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# **The identification of critical success factors in the development of national ETDs programs: A literature review**

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## **Abstract**

National Electronic Theses and Dissertations (ETDs) programs have been recognized as one of the most effective channels through which Theses and Dissertations (TDs) can be made available to academic communities. However, to establish a national ETDs developers need to be aware of the Critical Success Factors (CSFs). CSFs are the few key areas where “things must go right” for the program to flourish and without them the organization’s efforts for the period will be less than desired. This paper aims to identify CSFs deemed crucial for the implementation of national ETDs through review the existing body of knowledge related to this topic. Based on categorizing and thematizing data, this paper conceptualizes a generic framework comprised of five broad dimensions (management and organization, involvement, service, content, and technicalities) in order to make a national ETDs program successful. With knowledge about CSFs, stakeholders and managers would be more able to achieve organizational goals, make critical decisions, and allocate resources that are required to make national ETDs implementation programs successful.

**Keywords:** Electronic Theses and Dissertations, Critical Success Factors, Systematic Literature Review, National ETDs Programs.

## Introduction

Sharing of information and scientific findings is crucial for the education, which in turn, leads to the advancement of civilization (Fox et al., 1997b). One of the influential ways for sharing information is ETDs. ETDs programs have been increasingly recognized as a vital tool for accessing information resources and scholarly communication during past two decades, and the number of ETDs programs, especially at the institutional level, is increasing significantly every year. Along with the growth of institutional ETDs, other types of ETDs (i.e. national, regional, and global programs) have been developed to optimize sharing of students' research findings. Among these types, national programs are more important for countries, since they disseminate national research output and indicate national scientific power.

However, managing ETDs or other scientific databases at a nation-wide level is a challenging domain. Developing a national ETDs initiative has been underlined by many countries around the world and some countries have tried to develop their ETDs program. Nevertheless, establishment and maintenance of a national ETDs program is not as simple as an institutional ETDs program. Diversity (for example, various stakeholders, different standards, diverse backgrounds, several policies, etc.) makes establishing a national ETDs initiative more complicated than an institutional ETDs program. Therefore, different factors may affect a national ETDs initiative; these factors may force a program to stop or they can lead that to a long-term viability. Undoubtedly developers of ETDs programs want them to be successful in various aspects, and as Teper and Kraemer (2002) have emphasized, "*the goal of most programs is similar, procedural variations impact a program's long-term success*" (p. 61). Therefore, to design, implement, and manage a national ETDs initiative more effectively, developers need to know the critical factors for a successful program.

In the management terminology, critical success factor (CSF) is a concept which includes different important factors affecting the success of a phenomenon. From 1960s academicians have begun to explore CSFs in various contexts, and Daniel (1961) was the first author who coined this term in *Harvard Business Review*. Since its emergence, many scholars have tried to explain what the CSF is, but the Rockart's definition is more popular among them. Rockart (1979) provides the meaning of CSFs as follow:

*"[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"* (p.85).

Obviously, these areas need top managers' attention to make a system successful. Although CSF was originally developed as an approach for determining the key information needs of top managers (Rockart, 1979), in recent years this concept has been adopted for various purposes, including performance evaluation, information requirements determination, and planning (Peffer et al., 2003).

Though CSF is a frequently-used concept in this area, still one may ask 'what does the success mean?' Although success may be defined diversely from different approaches and in different

contexts, but mostly it will be measured based on mission and goals of a certain system/corporation/organization/program. Since the primary objective of national ETDs - as most of them have joined the open access movement - is the distribution of student's researches, it can be argued that it is the *use* of ETDs by different users (e.g. scholars, industries, or policy-makers) that determines the success of such programs. For example, when Wang, Bulick, and Muyumba(2014) want to prove the success of the Indiana State University ETD program, they point out to 'page views per year'(p. 244) in their research. However, perhaps national ETDs aiming to collect TDs, preserve the most of the intellectual properties around a country, impact on target communities, as well as help policy-making in scientific areas. Therefore, it is important to measure the success of an ETDs program based on its goals and objectives, as well as to control those factors may predict this success.

While several studies have been done on requirements for establishing an ETDs program at institutional levels, there is a lack of knowledge of the critical success factors for ensuring successful implementation of national ETDs initiatives. Accordingly, this paper is mainly concerned with national ETDs as a specific type of information service and aims to identify critical success factors deemed crucial in the implementation and maintenance of a national ETDs program.

