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Barriers to Distance Education: A Factor-Analytic Study

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Abstract

This article reports on a large-scale (n = 2,504), exploratory factor analysis that determined the underlying constructs that comprise barriers to distance education. The ten factors found were (1) administrative structure, (2) organizational change, (3) technical expertise, (4) social interaction and quality, (5) faculty compensation and time, (6) threat of technology, (7) legal issues, (8) evaluation/effectiveness, (9) access, and (10) student-support services.

Introduction

While numerous studies have discussed barriers to the successful implementation of distance education, many are based on the examination of one instructor's experience, one distance learning environment, or one type of distance learning program. The findings provide useful information, but it is difficult to piece these studies together to create a holistic picture of the barriers to distance education.

Some quantitative studies have been conducted (Berge 1998; Cegles 1998; Dickinson et al. 1999; Rockwell et al. 1999; Yap 1996), but they tap a small or very focused population group. A larger-scale study was still needed to consider simultaneously the many dimensions of barriers to distance education as perceived by people from a wide variety of backgrounds.

The survey study reported in this article sought to represent the perceptions of people who differed on six demographic variables: (1) workplace (e.g., community college, government, nonprofit organization, K–12 education); (2) job function (e.g., support staff,

manager, researcher, student); (3) type of delivery system used (e.g., audiotape, computer conferencing, interactive television [ITV]); (4) expertise regarding distance education; (5) the stage of the respondent's organization with regard to capabilities in delivering distance education (from no distance education activity to distance education being the way the organization does business); and (6) the area in which the respondent primarily works (e.g., fine arts, engineering, education). More than 2,500 survey respondents rated the severity of sixty-four separate barriers to distance education on a 1–5 Likert scale (from no barrier to very strong barrier, respectively).

One goal of this study, and the subject of this article, was to conduct an exploratory factor analysis to determine the underlying constructs that comprise barriers to distance education. We believed that developing a research-based framework for barriers would be helpful in several areas. First, it would simplify the further analysis of the data gathered in this survey by reducing the number of dependent variables. Second, it would provide a meaningful and useful framework for discussing the barriers that organizations and individuals are likely to encounter when implementing a distance learning program. Finally, in our literature review, we did not find any frameworks reported to have been developed through a factor-analytic study. We believed that a perspective derived using a different statistical treatment would be valuable, regardless of whether conclusions drawn were similar to or different from those of previous researchers.

Literature Review

We conducted a review of the literature on barriers, issues, and success factors in distance education. The literature fell into two broad categories: articles that listed numerous specific barriers to distance education, and articles that provided a framework or categorization to facilitate the discussion of barriers. Although it is important to discover the range and variety of barriers addressed in the literature, it is difficult to study or draw meaningful conclusions on so many specific barriers. For this reason, a framework, or a smaller number of categories for discussion of barriers, is highly desirable. A literature review revealed several articles that contained some form of categorization or a formal framework. These articles are briefly summarized below to provide an overview, and to later relate the categories identified by a selected number of the authors to the factors we identified in this study.

Rezabek (1999) grouped the barriers to distance education enrollment into three categories. *Situational barriers* result from an

individual's general situation or environment, and include such issues as transportation, age, time constraints, and family responsibilities. *Institutional barriers* are created by an institution's programs, policies, and procedures, and include problems with admissions, registration, scheduling of courses, financial aid, and support services. *Dispositional barriers* result from an individual's personal background, attitude, motivation, learning style, and self-confidence.

In Garland's (1993) study of barriers to student persistence, four barrier categories were used: *situational*, *institutional*, *dispositional*, and *epistemological*. The first three categories in this study are the same as those described by Rezabek. *Epistemological barriers* were that the course was difficult; that the course was too technical, theoretical, or abstract; that students lacked prerequisite knowledge; and that the content lacked personal interest or relevance.

Leggett and Persichitte (1998) investigated the history of barriers relating to the infusion of technology in the K–12 classroom. They found that teachers have consistently cited four basic barrier categories: *time*, *access*, *resources*, and *expertise*. The authors then added a fifth category: *support*.

Merrill et al. (1992) used three basic categories to discuss barriers: *ethical issues*, *legal issues*, and *cultural issues*.

