

THE ORGANIZATIONAL INNOVATION ENVIRONMENT, SELF-DIRECTED LEARNING, COURSE DESIGN STRATEGIES, TECHNOLOGY FACTORS, AND THE PERFORMANCE OF WEB-BASED TRAINING—AN EMPIRICAL ANALYSIS OF THEIR INTERRELATIONSHIP AMONG TAIWANESE SMALL AND MEDIUM ENTERPRISES

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ABSTRACT

This study attempts to analyze the cognition of small and medium enterprises (SMEs) to how the four critical success factors (CSF), the organizational innovation environment, self-directed learning, course design strategies, and the technology factors, affect the performance of Web-based Training (WBT). Besides its current situation and future development on WBT for SMEs in Taiwan and what kind of WBT being more feasible for them are also fully discussed.

In conclusion the results, based on a survey to those SMEs, which have obtained the primary performance in WBT, indicate that there are significant interrelationship between the performance of WBT and the four CSFs mentioned ahead.

Keywords: Organizational innovation environment, self-directed learning, course design strategies, technology factors, performance of the Web-based training, Web-based training, small and medium enterprises

INTRODUCTION

The World Wide Web (WWW) and Web-based technologies have dramatically changed how training is delivered in corporations, government agencies, educational institutions, and other organizations (Ellis, Wagne & Longmire 1999). Especially, the Web-based Training (WBT) has now become a new trend for training among the small and medium enterprises (SMEs) because of the considerable advantages that it brings—such as increased productivity, continuous traced learning, cost saving, and so forth.

The Institute for Information Industry, a major computer science research organization of Taiwan, estimates that the market of Taiwanese online learning will increase 113 per cent in 2001, and by 2004 its market will reach US\$ 87 million. Besides, more and more SMEs have considered introducing this kind of new training method into their business firms in the near future.

However, people will find that only a few of Taiwanese SMEs have actually adopted the newest learning method although WBT owns so many advantages and its market is continuous growth every year. This is because Taiwanese SMEs are inexperienced in the practical manipulation as well as insufficient in related research. Most notably, the research on what factors will affect the performance of WBT is one of the most important issues that

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seriously concern SMEs.

Based on these reasons, this study is trying to explore how the four critical factors—the organizational innovation environment (OIE), self-directed learning (SDL), course design strategies (CDSs), and the technology factors (TFs) affect the performance of WBT. Meanwhile, the current situation and its development on WBT for SMEs in Taiwan and what kind of WBT is more feasible for them are also fully discussed.

LITERATURE REVIEWS

In designing, developing, and implementing WBT, SMEs will face a number of challenges they would not normally have to address in developing traditional training approaches. For training developers and users alike, WBT experiences may not look like or work like training experiences that people already know. Some people may object to online training by saying that it is not as good as what they have experienced in the classroom. One of the more significant challenges will be to alter any of the negative perceptions about online training that exists in organizations. This can be accomplished by focusing on the unique characteristics of WBT, describing how online training can complement an overall performance support program, and effectively addressing areas of concern. To do so, organizations will need to consider the following general issues.

The rationale for introducing WBT to SMEs

Many writers have noted the benefits of WBT. Wilson (1999) suggests that these benefits include cost saving, increased productivity, no fear, fun, and continuous traced learning. Gayeski (1998) thinks that many of the problems of conventional training and job aid approaches, such as difficulty of updating, cost of distribution and duplication, challenges in scheduling training and finding necessary content, and barriers to providing just-in-time information are now much easier to overcome.

Whalen and Wright (2000) suggest there are both qualitative and quantitative benefits for learners training to use WBT. Qualitative benefits include the following:

- Convenience to employees in terms of training location and use of familiar technologies;
- Access to expert instructors regardless of geographic location;
- Added value to the learning experience through the interactivity of technology-assisted instruction; and
- Increased learners' access to training due to the elimination of scheduling restrictions and the reduced costs of training delivery.

Apart from cost savings, calculated as a return on investment, quantitative benefits related to learning efficiency and retention include the following (Ciancarelli 1998):

- Faster (by 60%) learning curve;
- Higher (by 25-60%) content retention;
- Greater (by 56%) learning gains;
- Better (by 50-60%) consistence of learning; and
- Faster (by 38-87%) training comprehension.

Ellis et al. (1999, p. 20) suggest that the advantages of WBT are different with those classroom-based training and their differences are shown as table 1.