## Literature Review

CSF has been applied in many domains; for example, education(Volery and Lord, 2000), knowledge management(Yew Wong, 2005), construction(Sanvido et al, 1999), Internet-of-Things (Solaimani et al., 2013 ), and health (Ben-Zion, Pliskin, and Fink, 2014). However, CSF are mostly studied in management area and is not very popular in Library and Information Science (LIS) domain. Based on the number of documents indexed in Scopus database<sup>1</sup>, researchers from *business and management* field are more interested in looking for CSFs than other academic fields,<sup>2</sup> following by *computer science*, and *engineering*. Not surprisingly, a search on Library, Information Science & Technology Abstracts (LISTA) retrieved only less than 40 documents about CSFs. However, during the past decade, LIS researchers have tried to investigate CSFs in various subjects in the field. For example, CSFs for knowledge management (Chung et al., 2007, Kimble and Bourdon, 2008, Lehner and Haas, 2010, Mohaghar et al., 2013, Saniah Sulaiman et al., 2013, Sedighi et al., 2015), resource sharing (Alidousti et al., 2008), information centers management (Alwis and Fühles-Ubach, 2010, Magal et al., 1988, Magal and Carr, 1988), usage of electronic information resources (Millawithanachchi, 2012), library gateways (Calhoun et al., 1999), information quality management(Başkarada and Koronios, 2014), digital libraries (Lagzian et al., 2013), institutional repositories (Lagzian et al., 2015, Westell, 2006, Thibodeau, 2007, Shearer, 2003, Cassella, 2010), and information systems (Chow and Wai On, 2009, Zhou, 2011, Rahnavard and Gholami, 2012, Ben-Zion et al., 2014).

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<sup>1</sup> June 01, 2015; TITLE-ABS-KEY ("critical success factor\*")

<sup>2</sup> around 1800 out of 4870 records

In additions, LIS researchers have tried to explore critical factors affecting the success of institutional repositories (for example, Lihitkar and Lihitkar, 2014, Westell, 2006, Giesecke, 2011, Shearer, 2003, Thibodeau, 2007, Cassella, 2010), which can be considered relevant to the current paper. While each study highlighted different factors, Lagzian, Abrizah, and Wee (2015) did a systematic literature review of these studies and concluded that 46 variables under six factors (management, services, technology, self-archive practices, people, and resources.) are critical for the success of IRs implementation. They also investigate critical factors affecting the success of digital libraries and drew six dimensions of CSFs (motivation, resource, people, process, location, and time) and 36 potential success factors.

Although in the ETDs area authors did not find a study to investigate CSFs specifically, but there are some studies on institutional ETDs that pointed out some success factors. Table 1 shows important factors may affect the success of institutional ETDs.

Table 1. Factors affecting success of institutional ETDs

Factors	Author(s)
Intra- and inter-organizational collaboration (between different related departments in an institution, as well as with other institutions)	(Feuer, 2014, Jewell et al., 2006, Early and Taber, 2010, Baro et al., 2014, Li et al., 2014, Perrin et al., 2015)
Preservation	(Alemneh and Hartsock, 2014, Teper and Kraemer, 2002, Wolverton et al., 2009, Lippincott, 2006, Perrin et al., 2015)
(Open) accessibility	(Alemneh and Hartsock, 2014, Lippincott, 2006, Shuto et al., 2014, Ubogu, 2001)
Information resources management	(Alemneh and Hartsock, 2014)
Hardware/software/technical services	(Ian, 2007, Edminster and Moxley, 2002, Mikeal et al., 2009, Wolverton et al., 2009, Lippincott, 2006, Potvin and Thompson, 2016)
Policies	(Ian, 2007, Teper and Kraemer, 2002, Wolverton et al., 2009, Lippincott, 2006)
Workflows	(Ian, 2007, Teper and Kraemer, 2002, Wolverton et al., 2009)
Copyright	(Ian, 2007, Copeland and Penman, 2004, Ratanya, 2010)
Students and academic staff	(Carbery, 2009, Mikeal et al., 2009)
Content Quality	(Schöpfel, 2013a, Fox et al., 1997b)
Strategic plan	(Schöpfel, 2013a)
Communications with faculty, students, and policy making bodies	(Edminster and Moxley, 2002, Mikeal et al., 2009, Wolverton et al., 2009)