Cegles (1998) conducted an international study of emerging issues affecting distance education research and practice in higher education. The three-round Delphi study, which included administrators, researchers, and support-services personnel, produced fifteen issue categories:

- Learner-support and student-related issues;
- technological advancements, convergence, and appropriate application;
- staff-development and professional-training issues;
- curricular/instructional design and delivery of distance education;
- quality-assurance issues;
- alternative-teaching and learning strategies, models, and/or systems;
- collaborative partnerships, linkages with business, industry, and education (interinstitutional and geographical);
- access to distributed learning and teaching (student, institutional, and geographical);
- evaluation methods and outcomes effectiveness;

- leadership and management issues in distance education reengineering;
- administrative, policy-related, and legislative issues (e.g., copyright, intellectual-property rights);
- costs, fees, funding resources, and capital-investment issues;
- convergence of traditional and distance education;
- mass production, commodification, and globalization of distance education;
- continuous, formalized further-education issues (lifelong learning).

Yap (1996) identified program benefits and implementation barriers in her report on the Pacific Northwest Star Schools partnership for distance education. The Satellite Telecommunications Education Programming Network in Spokane, Washington joined with five northwestern states to offer telecast courses for over 6,000 students in more than 500 middle schools and high schools. In a survey of 440 superintendents and building administrators, five implementation-barrier categories were identified: *lack of equipment and support*; *scheduling difficulties*; *program costs*; *instructional concerns* (e.g., interactivity, motivation); and *training and technical assistance*. These frameworks are described by Dooley, Metcalf, and Martinez (1999); Galusha (1997); Hopkins (1996); Lehman (1998); Merrill et al. (1992); and Sherry (1996).

The Framework for the Current Study

We also reviewed the framework of Gellman-Danley and Fetzner (1998), which addresses the issues of planning and policy development for distance education programs and provides a framework of seven policy-development areas: *academic, fiscal, geographic, governance, labor-management, legal*, and *student-support services*. These seven areas were listed as examples, but were not claimed to be an exhaustive list of policy areas. Berge selected this framework as a base for further research because it was believed to be more comprehensive in scope than the other frameworks reviewed. Berge (1998) surveyed instructors who teach online to investigate the barriers they encountered. He then attempted to match the barriers mentioned by the participants to the seven key issues identified by Gellman-Danley and Fetzner (1998). Only 28% of the participants' responses seemed to fit within their categories, so Berge added two new categories to the framework: *technical* and *cultural*.

Later, Berge and Mrozowski (1999) conducted an extensive literature review regarding barriers to online teaching in elementary, secondary, and teacher education, using the revised nine-policy

framework for the analysis. The primary areas of concern cited in the literature were *academic*, *cultural*, and *technical* issues. Secondary areas of concern were *labor-management* and *fiscal* issues. There was little or no mention of *geographic*, *governance*, *student-support*, or *legal* issues. Next, Berge and Mrozowski performed a content analysis of seventy-two chapters from a four-book series entitled *Wired Together: Computer-Mediated Communication in K–12* (Berge and Collins 1998). This content analysis revealed a set of concerns similar to those categories derived from the literature, in that the Berge (1998) framework was able to be used to categorize the barriers found in the content analysis.

Each of the specific barriers identified through the content analysis described above and through the literature review was carefully considered. Barriers that were judged to be the same or very similar were combined. The final result was a list of sixty-four specific barriers that were written as individual survey items. (See the survey online at <http://cgi.umbc.edu/cgi-bin/dharley/misc/barrier_survey.pl>.) The following section describes more fully the survey procedures.

Sample Research and Methodology

Berge developed the survey items—sixty-four barriers to distance education—from a review of literature, from previous survey work (Berge 1998), and from content analyses of selected case studies (Berge and Mrozowski 1999). Berge then conducted two rounds of beta testing using paper-and-pencil versions of the instrument that were administered to selected members of the target population (n > 50). Revisions were made before the final version of the survey was released on the World Wide Web. The survey was programmed to be accessible using standard Web browsers. It was designed so that, as each respondent completed and submitted the survey, the response was captured in an output file that could relatively easily be converted to SPSS (Statistical Package for the Social Sciences). Respondents were asked to rate each of the sixty-four barriers on a 1–5 scale (no barrier to very strong barrier, respectively).

