Typology of teacher perception toward distance education issues – A study of college information department teachers in Taiwan ☆

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Abstract

The popularity of distance education has grown rapidly over the last decade in Taiwan's higher education, yet many fundamental teaching–learning issues are still in debate. While teacher–student interaction is a key success factor in distance education, little work has been done on the teachers. The intent of this research was to clarify teacher's perceptions on key distance education issues and to develop a discernible typology of different groups of teachers based on their perceptions. Because there may be a gulf between teachers and the technology used in distance education, the target of this study was teachers in information related departments in Taiwan's colleges, who were more familiar with current technology. Factor analysis and cluster analysis were used to derive the typology. Five higher-level issue constructs emerged from the factor analysis: learning effect, customization, administrative challenges, geographic and resource integration, and instructional design challenges. Four groups of teachers, namely the skeptics, the optimists, the mild-promising group, and the outlier, were identified using cluster analysis of teachers' perceptions on these five higher-level issue constructs. The profiles of the four groups of teachers were summarized and implications were discussed, which should provide useful insights to the policy makers of higher education on distance education decisions.
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Keywords: Distance education; Teacher's perception; Factor analysis; Cluster analysis

1. Introduction

Prompted by the radical changes in telecommunication technology of the last 30 years, distance education has gone through several evolutionary transformations, from text correspondence to programmed instruction with audio/visual aids such as tapes, radio, broadcasting or satellite television, and personal computers, to the

flourishing development of e-learning on the Internet (Simonson, Sweeney, & Kemis, 1993). Today, the Internet and the World-Wide-Web have become the predominant media for distance education, especially in the well-developed countries that offer degrees at bachelor's, master's and doctorate levels. (http://www.degree.net). Despite the debate over the quality of Web-based education (Institute for Higher Education Policy, 1999), more and more higher level education institutions offer credit and non-credit courses via the internet because of increasing educational costs, lifestyle choices by many adult learners, and strong competitive pressures (Arenson, 1998; Mcgorry, 2003).

With the gaining popularity of e-learning in distance education, many issues remain for practical implementation. The biggest concern has been the question of whether distance education produces the same or even better learning outcomes than the traditional methods (LaBay & Comm, 2003; Miller, 2001; Russell, 1999). Although some studies did show equivalent performance (Dellana, Collins, & West, 2000; LaBay & Comm, 2003; Mehlenbacher, Miller, Covington, & Larsen, 2000), they also implied that online learning was not for everyone. For instance, Mehlenbacher et al. (2000) pointed out that reflective and global learners performed significantly better online than active and sequential learners. Mixed student satisfaction toward the distance education has also been an issue in addition to class performance (Stewart, Waight, Norwood, & Ezell, 2004; Vamosi, Pierce, & Slotkin, 2004). More critically, Frankola (2000) indicated that between 20% and 50% distance learners dropped out of the online classes due to the following seven reasons: students' lack of time, lack of management oversight, lack of motivation, problems with the technology, lack of student support, individual learning preferences, poorly designed course, and substandard/inexperienced instructors. The issue of high student-dropout rates was highlighted by Xenosa, Pierrakeas, and Pintelas (2002) and Moody (2004) as a global concern.

Teachers played an important role in the success of distance education (Gibson, Tesone, Hodgetts, & Blackwell, 2001; Lin, Young, Chan, & Chen, 2005; Wiesner, 2000), especially those in higher education (Croy, 1998; Haas & Senjo, 2004). Addressing the question raised by Shoemaker (1998) on the leadership of distance education in higher education, Irlbeck and Pucel (2000) identified five common elements requiring leadership, including quality of education, planning, implementation, resources, and support. Teachers and government policies have significant influences on all these five elements. Berge, Muilenburg, and Haneghan (2002) also suggested that teacher issues were the highest ranking barriers to a successful distance education program. Teachers have been reported to have problems with distance education because of the extra work on classroom material conversion (Lee, 2002), difficulty to gauge student learning (Motiwalla & Tello, 2000), and the lack of teacher–student interaction (Arbaugh, 2005; Ausserhofer, 1999; Gibson et al., 2001; Wiesner, 2000). However, as can be seen in the abundant literature on the effect of distance education, the majority of data were drawn from the learners' perspective instead of the teachers' (Carr, 2000; Everetts, 1998; Gibson et al., 2001; Hailey, Keith, & Hult, 2001). Although some teachers' viewpoints could be found in these literatures, since the authors were also teachers, we found very little full-scale empirical research done to collect the teacher's side of the story. Existing literatures on this respect were limited to small-scale qualitative studies (see Broady-Ortmann, 2002; Haas & Senjo, 2004; Lao & Gonzales, 2005) or studies toward a certain artifact (such as Woods, Baker, & Hopper, 2004).