Human resources	(Edminster and Moxley, 2002, Wolverton et al., 2009)
Stakeholder engagement and Institutional support	(Mikeal et al., 2009, Schöpfel and Soukouya, 2013)
Document workflow	(Mikeal et al., 2009, Wolverton et al., 2009)
Identity management	(Mikeal et al., 2009)
Project planning	(Teper and Kraemer, 2002, Schöpfel and Soukouya, 2013)
Costs	(Teper and Kraemer, 2002, Lippincott, 2006)
Budget and funding //isn't it part of cost?	(Schöpfel and Soukouya, 2013)
Marketing and create awareness	(Schöpfel and Soukouya, 2013)
System and organizational infrastructure	(Schöpfel and Soukouya, 2013)
Standards	(Lippincott, 2006)
Innovative and risk-taking approaches	(Feuer, 2014, Li et al., 2014)
Flexibility	(Li et al., 2014)

Beyond of institutional and national ETDs, Fox, Hall, and Kipp (1997a) believe the success of a global ETDs program like NDLTD depends on adopting sensible strategies, suitable standards, interoperability matter, and social issues. At the other hand, Materu-Behitsa and Levey think the provision of full-text can guarantee the long-term success of the DATAD project (Ubogu, 2001) which is a regional ETDs program.

In summary, it seems LIS researchers have focused more on technical issues than managerial, cultural, and social aspects. According to table 1, there are (at least) 24 possible factors that can be important for the success of institutional ETDs programs. Among these factors, scholars had a special emphasis on technical issues, preservation, intellectual property rights, accessibility, and collaboration among the related groups for the success of all institutional ETDs programs.

### Methodology

The main objective of this research is to explore the CSFs that are required to the implementation of national ETDs programs. To obtain this objective, the authors conducted a systematic review of relevant studies which focused on the factors affecting the success of ETDs programs. Current literature review follows the process (Table 2) proposed in *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins and Green, 2011). The authors identified potentially relevant studies through searching “electronic theses and dissertations” term and its variants in major applicable bibliographic databases (Table 3).

Table 2. The structured review process

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→ Research question: What are the success factors critical to the implementation of national ETDs programs?

→→ Searching for studies: searching ("electronic theses and dissertation\*") OR ("electronic thesis and dissertation\*") in title/abstract/keywords until June 01, 2016 through bibliographic databases (Library Science Database, Web of Science, Scopus, LISTA, and LISA) and ETDs symposiums' papers.

→→→ Selecting studies: Selecting journal articles and book sections which include possible success factors of institutional/national/regional/global ETDs programs.

→→→→ Analyzing data: synthesizing the data using categorization schemes.

→→→→→ Presenting results: critical success factors are presented in a table.

→→→→→→ Interpreting results and drawing conclusions

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In addition to bibliographic databases, ETD symposiums are a valuable source of ETDs related literature, while presented studies in these symposiums are not indexed in the commercial bibliographic databases. Therefore, most of the presented studies were retrieved through visiting events' websites. Table 3 shows the number of records retrieved from bibliographic databases and ETD symposiums.

Table 3. Searching for literature

Database	Search formula	No. of records
Library Science Database (ProQuest)	all("electronic theses and dissertation*") OR all("electronic thesis and dissertation*")	81
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
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	183

	thesis and dissertation*") OR KW ("electronic theses and dissertation*" OR "electronic thesis and dissertation*")	
LISA - Library & Information Science Abstracts (ProQuest)	ab(("electronic theses and dissertation*" OR "electronic thesis 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
Retrieved studies presented in ETDs symposiums	-	491