To announce this survey, we sent individual e-mail messages to personal acquaintances; to thousands of individuals collected from participation lists and membership lists gathered over the years from educational technology, distance education, and training conferences, workshops, seminars, and professional organizations; and to a wide variety of electronic mailing lists in which the topic of discussion was believed to be related to education, distance education, and

technology-enhanced learning. The announcement included background information regarding the survey, provided the perspective taken, and asked for volunteers to complete the online survey regarding barriers to distance education. Given this selection process, it is nearly impossible to accurately estimate rate of return.

Data were collected between June 1999 and January 2000. Those subgroups—such as university students and persons working in elementary and secondary schools—that were found to be underrepresented in the early stages of data collection (June to December 1999) were specifically targeted in the latter stage of data collection (mid-December 1999 to January 2000). As of February 1, 2000, 2,530 surveys were collected. After data cleaning, 2,504 valid surveys remained and were analyzed using SPSS.

Of the 2,504 survey respondents, 1,276 worked in higher education, 448 in corporate or business organizations, 375 in community colleges, 129 in government, 126 in middle or secondary schools, 117 in nonprofit organizations, and 33 in elementary schools. The job functions of the respondents included 1,150 teachers or trainers; 648 managers, directors, department chairs, or principals; 346 support staff; 167 higher administrators such as dean, provost, vice president, or superintendent; 102 researchers; and 91 undergraduate or graduate students. Respondents worked in a broad range of content areas, including education (33.0%), business (16.8%), health sciences (10.2%), humanities (8.6%), engineering (4.8%), behavioral sciences (4.6%), physical sciences (2.6%), humanities (1.0%), and "other" disciplines (18.5%).

The primary distance learning delivery systems being used by respondents included Internet- or Web-based computer conferencing (1,462); print-based systems (286); videoconferencing or desktop videoconferencing (269); CD-ROM or multimedia (177); audiotape or videotape (123); ITV (118); audioconferencing or audiographics (35); EPSS (Electronic Performance Support System) (32); and radio (2).

Analysis

We conducted a common-factor analysis—using the generalized least-squares extraction method and applying Kaiser's criterion of eigenvalues of 1.0 or greater—to determine the underlying structure of the data. Because we found no previous studies suggesting the existence of any specific uncorrelated factors, and because nonorthogonal factors may better represent the reality of barriers to distance education, Oblimin rotation was used. Therefore, some of

the factors obtained through this analysis are correlated. This could pose some problems if the factors were used as independent variables in a multivariate analysis. However, our plans for further analysis of the data would utilize these factors as dependent variables only.

The factor analysis of the sixty-four barriers to distance education resulted in ten factors that accounted for 52% of the overall variance. Table 1 shows the variables loading on each of the ten factors. A cutoff for statistical significance of the factor loadings of 0.30 was used, according to guidelines presented by Hair et al. (1995) for larger-sample sizes (n > 350).[1] Seven of the sixty-four variables loaded significantly on two factors, with the secondary loadings having a relatively low value ranging from .307 to .380. However, to obtain a parsimonious solution, only the larger loading for each variable would be used to determine which set of variables comprises a particular factor.

Table 1. Factor Analysis of Barriers to Distance Education

Barrier	1	2	3
Lack of partnerships/consortia agreements	.516		
Full-time equivalent issues	.510		
Technology fee	.494		
Tuition rate	.491		
Lack of transferability of credits	.464		
Lack of ongoing credibility of program	.445		
Local, state, or federal regulations	.440		
Revenue sharing with departments or business units	.426		
Difficulty competing with new distance learning (DL) business models	.396		
Lack of money to implement DL programs	.340		.307
Traditional academic calendar/schedule hinders DL	.304		
Organizational resistance to		-	

change		.724	
Lack of shared vision for DL in organization		-.722	
Lack of champion for DL in organization		-.640	
Lack of strategic planning for DL		-.555	
Difficult to convince stakeholders of DL benefits		-.498	
Lack of knowledge/support for administration		-.465	
Slow pace of implementation		-.433	
Lack of "right" people to implement DL		-.381	.317
Lack of identified need		-.348	
Lack of colleague knowledge/support of DL		-.336	
Difficulty keeping up with technological changes			.527
Lack support staff to help with course development			.517
Lack of technical support			.504
Lack of technology-enhanced classrooms/labs/infrastructure			.461
Lack of personal technological expertise			.452
Lack of DL training provided by organization			.357
Lack person-to-person contact			
Disrupts traditional social organization of classroom			
Quality of course/program, students, or learning			
Concerns with evaluation, testing, assessment, outcomes			
Faculty compensation,			