Croy (1998) once pointed out that "it is faculty who bear primary responsibility for the impact of distance technology in higher education, and there is currently a wide gulf between faculty attitude and this technology". Blignaut and Trollip (2003) were aware of this lack of teacher studies and had developed a taxonomy of faculty participation in synchronous learning environments. Howell, Saba, Lindsay, and Williams (2004) presented seven strategies for university administrators and faculty for deploying their own strategic plan to ensure program success. These strategies included: (1) enabling colleges and departments to accept more responsibility for distance education activities; (2) providing faculty more information about the distance education programs and activities; (3) encouraging faculty to incorporate technology into their traditional classrooms; (4) providing strong incentives for faculty to participate in distance education; (5) improving training and instructional support for distance education faculty; (6) building a stronger distance education faculty community; and (7) encouraging more distance education scholarship and research.

Unfortunately, these seven strategies were merely general descriptions, and did not offer specific links to applicable groups of teachers with different motivations, perceptions or experiences. There was still a void in the understanding and description of teachers in terms of their overall attitude toward distance education.

We believe this kind of information is important for school leaders in their strategic decision to effectively invest in distance education (Shea, Motiwalla, & Lewis, 2001), to minimize teacher resistance, and to encourage innovation (Irlbeck & Pucel, 2000). Therefore, the intent of this research was to clarify teacher's perceptions on key distance education issues and to develop a discernible typology of different teacher groups based on their perceptions. To reduce possible ''noises'' caused by unfamiliarity with the technology on the teachers' part, the target of our study was limited to teachers in information related departments in Taiwan's higher education institutes. Taiwan's distance education is briefly introduced below before presenting the research methodology for this study.

2. Distance education in Taiwan

Distance education programs could date back to the 19th century. Since then, pioneers in UK and USA have continued to re-invent new generations of distance education (Williams & Nicholas, 2005), and have offered to the world online bachelor's, master's and doctorate degrees. These well-developed countries set good examples for developing countries such as Taiwan to follow. To set the stage for this study, the information and communication technologies (ICT) infrastructure and needs of Taiwan's distance education were described in this section along with outstanding issues.

Taiwan's government began its own National Information Infrastructure (NII) project in June 1994 after the US government initiated its NII project in 1993 (Chen, 2003). As of February 2005, it was estimated that over 13.8 millions of people go online in Taiwan, which was about 60% of the Taiwan's 23-million population. In addition, 54% of Taiwan's households used broadband to access the Internet. In World Economic Forum's global information technology 2004–2005 report, Taiwan was ranked 15th in the world in terms of network readiness (Schwab, 2005). Because of the high percentage of Internet population, applications such as electronic commerce (EC) and e-government services were popular and common practices in Taiwan (Taiwan Network Information Center, 2005). Taiwan's e-government was ranked first by Brown University (West, 2005) and 7th by Waseda University (Waseda University of e-Government, 2006). On the EC side, Taiwan's ability to support and promote digital business and ICT services was ranked 22nd among 65 major economics countries in the 2005 white paper published by Economist Intelligent Unit (2005). These data showed that Taiwan's ICT infrastructure was very competitive in the world, and should have been more than adequate for distance education.

The need for distance education in Taiwan could be seen from its development in three phases. In 1986, National Open University (NOU, http://www.nou.edu.tw), the first higher education institute in Taiwan to offer distance education and continuing education to adults, was established. NOU originally delivered multimedia learning contents via television and radio broadcasting, and started its internet-based classes in 2002. In September 1994, the NII team coordinated the Ministry of Education (MOE) to build an experimental high speed network platform for testing real-time multicast, virtual classroom and curriculum on demand systems in five Taiwan's national universities. In 1996, real-time multicast distance education was commonly operating in Taiwan's higher education institutes (Chen, 2003). In 1998, many Taiwan's universities began to develop Internet-based distance education programs founded on the successful MOE project. Examples of large-scale implementations could be found in National Sun Yat-sen Cyber University (http://cu.nsysu.edu.tw/) and National Taiwan University Online Courses (http://nol.ntu.edu.tw/guest/).