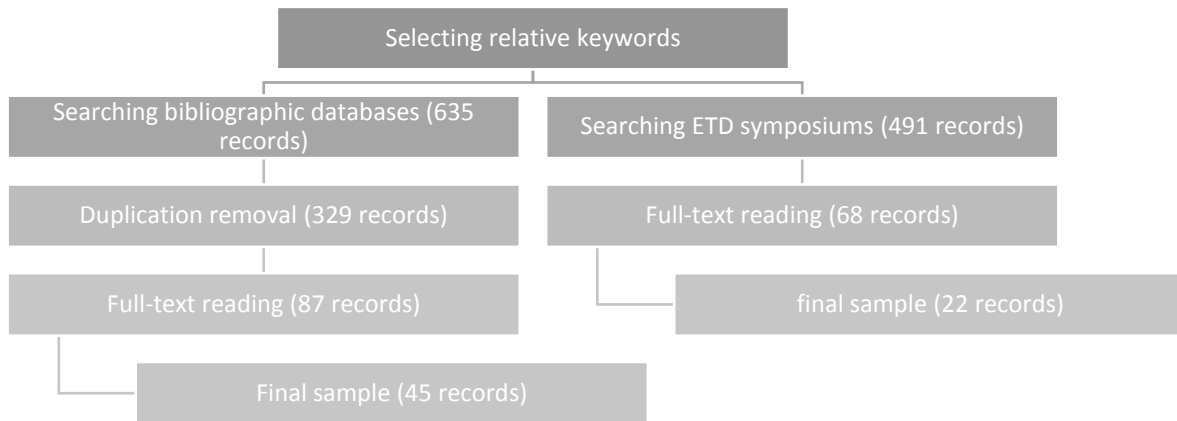


Figure 1. Decision tree for sampling literature

According to Figure 1, 635 records through database searching were identified for initial cursory. These records were downloaded and imported into a local database designed by EndNote X7. As records were downloaded from different databases, removing duplicates yielded a total of 329 unique publications. Furthermore, 491 records were found through ETDs symposiums searching and imported to MS Excel file. After initial cursory based on relevancy of studies to research question (factors affecting success of ETDs programs), 87 records from database searching and 68 records from symposium searching were selected to full-text reading. Among these records, 45 articles from databases and 22 studies from symposiums (sum: 67 records) were included in the final sample.

At the next step, synthesizing the data using categorization schemes, all identified possible CSFs (codes) were categorized in various dimensions (themes). Two CSFs models proposed by Lagzian, Abrizah, and Wee (2013, 2015) were selected as initial frameworks for the categorization. These models provide CSFs for digital libraries and institutional repositories which are related to ETDs. However, during categorizing process, authors excluded, changed, and created themes to cover all identified codes, properly. After an iterative process among authors, CSFs framework for ETDs was structured. While research process will partially ensure validity, further investigations are required to validate and finalize the proposed framework.



## Findings and Discussion

The analysis of various studies is performed to obtain the objective of this research. According to the literature review, there are various factors which can affect implementing national ETDs successfully. After an iterative process, authors propose MISCT model for categorizing all possible CSFs extracted from the literature. MISCT model is comprised of five dimensions of CSFs, including management and organization, involvement, service, content, and technicalities. These five dimensions are defined in Table 4.

Table 4. Definitions of MISCT model dimensions

CSFs dimensions	Definition
Management and organization	Management and organization dimension refers to the governing process of dealing with or controlling things or people in a program. This dimension consists of organizing resources to accomplish goals and objectives. Managerial roles (e.g. planning, staffing, etc.) are categorized in this dimension. Financial aspects of a program, for example, are one of the main challenges in this dimension, which program manager should deal with.
Involvement	Cooperation among various groups is required for implementing national ETDs programs. Involvement dimension refers to contributions and supports of these groups which have an important impact on the success of such programs. The main challenge in this dimension is about participating of institutions to provide content for ETDs programs.
Service	Service dimension refers to the provision of services to programs' users, which is beyond basic functionality. It may be required to perform additional activities for the provision of a range of services. Some of these services are added values which are not a part of programs' core services. Usually, a wider range of services will increase usage and the impact of national ETDs programs.
Content	Content dimension refers to data and information resources directed towards users. The quality of the content is an important factor to show the success of ETDs programs. Those activities that increase the quality of the content are categorized in this dimension. ETDs programs should have clear policies on a set of standards and criteria for the selection and validation

	the content.
Technicalities	Technicalities dimension refers to a wide range of tools, skills, activities, etc. pertaining to computers or technology. Usually, technicians or someone from computer science can deal with these issues. Technicalities are the base for running an ETD database. Harvesting content from other repositories, data registry and organizing process, and making information available for end-users are some of main activities in this dimension. Technicalities are involved in different stage of designing an ETDs program, because such systems are relied on ITs.

The results of the literature review indicate that MISCT model includes 45 CSFs variables which influence on implementing national ETDs programs. Technical issues dimension includes 15 variables, which has more variables than other dimensions, following by management and organization dimension (13 variables), content dimension (10 variables), involvement dimension (4 variables), and service dimension (3 variables). All 45 variables with reference literature are presented in Table 5.