TABLE 1
Comparative Advantages

Web-based Training	Classroom-Based Training
<ul style="list-style-type: none"> • Addresses learning at the individual level. 	<ul style="list-style-type: none"> • Addresses learning in a group context.
<ul style="list-style-type: none"> • Can be designed for use anytime and anywhere 	<ul style="list-style-type: none"> • Must be schedule for a time and a location.
<ul style="list-style-type: none"> • Maximizes connections among learners and resources. 	<ul style="list-style-type: none"> • May be limited by resources physically present.
<ul style="list-style-type: none"> • Can be designed to be learner-driven at a pace that corresponds to an individual's learning style. 	<ul style="list-style-type: none"> • Moves at a pace set by the group.
<ul style="list-style-type: none"> • Can be used at the trainee's job site, as time is available. 	<ul style="list-style-type: none"> • May require travel and time away from the trainee's regular job.
<ul style="list-style-type: none"> • Makes it possible to access resources quickly and easily at any time through online search engines 	<ul style="list-style-type: none"> • Content is tied to the classroom setting or to predetermined, prepared materials.
<ul style="list-style-type: none"> • May require less of an investment in on-site instructors. 	<ul style="list-style-type: none"> • May require a significant investment in training personnel to deliver training.
<ul style="list-style-type: none"> • Does not require additional physical space 	<ul style="list-style-type: none"> • Requires physical space.
<ul style="list-style-type: none"> • Connects learners in diverse locations 	<ul style="list-style-type: none"> • Addresses participants only in the same physical space.
<ul style="list-style-type: none"> • Enables immediate implementation of new learning 	<ul style="list-style-type: none"> • Implementation of learning can be overridden by crises at hand.
<ul style="list-style-type: none"> • Facilities seamless connection between training and performance support. 	<ul style="list-style-type: none"> • Training and performance support are more likely to be approached as separate efforts.

The important concept of self-directed learning (SDL) to WBT

Peter Drucker (1999) point out, the concept of SDL will produce an important influence to those knowledge workers of enterprises. Besides, many scholars and experts emphasize that WBT is one kind of training that is highly depended on the learners' concept of self-directed and self-paced learning (Chang 2000; Chang 2001; Derryberry & Gomberg 1998; Kilby 2001; Song 1998).

Song (1998) also suggests self directed and motivated attitudes of learners' are fundamentally required in order to fully utilize the resources on WBT and it is surely a challenge to the learners themselves, as well as the instructors. Ellis et al. (1999) indicate 'many course design issues are relevant to traditional computer-based training approaches, but the Web enables

learners to access huge arrays of training option and requires them to be more self-directed than did earlier approach.' Hence, SMEs must be able to understand that if their organizations cannot put the SDL concept into a serious consideration, they cannot obtain a superior performance in WBT.

The significant relationships between the organizational innovation environment (OIE) and the performance of WBT

Using the WWW and Web-based technologies to train employees rises and develops in recent years among Taiwanese SMEs. Nevertheless, WBT is a new technology and a new concept for some SMEs so not all enterprises can accept this new technology easily.

In other words, their organization must have better innovation atmosphere if their organization wishes to have a better performance in all respects (Amabile, Conti, Lazenby & Herron 1996; Oldham & Cumings 1996; Bailyn 1985; Donnelly 1994; Kanter 1983).

Based on the above ideas, people can know that only organizations possess the better OIE, and then those people who have so-call technophobia in their organizations will not resist WBT. Eventually, organizations can obtain a good performance in WBT. Hence, the OIE can be seen as one critical factor when SMEs want to implement WBT in their enterprises.

Course design strategies (CDSs) to WBT

Ellis et al. (1999) mentions that identifying appropriate learning materials for online delivery is one of the most difficult challenges facing a trainer. Most trainers find it easier to develop content to test knowledge of demonstrable tasks than of other tasks. Nevertheless, rapid developments in Web technologies open a new menu of possibilities for delivering content.

WBT challenges many long-held assumptions about training and course design because of the nature of the medium. How do people design courses that motivate and engage learners in environments that involve little or no interaction between the learners and an instructor or among several learners? Many course design issues are relevant to traditional computer-based training approaches, but the Web enables learners to access huge arrays of training options and requires them to be more self-directed than did earlier approaches. Consequently, WBT course design requires a learner-centered approach to design and development.

The role of technology factors (TFs) in WBT

Traditional training approaches are much less dependent on organizational hardware and software than are Web-based programs (Ellis et al. 1999). Now it is critical that training specialists understand the basic technical details about an organization's computer and network infrastructure. This means knowing about the operating systems, the Web browsers in use, the computer equipment's hardware specifications, and the network capacity.

Developers of WBT often have state-of-the-art hardware, the most recent browsers and operating system, and other high-end and expensive equipment, but you cannot assume your users will possess this same level of functional sophistication. In managing the development of an online training resource, one must consider the constraints placed on the end product by the users' equipment and software. Failure to consider those essential ingredients can greatly

affect the functionality and appearance of a WBT site.