In terms of degrees via distance education, NOU has been the only channel offering bachelor degrees and is currently experimenting with the master's degrees. Since the establishment of NOU, 280 thousand adult students had participated in NOU programs, however, only 25,000 of them had earned their bachelor degrees. In terms of real-time multicasting, it mainly offered credits for general elective courses across universities. At the same time, online programs provided by individual universities were mainly for non-degree programs or courses-for-credit programs toward a future degree. The MOE in Taiwan had heavily regulated these developments from the start. Taiwan had over 150 higher education institutes to serve the population of 23 millions. The fact that only NOU offered degrees via distance education did not meet the demands of adult learners in Taiwan on distance education.

Facing the pressure of the World Trade Organization (WTO) to open Taiwan's education market, MOE has gradually loosened its tight grip on Taiwan's higher education in order to achieve global competitiveness.

The old regulation by MOE set a limit on the number of credits earned through distance education toward a degree in Taiwan's higher education institutes; only up to one third of the total graduation requirement were admitted for degree programs (Ministry of Education, 2001). Because of this limitation, many university leaders in Taiwan were constrained in their investment and promotion in distance education and thus fell behind their main Asian competitors such as China and South Korea. Recently, MOE has announced a loosening of this regulation from one third of total credits to one half, and to lift the limitation altogether on continuing education programs for K1–K12 teachers, management, and other domains related to Taiwan's industrial development (Ministry of Education, 2005). This presents a great opportunity as well as challenges for Taiwan's distance education.

Taiwan has a special competitive advantage in language in the greater Chinese-speaking market. Although some well-developed countries such as the US and the UK are expanding their distance education markets to Asia where education value is emphasized traditionally, Taiwan has not seen a great impact thanks to the MOE regulation and the inadequate English proficiency level of local students. The poor English proficiency level had prevented the majority of Taiwanese students from taking imported distance education programs or courses delivered in English. This, however, presents a great opportunity to Taiwan's distance education providers. They are in the position to fulfill local market demands and potentially the demands of the greater Chinese-speaking communities around the world in distance education.

Taiwan's ICT infrastructure is very competitive in the world, and its ICT services in e-government and EC are prosperous. However, the preparation of higher education institutes for distance education is not quite ready due to a long history of constraining policy by the MOE. With the regulations relaxing, school leaders in higher education institutes are no longer constrained by uncontrollable policy impacts on their leadership (Irlbeck & Pucel, 2000). Consequently, faculty issue becomes the next critical theme in the leadership elements for distance education leaders (Irlbeck & Pucel, 2000). After two decades of lukewarm development and haphazard implementation, it is especially important to understand the mindset of these faculties who stand at the front line of the battle to compete on distance education.

3. Methodology

Because there was no existing typology of teachers in the distance education literature which had presented very diverse views through the development of distance education, this study took an exploratory approach to generate a typology of teachers on various distance education issues. This was done by designing a survey of current distance education issues to collect data from target teachers, and using statistical tools of factor analysis and cluster analysis to categorize responding teachers on a set of issue dimensions derived from the data. The methodology is described in full detail below.

An extensive literature review, which included major research papers or reports from 1997 to 2003, was conducted to uncover issues related to distance education. As a result, two basic issue categories emerged from the review. The first was the concerns of the learning effect produced by distance education, such as its ability to facilitate teaching performance and learning outcome, characteristics which enable customization and individualization of learning, and its ability to integrate learning resources and environment. The second category was the concerns related to the implementation and school administration of distance education, such as its cost to implement, its ability to affect the competitive situation in the higher education market, and its ability to integrate structure within and among schools.