Table 5. Critical success factors for national ETDs programs implementation

CSFs dimensions	CSFs variables	Author(s)
Management and organization	Branding	(Mikeal et al., 2009)
	Policies	(Ian, 2007, Teper and Kraemer, 2002, Wolverson et al., 2009, Lippincott, 2006)
	Procedures	(Ian, 2007, Teper and Kraemer, 2002, Wolverson et al., 2009)
	Business model	(Rasuli et al., 2015, Anthony et al., 2007)
	Staffing and personnel	(Edminster and Moxley, 2002, Wolverson et al., 2009)
	Costs	(Teper and Kraemer, 2002)
	Budget and funding	(Schöpfel and Soukouya, 2013)
	Defining objectives and strategies	(Schöpfel, 2013a)
	Planning	(Teper and Kraemer, 2002, Schöpfel and Soukouya, 2013)
	Flexibility	(Li et al., 2014)
	Intra- and inter-	(Feuer, 2014, Jewell et al., 2006, Early and Taber,

	organizational collaboration	2010, Baro et al., 2014, Li et al., 2014, Perrin et al., 2015)
	Clear workflow	(Wolverton et al., 2009)
	Innovative and risk-taking approaches	(Feuer, 2014, Li et al., 2014)
Involvement	Communities' awareness	(Schöpfel and Soukouya, 2013)
	Participation of institutions	(Sale, 2006)
	Stakeholders and policy makers engagement	(Mikeal et al., 2009, Schöpfel and Soukouya, 2013)
	Communications with content providers (institutions, faculties, and students)	(Edminster and Moxley, 2002, Mikeal et al., 2009, Wolverton et al., 2009, Carbery, 2009)
Service	Scientometrics	(Schöpfel, 2013b)
	Plagiarism check	(McCutcheon et al., 2008, Lippincott, 2006)
	Other added value services (literature search, monitoring impact of ETDs, etc.)	(Schöpfel, 2013b)
Content	(Open) accessibility	(Alemneh and Hartsock, 2014, Lippincott, 2006, Shuto et al., 2014, Ubogu, 2001)
	Metadata	(Schöpfel, 2013a, Edminster and Moxley, 2002, Copeland and Penman, 2004)
	Intellectual property	(Ian, 2007, Copeland and Penman, 2004, Ratanya, 2010, Lavrenova et al., 2003)
	Selection	(Schöpfel, 2013a)
	Validation	(Schöpfel, 2013a)
	Preservation	(Alemneh and Hartsock, 2014, Teper and Kraemer, 2002)
	Classification	(Schöpfel and Soukouya, 2013)
	Indexing	(Schöpfel and Soukouya, 2013)
	Collection management	(Alemneh and Hartsock, 2014)
	Embargo	(Baccarne, 2007, Perrin et al., 2015)
Technicalities	Hardware	(Edminster and Moxley, 2002, Yiotis, 2008)

Format	(Alemneh and Hartsock, 2014, Teper and Kraemer, 2002)
Migration and refreshing	(Alemneh and Hartsock, 2014)
Software (suitability, functionality, and sustainability)	(Edminster and Moxley, 2002, Copeland and Penman, 2004, Yiotis, 2008)
Backups	(Edminster and Moxley, 2002)
Interfaces	(Edminster and Moxley, 2002)
System architecture	(Mikeal et al., 2009)
Interoperability	(Mikeal et al., 2009, Schöpfel, 2013a, Potvin and Thompson, 2016, Copeland and Penman, 2004)
Repository platform	(Mikeal et al., 2009)
Document workflow	(Mikeal et al., 2009, Wolverton et al., 2009)
Scalability	(Looi and Yeng, 2003)
Security	(Looi and Yeng, 2003, Lippincott, 2006, Copeland and Penman, 2004)
Searchability	(Looi and Yeng, 2003, Copeland and Penman, 2004, Edminster and Moxley, 2002)
Storage	(Looi and Yeng, 2003, Copeland and Penman, 2004)
Standards	(Lippincott, 2006)

The literature review reveals that technical issues dimension have more variables, which means the academic community has focused on this dimension more than the others. Probably the main reason for this focus is that the most authors and developers in ETDs field have a technical background and think a robust hardware and software infrastructure will lead ETDs program to success. Furthermore, the main driver to emerge ETDs in the 1980s was technological development, so that not-surprisingly academics refer to literature and practices of the first generations ETDs. Of course, developing technical infrastructure and proper software is the most important stage to start a national ETDs program. Since a national ETDs repository is a strategic intellectual asset of a country, it should be secure and scalable with suitable storage support to collect resources. Also, it collects ETDs from various institutions with different specifications, so that interoperability is vital to contact with heterogeneous systems, standards, and architectures. In additions, users should be able to search in the database in an effective manner and find proper formats.

