.[59] The end-users are perhaps the most important stakeholders; they vary from students, researchers, trend analysts, to the general public. Their continuous feedback is needed throughout the development phase.[60] With insights into users' information needs and information-seeking behavior, the developers are able to develop ETD systems and interfaces with high usability and user friendliness.[61] Efforts should be made to increase the awareness of all participants of the ETDs' network about the program (such as the involved processes, functionalities, opportunities, and challenges).[62] According to Mikeal et al., as part of the ETD programs, training courses can be organized that improve the communities' awareness of the program.[63]

Content
Content refers to the collection of Theses and Dissertations (TDs) from content providers and its preparation and provisioning to end-users. The content is directly submitted by individuals,

faculty members, academic departments, and institutions or indirectly through a harvesting method, which means data gathering from other sources than through students or faculties.[64] For example, some national programs harvest ETDs via individual institution through their IRs.

It is highly recommended that ETD programs define criteria for the collection management of TDs, including a content selection and a TD validation process to ensure the delivering of valid and high-quality content.[65] The format of TDs (print, digital, or both) is another aspect that should be decided upon. Some content providers also have specific policies on publication delays due to data sensitivity, deriving articles to submit them for publication in academic journals, which should be taken into consideration in any ETD program.[66]

The quality and accessibility of the content is another important factor and includes topics, such as indexing (assigning appropriate keywords and thesauri to the content), classification (dividing content in a range of subject categories), and describing the content with metadata to improve information retrieval.[67] Also, digital and physical preservation of TDs appears to be an essential aspect, in particular when it comes to the loss prevention of information.[68] According to Teper and Kraemer, preservation involves *"binding, conservation, deacidification, care and handling, and reformatting programs."*[69] In ETD programs, digital preservation is advocated as it ensures a greater longevity of the documents.[70]

Copyright is another recurring aspect of ETDs' provisioning.[71] The content providers' moral, ethical, and economic rights should be clear, and copyright-related issues should be attended to, including declaimers and terms of use and must be published online.[72] In addition, policies to address copyright infringement, plagiarism, and embargo in ETD programs should be explicit and transparent.[73] Transparency about these policies is an effective step to avoid content providers' concerns about improper, or misuse of, content.[74] Related to copyright, the debate on open and semiopen access to TDs has increasingly attracted developers' attention.[75] While open access leads to less revenue, it does create a network effect in which more and more users are attracted to the ETD program (or platform), thus making it prominent.

Technology

Technology is the key enabler of an ETD program, and a significant part of the implementation is carried out by Information Technology (IT) staff. Technology dimension refers to a wide range of tools, skills, and activities pertaining to digitization.[76] It must be emphasized that the infrastructure (both hardware and software) need to be scalable to facilitate new content and run new services if needed,[77] as well as to cope with interoperability among various content systems.[78] Mikeal et al. emphasize the role of system architecture in addressing scalability and interoperability.[79] However, multilayered architecture, including storage, logic, and access layers can address these two domains.[80]

A robust ETD program delivers content to end-users in a seamless way.[81] Document workflow that represents the entire process from preparing ETDs (collecting TDs) to delivering content to end-users should be defined.[82] This workflow is defined and implemented in a repository platform, which plays an important role in selecting standards for filing, preserving, describing, and retrieving ETDs.[83] Also, the searchability of content is underlined.[84] DSpace is an example of a widely accepted platform used by the ETD community, with features including organizing and managing content, finding and searching, preserving, making backup, and analyzing usage statistics.[85] It is suggested that repository platforms facilitate searchability and accessibility of content in an ETD database.[86]

Users' interface is another important factor with considerable impact on the satisfaction and experience of end-users.[87] In this regard, user-friendliness combined with the ability to navigate (for instance, visualizing tools) is emphasized.[88] Moreover, full-text searching and metadata-enabled searching are other important elements in designing a user interface.[89]

Security is considered to be another crucial aspect of ETD program design and implementation.[90] Security refers to the tools, methodologies, and processes that aim to protect content, users' privacy, and the source code used in developing the application software.

Finally, to have a sustainable ETD program, migration and data-refreshing formats are required.[91] With the advancement of different technologies, existing formats for saving content (such as PDF) may be replaced with other formats. Therefore, refreshing the content formats will help the program to serve its users continuously. The decisions around formats are also relevant with respect to data backups.[92]

Service

The service dimension refers to the values created for end-users.[93] For example, scientometrics are considered very useful for users of ETDs, and the dimension should capture research trends, measure impact through usage and citations, and show collaboration networks.[94] Several ETD programs, such as the ETD programs of Iran and India, have developed different dashboards for their content providers to monitor their statistics and impact. Through these dashboards, content providers—including institutions, university departments, faculties, and students—can compare their performance with one another.