From the literature discussed above, a 30-item questionnaire was generated to collect teachers' perceptions of various distance education issues as shown in Table 1. Only those unique and important issues with at least two references were adopted as questionnaire items. These questions were measured with a seven-point Likert type scale ranging from 1 (extremely disagree) to 7 (extremely agree). Demographic data of teachers such as education background, training, type of affiliation, age, gender were collected through the same questionnaire, as well as their willingness to accept and to use distance education as an instructional alternative. The questionnaire was pre-tested with four teachers, and was modified according to their feedback. The initial Cronbach's α was 0.965 for the 30-item perception survey, which demonstrates a high reliability. The final version of the questionnaire takes about fifteen minutes to complete.

Table 1
Questionnaire items and references

No.	Question description	References
1	Distance education is important in crossing over the restraint of geography	Owston (1997), Gladieux (2000), Raab et al. (2001)
2	Schools are compelled into distance education due to the educational tendency and learners' needs	Harris (1999), Chassie (2002), Pahl (2003)
3	Distance education makes it easier for schools and teachers in providing learners a personalized learning environment	Tien (2000), Wallace and Wallace (2001), Tsai and Tseng (2002)
4	Distance education raises the competitive capacity of the school	Jain (1997), Jonhendro et al. (2002)
5	Distance education effectively integrates teaching resources	Harun (2001), Geueke and Stausberg (2003)
6	Distance education effectively matches the choices between the schools and the learners	Hillesheim (1998), Ubell (2000)
7	Distance education increases the flexibility of schools in making teaching strategies	Hillesheim (1998), Welle-Strand and Thung (2003)
8	Distance education produces better learning results than traditional teaching	Latchman et al. (1999), Louvieris and Lockwood (2002), Welle-Strand and Tjeldvoll (2002)
9	Distance education provides basic teaching as well as the fun of learning	Pison (1997), Jonhendro et al. (2002)
10	Distance education boosts learners' learning interests	Jonhendro et al. (2002), Khalifa and Lam (2002)
11	Distance education rapidly delivers knowledge and information to learners	Vaupel and Sommer (1997), Chassie (2002)
12	Distance education lowers learning opportunity cost in the learning	Pison (1997), Raab et al. (2001), Ubell (2000)
13	The rise of distance education gradually replaces traditional teaching	Owston (1997), Hartnett (1999), Carver et al. (1999)
14	Distance education accelerates the imitation between schools	Jerman-Blazic (2000), Thiriet et al. (2002), Raab et al. (2001)
15	Distance education changes the current competition terms of education market	Hillesheim (1998), Raab et al. (2001), Welle-Strand and Thung (2003)
16	Distance education promotes the school's service-oriented culture	Hillesheim (1998), Boone and Ganeshan (2001)
17	Distance education tailors for the learner and offers the requested content as well as the information	Latchman et al. (1999), Unruh (2000)
18	The value of distance education lies in its capability to integrate technology into teachings	Starr (1998), Peterson (2001)
19	Distance education develops mutual understanding between teachers and learners	Starr (1998), Jonhendro et al. (2002), Liber et al. (2000)
20	Distance education boosts the teacher's teaching performance	Raab et al. (2001), Blignaut and Trollip (2003)
21	Distance education helps to understand learners' individual preferences	Tan and Teo (1998), Kabassi and Virvou (2004)
22	Distance education helps lower regional competition of schools by extending into global market	Hailey et al. (2001), Jonhendro et al. (2002), Raab et al. (2001)
23	Distance education promotes information exchange between schools	Scollin and Tello (1999), Raab et al. (2001), Thiriet et al. (2002)
24	Distance education fails to protect intellectual property rights of the knowledge	Ubell (2000), Kennedy (2002), Syed (2001)
25	Distance education presents a time-consuming issue in preparing teaching material	Croy (1998), Peterson (2001), Pahl (2003)
26	Distance education demands flexible learning contents	Syed (2001), Kabassi and Virvou (2004)
27	Distance education environment construction is not easy	Fosay (1998), Rogers (2000), Konstantopoulos et al. (2001)
28	Distance education is difficult to mimic face-to-face teaching	Latchman et al. (1999), Carr (2000), Shapiro et al. (2002)
29	Distance education presents a difficulty in supervising the class condition	Odin (1997), Hazari and Schnorr (1999), Syed (2001)
30	Distance education is a long-term investment strategy	Ubell (2000), Raab et al. (2001), Carr (2001)

Because of the educational infrastructure in Taiwan, college teachers who were affiliated with information related departments had more opportunities to experience learning technologies and possessed a better understanding of the impacts of technology on the learning environment. They were also most likely to lead or participate in distance education projects in their schools. We had selected them as the target population of this investigation. The questionnaires were sent to a random sample of 400 teachers in the information management or information technology department of 150 universities, institutes of technology and junior colleges listed in the MOE in Taiwan.