However, technical issues are not the most important CSF in the other relevant fields. For example, Lagzian, Abrizah, and Wee (2015) highlighted management support as the most

important factor for the success of institutional repositories. While technical issues are important in the first stage of developing ETDs programs, organization and managerial issues can ensure the sustainability and viability of programs. Controlling financial aspects as well as defining plans, objectives, procedures, and strategic cooperation are important to manage an ETDs program, in particular at the national level. In recent years, along with sustainability and viability issues of ETDs programs, more people from academic and practice are talking about management and organization dimension.

Another identified success factor thematized from the literature is the content dimension, which is referred as the core of ETDs repositories. Obviously, ETDs programs rely on providing content to serve their certain communities. However, this is the quality of content that makes an ETDs program successful. Since a national ETDs program has to compete with other information discovery systems, such as institutional repositories, ensuring the quality of content and information resources is vital for success. Hence, a national program should try to control selection, validation, and dissemination of ETDs. In additions, content should be indexed and classified based on suitable metadata models. One of the most challenging variables in this dimension is copyright, which should be addressed even before the start of every program. Intellectual property right is even more challenging when content will be collected and accessible through a national program.

Although other two dimensions of MISCT model attracted less interest of academics as factors for make a program successful, but they have a vital role in the success of a national ETDs program. Without the participation of (all) institutions around a country, a *national* program will never be established. Some countries prefer to mandate deposit of TDs (such as India and Iran), but others call institutions to deposit their content in the national program, voluntarily. While there are success and failure stories about these two methods, it seems work on effective incentives for institutional participation should be included in 'to do' list of national programs' developers. Offering valuable and unique services, for example, is an important incentive for institutions to participate in programs. Offering these services, also, can attract attentions of users, policy-makers, stakeholders, and other funding bodies to support a national ETDs program, and ultimately, to make it successful.

## **Conclusion**

Implementing and improving national ETDs programs may help to build a stronger global ETDs program, which, in turn, facilitate sharing of information and scientific findings through an international database that is accessible for researchers around the world. Several countries have already started and some are going to establish ETDs programs for managing TDs in a better way and maximizing access to students' research findings. Establishing a national ETDs program needs time, human resources, money, etc., so that program managers need to know what are affecting success of the programs. What is important for successful implementing such programs can be summarized in CSFs. While they perhaps are informed of some important factors, there is no a generic and holistic framework to control CSFs in the ETDs field.

This research investigates the CSFs in establishing of national ETDs programs. The paper presents the MISCT model under five dimensions (management and organization, involvement, service, content, and technicalities) and 45 variables. Literature analysis revealed that technical issues dimension has attracted more attention of academics than the other dimensions. Since the current issues of ETDs program are sustainability, so that other dimensions, like management and organization, ensuring the quality of content, and offering proper services are critical for the success of ETDs programs. While national ETDs programs depend on content providers' participation more than institutional repositories, involvement is more important in such contexts, which academics have not paid attentions to this dimension very well.

Finding of this research not only helps ETDs' developers to establish and maintain programs, but also provides a framework for evaluating programs; they will find what is important for successfulness of the programs, then evaluating ETDs programs against MISCT framework will bring them valuable results. Since the surveyed studies have not pointed success factors out based on a specific order or the importance of them, the dimensions of MISCT model are not prioritized in this study. However, "prioritization is of great importance because it is always unfeasible to address all factors concurrently and they can focus on the most critical factors first and then gradually address the others" (Chin et al., 2008). Although prioritizing factors can be investigated in future studies; for example, determination the relative importance of each dimension is possible through consulting a group of experts.

This research is providing useful information on CSFs, however further studies in this area are required. While the most of CSFs are presented in MISCT model in this study, perhaps there are other variables that are not covered in this paper, because they have not appeared in the ETDs literature and they will be extracted from practice and real contexts.

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