Another essential service is a plagiarism check.[95] Some countries, such as Iran and India, have tools integrated for plagiarism checks in their national ETD programs.[96] This service is available in the Iranian program for the content providers and other institutions. Therefore, this service can be considered an incentive to attract more participants to the ETD program.

Another value-adding service is "literature search,"[97] which is provided by the Iranian ETD program. With this service, search specialists help the end-users to find related TDs in a certain area. However, this is a paid service, charged per user request. For providing more services, ETD developers can request information from their users about their needs and demands. In this regard, "need assessment" surveys may help ETD programs to provide more relevant and creative services. The provision of a wide range of helpful services will make ETDs useful and encourage stakeholders to (financially) support the programs.

Conclusion

An institutional ETD program is an institutional repository of theses and dissertations. According to Lynch and Lippincott, institutional repositories play a key role in digital scholarship and are broadly recognized as an essential infrastructure for academic research.[98] Thus, the successful implementation of ETDs has a direct implication for national and international research and education.

In this study, a systematic literature review was conducted to shed light on the existing literature of ETDs. The findings of this study indicate that the existing ETD literature focuses on at least five areas of management and organization, participation, content, technology, and service. Strikingly, the technology dimension consists of more variables than all of the other dimensions, which implies that the ETD community is more focused and nuanced on an understanding of this dimension. Perhaps the technical background of the authors in the field of ETDs has played a role in this. Moreover, the technological advancements in digitization,
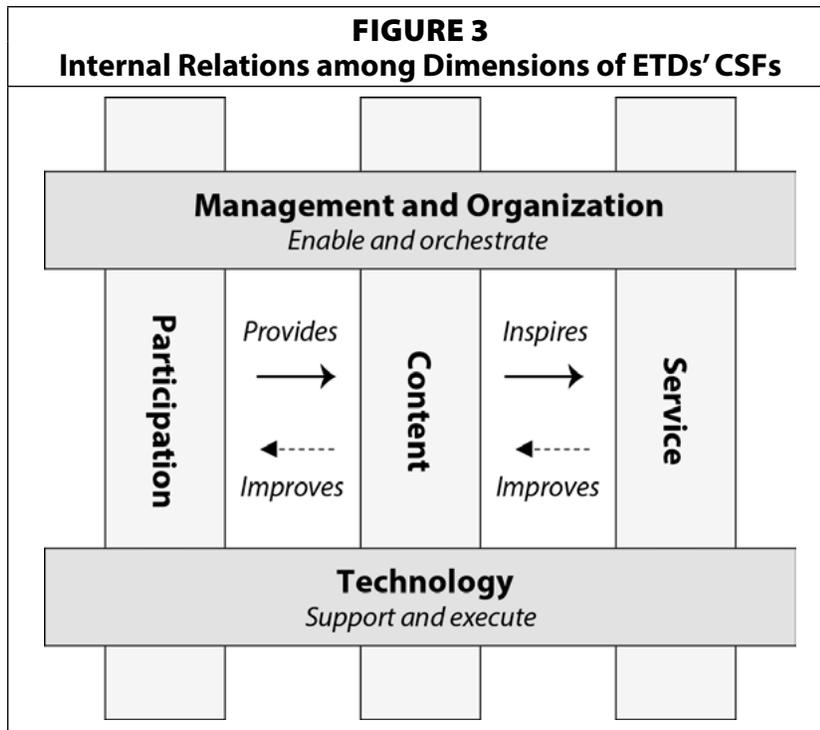
data networks, and management helped the emergence of ETDs in the early '80s, which may be another underlying reason for the nonproportional focus on technology. In this study, it is argued that all dimensions should receive equal attention.

More specifically, it can be concluded that, while technical issues are crucial in the early stages of the development of ETDs, organizational and managerial issues can ensure the sustainability and viability of the program in the later stages. Furthermore, since an ETD program has to be compatible or connected with other information discovery systems (such as current research information systems [CRISs], online public access catalogs [OPACs], and specialized scientific databases), ensuring the quality of content is vital, which requires the cooperation of all participants. Without the participation of (all) content providers, either at an institution or country level, a self-sustaining ETD program is barely viable. While some programs prefer to mandate depositing TDs (such as the national ETD programs in India and Iran), others prefer voluntary submission (such as EThOS in the United Kingdom and Theses Canada). Either way, to have active participation of the content providers, incentive mechanisms need to be in place to encourage content providers.[99]

Drawing on the findings of this study, it can be stated that the business viability of ETD programs seems to be contingent upon five dimensions: (1) management and organization; (2) participation; (3) content; (4) technology; and (5) service. A great number of the reviewed articles consider that the *management* and *organization* of the CSF throughout the entire design and implementation cycle of the ETD programs is the most crucial, including the policies regarding required technologies and tools, the partners and the forms of participation, the content types, and the collecting methods, as well as the quantity and quality of service level. At a more operational level, the *technology* dimension is of greatest concern, with technical specifications and infrastructural issues coming to the fore throughout the design and implementation of the ETD program.