Segmentation of teachers' perception of distance education issues was achieved through factor analysis and cluster analysis (Hair, Anderson, Tatham, & Black, 1998). Factor analysis was used to dissect teachers' overall perception into a few revealing dimensions by extracting the underlying factors from the question items. These dimensions (factors) represented a higher-level construct of teachers' perception on distance education issues. Factor analysis produced a factor score for each case on each dimension. These standardized scores now represented teachers' perceptions on the higher-level constructs. Cluster analysis was then performed using these factor scores as clustering variables. Segmentation was then determined using the most appropriate clustering results.

4. Findings

The findings are briefly described in the order of teacher profile, factor analysis, and cluster analysis below.

4.1. Teacher profile

A total of 80 teachers responded to the survey. After discarding 3 incomplete ones, 77 questionnaires were entered into our analysis, yielding a final response rate of 19.25%. Technically speaking, the case to variable ratio of 3.57:1 (77 cases versus 30 variables) in our study fell below the recommended general rule of thumb of at least 5:1 for an adequate factor analysis as suggested in Hair et al. (1998). However, 3.57:1 was higher than the 2:1 ratio suggested by Cattell (1988), and the 1:1 ratio suggested by Baggaley (1982). Roberts, Gibson, Rainer, and Fields (2001) also supported Cattell's and Baggaley's claims with evidences of existing references such as Abdul-Gader and Kozar (1995) and Essex et al. (1998).

The descriptive statistics of teacher profile were summarized in Table 2. Briefly speaking, the majority of responding teachers were male, between the age of 31 and 45, and holding a Ph.D. degree. Over 62% of them were trained in information related fields but without formal training in educational methods. More than 75% of teachers served in private universities or colleges while nearly 25% served in public universities or colleges. Eighty percent of respondents said that they accepted the notion of using distance education, while a little more than 85% said that they were willing to try distance education as an alternative teaching method. In general, characteristics of respondents in terms of gender, age, education level, educational method training, and school affiliation met the overall image of the target teachers in Taiwan with a higher percentage of Ph.D. holding males in their 30s and 40s.

From both the technical and analytical view, the representativeness of the respondents was considered adequate. However, caution is advised in generalizing the results of this study to all teachers in higher education institutes because the sample was limited to information-related faculty.

4.2. Factor analysis

Kaiser–Meyer–Olkin (KMO) test for sampling adequacy and Bartlett's test for sphericity were used to first examine the suitability of selected variables for the factor analysis (Bryman, 1989). As seen in Table 3, KMO test resulted in a 0.873 value that was greater than the suggested minimum value of 0.5 for adequacy, and Bartlett's test also demonstrated a very good sphericity ($\chi^2 = 1637.91$, df = 437, $p < 0.000$). These tests indicated that the 30 variables were suitable for the following factor analysis.

Factor analysis was used to extract the principal components of teachers' perception on the 30 distance education issues. Only those extracted factors with eigenvalues bigger than one were selected. In the end, a total of five factors emerged which together explained 69.78% of the total variance. Varimax with Kaiser

Table 2
Teacher's profile

Gender: ($n = 77$)	
Male	56 (72.7%)
Female	21 (27.3%)
Age: ($n = 77$)	
⩽25	2 (2.6%)
26–30	12 (15.6%)
31–35	16 (20.8%)
36–40	23 (29.9%)
41–45	18 (23.4%)
>45	5 (7.7%)
Course training in education: ($n = 75$)	
Normal college or university	8 (10.7%)
Credits from education courses	5 (6.7%)
None	62 (82.6%)
Willing to try distance education: ($n = 77$)	
Yes	66 (85.7%)
No	11 (14.3%)
Degree: ($n = 77$)	
Ph.D.	53 (68.8%)
Master	23 (29.9%)
College	1 (1.3%)
Major: ($n = 77$)	
Information	48 (62.3%)
Information related	21 (27.3%)
Non-information	8 (10.4%)
School affiliation: ($n = 77$)	
Private	58 (75.3%)
Public	19 (24.7%)
Accept the concept of distance education: ($n = 77$)	
Yes	62 (80.5%)
No	15 (19.5%)