incentives, workload, tenure, etc.			
Increased time commitment (course development, training, etc.)			
Lack of grants for DL			
Perception that computers may replace teachers			
Faculty feel job security is threatened			
Fear of technology			
Threat to instructors' sense of competence, authority			
Copyright and fair use issues			
Lack of policy concerning intellectual property rights			
Legal issues (computer crime, hackers, piracy, viruses)			
Lack of research supporting effectiveness			
Lack effective evaluation for courses/programs			
Lack adequate student access or equal access concerns			
Lack of adequate instructor access to DL			
Lack of advisement for DL students			
Lack of library access or materials delivery			
Lack student services (admissions, financial aid, etc.)			
Inability to monitor identity of DL students			
Difficulty recruiting faculty			

or students			

The following fourteen variables fell below the 0.30 factor-loading cutoff and were not included in any factor:

- existing union contracts;
- competition with on-campus courses, or for existing students;
- service area limitations or restrictions;
- lack of parental involvement;
- information overload;
- isolation felt by instructors;
- problems with vast distances or time zones;
- lack of acceptable-use policy;
- lack of professional prestige for distance learning;
- ethical issues;
- accreditation issues;
- language barriers across cultures;
- cultural issues (lack of bias-neutral technology);
- difficulty managing distance learning classrooms.

Identifying the Factors

The goal of this exploratory analysis was to identify constructs that organize barriers to distance education. Although the Berge and Mrozowski (1999) framework contained nine categories of barriers and served as the theoretical foundation for the survey used and reported here, this factor analysis produced ten factors. Exhibit 1 shows an analysis of the overlaps concerning this framework and the factors found in the current study.

Review of the barriers that loaded on each factor yielded the following factor names or proposed constructs:

1. *Administrative structure:* Managing distance learning programs through the existing administrative structure can be problematic. Partnerships among different units within an organization or among different organizations require agreements on fiscal issues such as costs, tuition and fees, and distribution of revenue, as well as scheduling and issuance of credits.
2. *Organizational change:* Organizations are resistant to change. Without a shared vision for distance learning, a strategic plan, and key players within the organization who are knowledgeable and supportive of distance learning,

implementing a distance learning program is a slow and difficult process.

3. *Technical expertise, support, and infrastructure:* It is difficult to keep pace with technological change. Many instructors lack the knowledge and skills to design and teach distance learning courses, yet their organizations lack support staff to assist with technical problems, to develop distance learning course materials, or to provide distance learning training. The technology-enhanced classrooms or laboratories and the infrastructure required to use them may not be available.

4. *Social interaction and program quality:* Participants in distance learning courses can feel isolated due to lack of person-to-person contact. But some people are uncomfortable with the use of student-centered and collaborative learning activities because they change the traditional social structure of the classroom. There are concerns about the quality distance learning courses, programs, and student learning. Testing and assessment of student outcomes is also a concern.

5. *Faculty compensation and time:* Distance learning courses require a greater time commitment, so faculty compensation, incentives, and release time are important issues. Lack of grants to fund distance learning projects is also a problem.

6. *Threat of technology:* Some educators fear that an increase in the use of distance learning technologies may decrease the need for teachers. Feeling intimidated by technology may also threaten an instructor's sense of competence or authority. Either or both of these psychological factors may lead a teacher to feel that his/her job security is threatened.

7. *Legal issues:* The increasing use of (in particular) the Internet to deliver distance learning raises concerns about copyright, fair-use policies, piracy, intellectual-property rights, and problems with hackers and viruses.

8. *Evaluation/effectiveness:* There is concern over a lack of research supporting the effectiveness of distance learning as well as a lack of effective evaluation methods for distance learning courses and programs. (The issue of accreditation for distance learning programs also correlated with this factor, although it did not meet the cutoff of 0.30.)

9. *Access:* Many students lack access to necessary hardware, software, or the Internet, or there are concerns over equal access to courses offered via newer technologies such as Web-based instruction. Instructors also lack access to the necessary equipment and courses.

10. *Student-support services:* Provision of student services such as advisement, library services, admissions, and financial aid is a critical facet of any distance learning program. There are

also concerns about how to monitor the identity of distance learning students (such as determining that the person who registered for the class is the person taking the online examination or doing the work).