Enabled by management and organizational facilities and supported by technological infrastructure, the three remaining dimensions can be effectively organized. As such, *participation* refers to attracting and encouraging content providers and other stakeholders, such as policy-makers, researchers, and the general public. While the content providers are a critical part of any ETD program, the provided content is equally important. *Content* is mainly the theses and dissertations. The content should be made available after verification, indexing/abstracting and via proper channels to the "right" segment of users. The content is made usable and useful through *services*. The ETD services include the basic functionality of the programs, such as basic search and access to metadata and full-text. Some examples are content delivery, print facilities, visualizing information, preparing networking among authors, assigning DOI to documents, as well as the size and quality of content. It can be argued that the five dimensions are integrative and work as a system. Equal attention to all dimensions enhances the likelihood of effective and sustainable ETD programs (see figure 3).

Furthermore, the findings of this study imply that management, technology, and service are three common dimensions of CSFs in implementing ETDs, IRs, and DLs. However, despite the commonalities, the corresponding CSFs are not identical per se. For instance, according to Lagzian, Abrizah, and Wee, self-archive practices seem crucial for IRs, given the voluntary participation of its content providers,[100] but virtually irrelevant for ETDs since students' submission of TDs is often mandatory. Another example is IRs that are implemented by a team from various departments and specialties in an institution,[101] for which the "people" dimension is

FIGURE 3
Internal Relations among Dimensions of ETDs' CSFs

Management and Organization
Enable and orchestrate

Participation

Provides →

Improves ◄------

Content

Inspires →

Improves ◄------

Service

Technology
Support and execute

evidently crucial. However, the ETDs are often implemented exclusively by university libraries and librarians, skillful in collecting, organizing, and disseminating of ETDs, and leading the "people" to be a variable and not a dimension in the CSF.

The findings of this research can help developers and managers in the design, implementation, and maintenance of the ETD programs, for instance, by using the proposed integrative framework and the underlying 46 CSFs; they can also be useful for evaluating existing programs. Practitioners can prepare a roadmap covering CSFs and draw associations among different factors. ETD programs' managers should have clear policies for addressing CSFs while preparing their action plans. From an academic viewpoint, the framework provides a coherent structure in which other future studies can be positioned. The study also provides a comprehensive view of the existing body of knowledge on ETDs and relevant CSFs.

Limitations

This study has several limitations. First, although great effort was made to collect as many possible relevant articles as possible, undoubtedly more could have been added (such as digital library, institutional repositories). However, given the large number of collected papers, it is fair to argue that adding more articles would not necessarily change the overall structure of the framework. Also, the framework and the variables are, to some extent, resting on the subjective understanding and interpretation of the authors; however, this is a generic shortcoming in any qualitative research. To address this shortcoming and improve the internal validity of the study, the authors organized iterative discussions among themselves to reach a consensus view on how various CSF should be interpreted and structured within the proposed framework. The repetitive occurrence of the CSFs was also taken into consideration.

Future Research

Needless to say, the results of this study show commonalities with other IT-driven projects (such as Wong and Tein[102]), mainly due to the fact that ETD projects are often based on existing IT infrastructure, initiated and led by IT-savvy staff. A broader generalizability can be achieved by comparing the findings of this study with other IT implementation or digitalization projects in general, and specifically with IT systems in library and information management context, such as the rollout of specialized databases, CRISs, IRs, or DL platforms. Business

feasibility is another highly relevant yet underresearched area in the ETD literature. Without a clear alignment between the business model and the underlying operational infrastructure and processes, the business feasibility and viability of ETD programs are untenable (compare with Solaimani[103]). To this end, finding relevant metrics is imperative in evaluating and validating the implementability and progress,[104] for instance, to assess the ETDs' added value for various stakeholders.

Notes

1. Edward A. Fox et al., "NDLTD: Encouraging International Collaboration in the Academy," *DESIDOC Bulletin of Information Technology* 17, no. 6 (1997).

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