Table 3
KMO and Bartlett's test for factor analysis

Kaiser–Meyer–Olkin measure of sampling adequacy		0.873[a]
Bartlett's test of sphericity	Approx. χ^2	1637.91
	df	437
	p-Value	0.000[b]

[a] >0.5 minimum suggested value.
[b] Level of significance.

Normalization was applied to ensure the extracted factors were distinct from each other. Question items 2, 4, 6, 12, 14, and 18 were dropped from the analysis due to their low factor loadings on every extracted factor. Table 4 shows the result of the factor analysis. Each factor was named to reflect a common higher level construct of those questions that loaded on the same factor. Factor one included 9 question items with regard to issues of learning effect, which resulted in a high Cronbach's alpha of 0.9359. Four question items in relation to the customization issues made up the second factor, with a Cronbach's alpha of 0.8177. The third factor included 5 question items concerning administrative challenges of distance education, with a Cronbach's alpha of 0.7762. Three questions with respect to the ability of geographic and resource integration constituted the

Table 4
Factor analysis results

Factor		Question number	Cronbach's alpha
1	Learning effect	13, 9, 20, 19, 16, 8, 10, 11, 21	0.9359
2	Customization	26, 27, 17, 22	0.8177
3	Administrative challenges	25, 24, 29, 15, 30	0.7762
4	Geographic and resource integration	1, 3, 5	0.7783
5	Instructional design challenges	28, 23, 7	0.7269
	Overall		0.9467

fourth factor, with a Cronbach's alpha of 0.7783. The fifth factor had a Cronbach's alpha of 0.7269 and was composed of three question items regarding instructional design challenges. Cronbach's alpha of the overall 24-item questionnaire remained high at 0.9467.

4.3. Cluster analysis

K-mean cluster algorithm was then applied to obtain four distinct segments for teachers, which were further named according to the final cluster center position on each of the five factors identified earlier (see Table 5). As seen in Fig. 1, the four segments for teachers were: (1) cluster one: the skeptics, (2) cluster two: the optimists, (3) cluster three: the mild-promising group, and (4) cluster four: the outlier.

(1) *The skeptics:* Teachers in this cluster were not convinced of the learning effect of distance education. Although they did not swing one way or the other on the issues of customization and administrative challenges, they did appear to be a little unsure about the ability of using distance education to integrate

Table 5
Final cluster centers

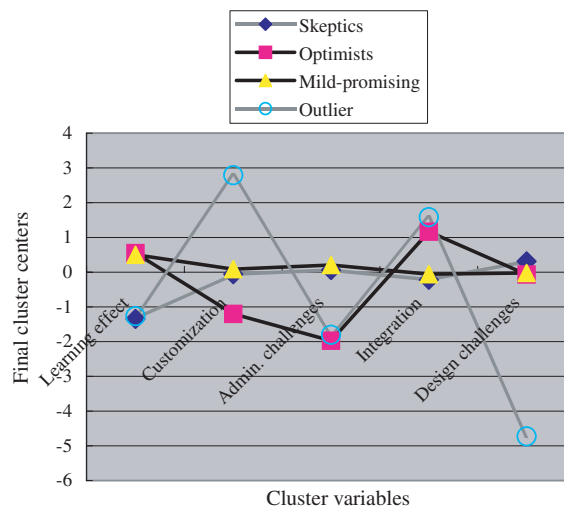|	Cluster			
	1	2	3	4
Learning effect	−1.34699	0.55038	0.49910	−1.26603
Customization	−0.05939	−1.20376	0.08656	2.79220
Administrative challenges	0.06095	−1.97469	0.20506	−1.80373
Geographic and resource integration	−0.21837	1.16464	−0.05957	1.58256
Instructional design challenges	0.31234	−0.06815	−0.02309	−4.72857

Fig. 1. Segmentation of teachers' perception on distance education issues.

learning resources or to break geographic boundaries. They were also aware of the instructional design challenges brought forward by using distance education. Twenty teachers or 26% of total respondents belonged to this segment. They evenly spread across all age groups and between public and private schools. Among them, 80% were male, 50% held a Ph.D. degree and 80% majored in information. However, a great majority (90%) of them had not received any course training in education at all. Although 70% of teachers in this group were willing to try distance education, only 55% of them accepted the concept.