Discussion

It can be seen from the literature review that there are many ways to categorize barriers. In addition, some specific barriers can be placed in more than one category within a particular theoretical framework (see Table 1). For example, the barrier *intellectual-property rights* may be considered to fall within both the *legal* and the *labor-management* categories of the Berge and Mrozowski (1999) framework.

To date, the frameworks that have been used in the literature have no quantitative basis. The number of categories used, and the degree to which specific barriers are combined or grouped, has been through qualitative analyses. The ten constructs revealed through this factor analysis provide a solid starting point for developing a quantitatively based framework of barriers to distance education. However, given that the framework derived here is relatively general, specific sites or populations may wish to conduct their own factor analyses, possibly using the instrument here or a modification of it.

Most of the barrier constructs identified through this exploratory factor-analytic study were also identified in some of the theoretical frameworks reviewed in this article. These commonalities lend strength to the validity of the ten constructs found in this study.

Exhibit 1. Overlap of Factors with Literature Review

- Administrative structure is similar to Cegles' (1998) *collaborative partnerships*, and Berge and Mrozowski's (1999) *governance*.
- Organizational change is similar to Cegles' (1998) *leadership and management issues*, and Berge and Mrozowski's (1999) *cultural issues*.
- Technical expertise, support, and infrastructure is discussed in Leggett and Persichitte's (1998) *resources*, *expertise*, and *support*, Yap's (1996) *lack of equipment and support*, and Berge and Mrozowski's (1999) *support*.
- Social interaction and quality is addressed in Cegles' (1998) *quality assurance issues.*

- Legal issues match Berge and Mrozowski's (1999) *legal issues*, Merrill's et al. (1992) *legal issues*, and Cegles'(1998) *administrative, policy-related, and legislative issues*.
- Evaluation/effectiveness is addressed in Cegles' (1998) *evaluation methods and outcomes effectiveness*.
- Access matches Leggett and Persichitte's (1998) *access*, and Cegles' (1998) *access to distributed learning and teaching*.
- Student-support services is discussed in Rezabek's (1999) *institutional barriers*, Cegles' (1998) *learner-support and student-related issues*, and Berge and Mrozowski's (1999) *student-support issues*.

The factors *faculty compensation and time* and *threat of technology* were items mentioned in the discussion of some of the frameworks, but were grouped under larger headings. Interestingly, these two items were important enough to stand alone as factors in this study.

Future Analysis and Research

This factor analysis is a first step in the analysis of the data gathered in this survey. The data will be combined to create factor scores that will be used as dependent variables. The six demographic variables (workplace, job function, type of delivery system used, expertise regarding distance education, the stage of the respondent's organization with regard to capabilities in delivering distance education, and the area in which the respondent primarily works) will be used as independent variables to determine how they affect the barriers perceived. Due to the very large data set obtained (more than 2,500 participants), it will be possible to analyze the barriers perceived by many different subgroups of the survey.

Data is still being collected using the online survey. It may be possible to compare the newer data to the original data set to confirm the findings of this study or to look for differences. A follow-up survey could be sent to the entire pool of participants to look at changes over time. Because survey studies raise so many new and interesting questions that the data cannot answer, it may be fruitful to conduct a quantitative or qualitative follow-up with a select sample of the original respondents.

The model developed in this study accounts for 52% of the variance in the data. The ten categories identified here probably do not represent completely the constructs that comprise barriers to distance education. Further research is needed both to validate the

findings of this study and to identify additional constructs that would account for a greater proportion of the variance.

Finally, as we worked with the responses to this large dataset, it became clear that there was an inherent bias in the original survey toward a faculty perspective. There is need for future research concerning barriers to distance education from the student perspective. For instance, the literature involving student dropout rates (Cookson 1989; Cookson 1990) should be considered.

Note

1. The authors realize that 0.30 is not the most conservative cutoff that could be used. Reasons for deciding on this cutoff are mainly threefold. First, this is an exploratory factor analysis, and the factors found using the methodology presented here are reasonable based on the literature and our experience. Secondly, given an $n > 2,500$ responses, it seems unlikely that the weaker factors we included are random noise. Finally, it is common practice in educational, exploratory research using factor analysis to use the cutoff value of 0.30.

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