In view of above, Chang (2001) proposes organizations need to consider the following technology factors: (1) technology compatibility; (2) technology complexity; (3) technology maturity; (4) technology acceptability; and (5) technology support, if they want to obtain a better training performance.

As to the technology, compatibility means that organizations must think about the compatible problem when they want to introduce new system into their organizations. The technology complexity means that the technology is too difficult to operate in organizations. The technology maturity means that organizations have insufficient capability to carry out this new system. The technology acceptability means that not only the organizations but also the users can accept this new technology easier. Finally, technology support means that organizations must have very good supporting systems to help users to solve they problems when they use WBT.

METHODOLOGY

Sample

For reaching research goals, research will employ a questionnaire investigation method to those 350 Taiwanese SMEs listed in the bureau of SMEs of Taiwan who have successfully implemented WBT and obtain preliminary training performance.

Eventually, out of all questionnaires, 268 SMEs return their questionnaires and a 76.5% response rate is achieved.

Research hypotheses

Research categorize the hypotheses into the following five portions:

H1: The OIE positively influence the performance of WBT.

H2: The SDL positively influence the performance of WBT.

H3: The CDSs positively influence the performance of WBT.

H4: The TFs positively influence the performance of WBT.

H5: The four variables, OIE, SDL, CDSs, and TFs positively influence the performance of WBT.

Research framework

According to above research hypotheses, the framework of this research are depicted as Figure 1.

Questionnaire design

Regarding to the questionnaire's design, research mainly consult the Chiou's (2000) Creative Organizational Climate Inventory Scale (COCIS), the Guglielmino's (1977) Self-Directed Learning Readiness Scale (SDLRS), the Chang's (2001) WBT Course Design Scale (WBTCDS), Technology Factors Scale (TFs) and Chang's (2001) Training Performance Evaluation Scale (TPES). Besides, questionnaires are using Likert's five-scale evaluation method to test the respondents' recognition to those questions in questionnaires.

Data validity and reliability

A successful questionnaire depends on respondents' perceptions that the questionnaire can

assess their knowledge accurately. The questionnaire of this research has done a pre-test before all questionnaires issue to all potential respondents. That is to say that this research has owned an appropriate validity.

Besides, a reliability assessment of this questionnaire was also carried. The Cronbach's coefficient alpha for the total scale is 0.82 and every single variable is over than 0.7 indicating that the scale is adequate for the study

TABLE 2
The Reliability Analysis of Questionnaire (Cronbach α)

Variable dimensions	Before standardization	After standardization
Organizational innovation environment	0.9170	0.9173
Self-directed learning	0.8484	0.8580
Course design strategies	0.8343	0.8229
Technology factors	0.7231	0.7249
Performance of WBT	0.9502	0.9506