(2) *The optimists:* Though a smaller group, these teachers were stronger believers and supporters of distance education. They disagreed with customization and administration challenges issues, and were impressed with the geographic and resource integration ability of distance education. They were positive on distance education's learning effect, and did not think much about the instructional design challenges. Five teachers were in this group representing 6% of total respondents. They belonged to the higher age groups of above 36–40, and were affiliated with private schools. Among them, 60% were male. Interestingly, only 20% of them held a Ph.D. degree, and 50% of them had obtained course training in education. In terms of their major, 40% of them were in information and another 40% in information related fields. All teachers in this group accepted the concept and were willing to try distance education.

(3) *The mild-promising group:* This group reflected the majority perception. They mildly agreed with the learning effect of distance education, but did not hold strong opinions on all the other issue dimensions. There were 51 teachers in the segment, representing 66% of the respondents. They fell between the age groups of 31–45, and were affiliated with private schools. Among them, 71% were male, 78% held Ph.D. degrees, but 82% had had no course training in education. Only 10% of teachers in this group did not major in information or related fields. A high 88% of teachers accepted the concept of distance education and a higher 90% were willing to try it.

(4) *The outlier:* There was one teacher who held extremely strong opinions on all issue dimensions and could not be grouped with any other teachers. So this respondent was classified as an outlier.

5. Discussions and implications

Three themes worthy of further discussion emerged from our analysis of teachers' perceptions on distance education issues in Taiwan. The first is a lack of competitive awareness on the teachers' part regarding the distance education environment. Second, the data showed a high percentage of teachers holding promising views on the development of distance education in Taiwan. Finally, the study revealed a substantial percentage of skeptic teachers whom should not be ignored in the decision and implementation of successful distance education programs. Discussions and implications were provided below for each theme.

5.1. A lack of competitive awareness

The result of the factor analysis produced five higher-level constructs of distance education issues similar to our initial conceptualization from the literature review. The foremost concerns that teachers had in their mind were the ability of distance education to influence learning and teaching outcomes, since that was the most important part of a teacher's role. Though separated from the learning effect factor, issues of customization and instructional design challenges ultimately led to the quality of distance education, and were indeed two very distinct constructs compared to traditional education. Other factors such as administrative challenges and geographic and resource integration were within our conceptual expectation on the implementation and school administration side. The only surprise was the issues regarding distance education's ability to affect the competitive situation in the higher education market, which did not converge under the data structure of the responses from this sample. It was possible that teachers just did not care enough about these competitive issues since they were not at the position to make school competitive decisions.

This surprise might have been the result of the previous experience of a constrained distance education development under the MOE regulations which had impeded school leaders in Taiwan to clearly see its future and to effectively implement strategies. Under the regulations, many of the investments or actions by school

leaders were regarded as unrealistic and were resented by many teachers. With the recent MOE deregulation, school leaders can now better envision the role of distance education in their institutes for adoption decisions and implementation strategies. Very soon, schools will be forced to build appropriate ability of distance education to promote their competitive position in higher education market, and to consider proper evaluation of the returns or the critical success factors of distance education. We believe that teachers' lack of awareness on the competitive issues will improve in the near future.

5.2. A high percentage of promising teachers

Except for a small group of optimists, it appeared that most teachers were wary of the major issues regarding distance education and were unsure how these issues might play out in the future. The largest segment of teachers took a neutral position on all issue dimensions except for the learning effect dimension to which they expressed mild support. Teachers in this group would be the easiest to convert to proponents of distance education since they had not formed strong opinions one way or the other.

The combined percentage of the promising group and the optimists group reached 72% of total respondents, which implied that the school leaders had a good chance to rally enough support from teachers once implementation and promotion of distance education started. We believe that the high percentage of promising group was the result of a positive influence from previous experiences of distance education pioneers in countries such as the US and the UK. For these groups who believed in learning effect, we suggest school leaders to consider the following strategies offered by Howell et al. (2004) to further enhance their support for distance education: (1) enabling colleges and departments to accept more responsibility for distance education activities, (2) encouraging faculty to incorporate technology into their traditional classrooms, (3) building a stronger distance education faculty community, and (4) encouraging more distance education scholarship and research.

5.3. A substantial percentage of skeptic teachers

The fact that more than a quarter of the respondents were skeptics was alarming. These teachers were not sure of the customization and administration challenges brought forth by implementing distance education, nor did they care much about distance education's ability to integrate resources. Moreover, they questioned distance education's ability to produce quality education and learning outcomes.

School policy makers should be aware that it might take a lot of effort to motivate the skeptics of distance education. More conclusive and positive evidence of the learning effect from distance education was required to win this group over. It was also possible that this group of teachers lacked appropriate training in the design and use of distance education, or that they simply did not acquire any positive experience from participating in a distance education project. Two possible remedies for the skeptics are offered below.

5.3.1. Increasing the percentage of teachers with course training in education

Comparing teacher profile items, "course training in education" seemed to mark the most significant differences between the skeptics, the mild-promising, and the optimists. In our sample, there were only 10% of the skeptics and less than 20% of the mild-promising teachers who had acquired course training in education, while over 50% of the teachers in the optimists group had done so. Unlike K1–K12 teachers in Taiwan, teachers in higher education institutes were allowed to teach without basic training in education-related subjects. We believe enhancing teachers' knowledge and experience in educational theories and practices could be an effective way to influence their attitude toward distance education. Accordingly, increasing the percentage of teachers with course training in education by offering more distance education related courses to teachers and encouraging teachers to take courses in teaching and education might be a direction for school administration to focus on.

5.3.2. Building dedicated support for teachers lacking experience or knowledge in distance education

Teaching resources centers were established in many of Taiwan's higher education institutes, and were especially emphasized by schools with successful distance education programs. Teaching resources centers

in many schools played important roles in providing training courses or activities to promote distance education. As a solution for the skeptics, schools might also dedicate teaching resources centers to the support for teachers lacking distance education experience or related resources. This could be done by providing individual consultation to teachers and encouraging participation in new distance education projects.

Howell et al. (2004) offered similar strategies which were applicable in converting the skeptics. These included (1) providing faculty more information about the distance education programs and activities, (2) providing strong incentives for faculty to participate in distance education, and (3) improving training and instructional support for distance education faculty. The taxonomy of faculty participation in synchronous learning environments developed by Blignaut and Trollip (2003) can also be a useful resource for school policy makers.

We had little to learn from the one teacher in the outlier group, except that there is bound to be outliers in every issue. The implication of this outlier group is that policy makers better prepare themselves for noises in the process of all decision-making.

6. Conclusion

The above discussion and implications should be referenced in light of some limitations of this study. The first research limitation was the case-to-variables ratio of 3.57:1, which was lower than the 5:1 general rule of thumb, although we had found evidences that claimed lower ratios to be acceptable (see Baggaley, 1982; Cattell, 1988; Roberts et al., 2001). The second limitation was the generalizability of this study which was limited to Information-related teachers. Because Information-related teachers had historically been one of the key driving forces behind distance education in Taiwan, the results might have represented a more favored view toward distance education among all teachers. In other words, it may take school leaders of higher education institutes additional efforts and time than what the results of this study might have indicated to successfully bring all the teachers on board on the issues of distance education.

Due to the recent de-regulation by Taiwan's MOE, Taiwan's higher education institutes are facing a new challenge on distance education strategies. A clear understanding of the composition of teachers in these perception groups is important for schools' policy makers to form better directions and decisions when implementing distance education. Researchers and developers of distance education technology should also be aware of these different groupings of users. Additional studies are recommended to extend the research on teachers' perceptions to their overall attitude (e.g., willingness to use distance education), their need for educational technology, technical assistance and training support, and a comparison with students' perceptions on these issues.

Acknowledgements

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