Source: this research

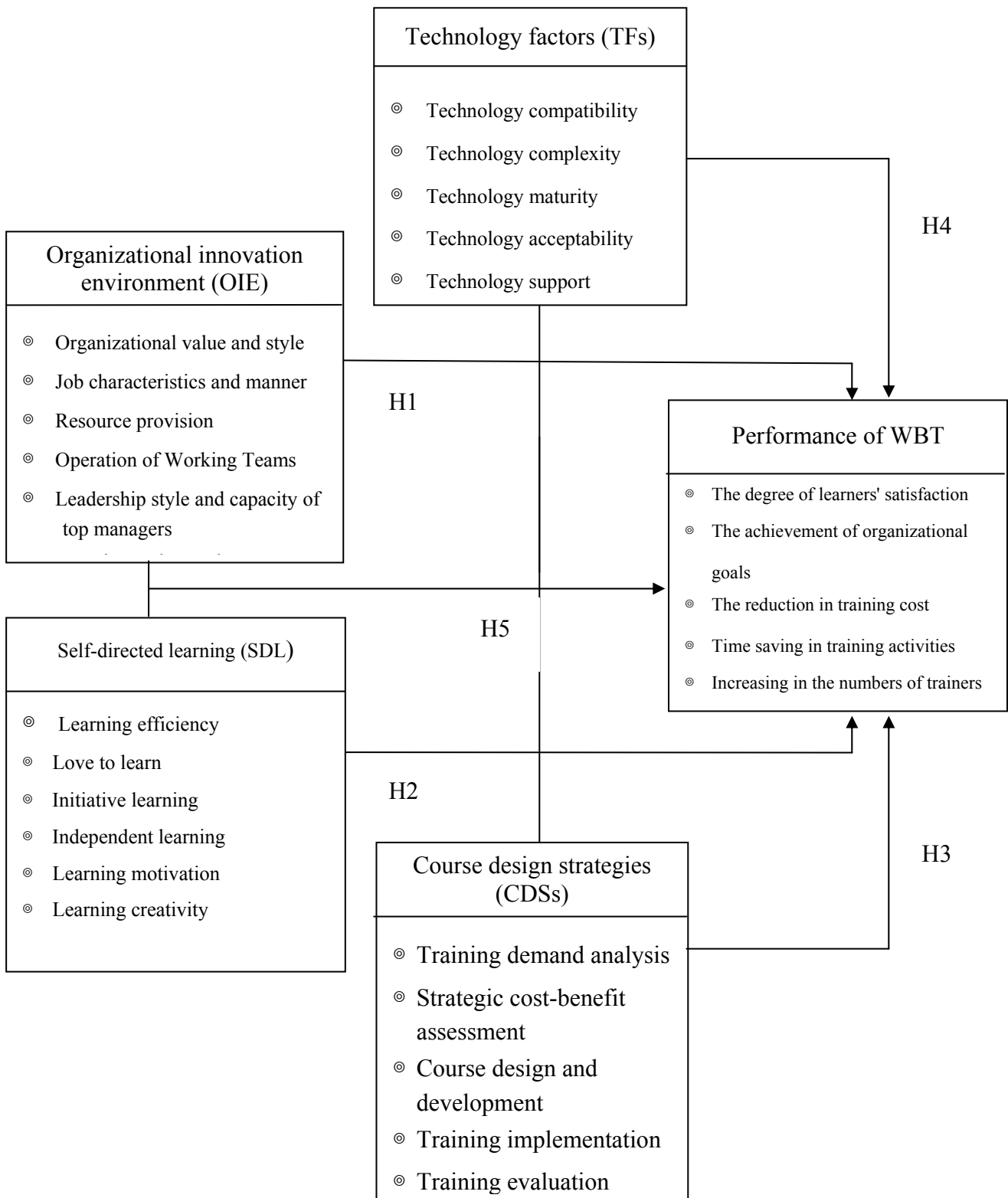


FIGURE 1
Research Framework

RESULTS AND DISCUSSIONS

The current situation and development of WBT for SMEs in Taiwan

After the statistical analysis, research finds that the current situation and development of WBT for SMEs in Taiwan can be categorized as follows:

1. 92 per cent of respondent trusts that the WWW and Web-based technologies have dramatically changed how training is delivered in SMEs even though it is still a low percentage (below 20%) of SMEs to adopt WBT.
2. 83 per cent of SMEs are expected to design, develop, and manage WBT initiatives even when they have little or no idea of what is involved in such activities.
3. 87 per cent of respondents think that seed instructors who are proficient in course design and technology support are obviously insufficient in current SMEs. This will lead to WBT not being promoted and propagated promptly. Hence, respondents propose that SMEs must consider a good solution to solve this issue in the near future.
4. 93 per cent of respondents reveal that their organizations have not enough budgets to invest in the course design and development. However, a limited budget does not necessarily mean that their organizations have to settle for an inferior WBT program.
5. 90 per cent of respondents point out that most people who participate in WBT are self-motivated. With this increase people believe that this training experience will make learning easier and that learning will lead to better performance.
6. 85 per cent of respondents think that few people have all the skills and knowledge necessary to succeed at every task involved in a WBT program—nor should they have to be able to do everything.

From the above perspective, people will understand that even though SMEs have a limit budget and unfamiliarity and inexperience in the practical manipulation of WBT, they still trust that WBT is a important tool for them in future training activities.

The partial correlation analysis for OIE, SDL, CDSs, and TFs to the performance of WBT

Four hypotheses (H1, H2, H3, H4) concerning the individual influence of OIE, SDL, CDSs, and TFs to the performance of WBT are tested by the Analysis of Variance and Multiple Regression Analysis.

As summarized in tables 3, 4, 5 and 6, the analytical results indicate that the OIE ($F= 39.226$, $P<0.001$, and Adjusted $R^2 = .4399$), SDL ($F= 41.276$, $P<0.001$, and Adjusted $R^2 = .6533$), CDSs ($F= 29.89$, $P<0.001$, and Adjusted $R^2 = .7501$), and TFs ($F= 47.226$, $P<0.001$, and Adjusted $R^2 = .501$) are independently significant influence on the performance of WBT. Meanwhile, they have highly partial correlation between each of them.

As to the order of correlation strength between each single variable and the performance of WBT are depicted as following equations:

1. The multiple regression equation between the OIE and the performance of WBT

The performance of WBT = $.182 \times$ Resource provision + $.171 \times$ Operation of working teams + $.137 \times$ Leadership style and capacity of top managers + $.136 \times$ Job characteristics and manner + $.121 \times$ Job

environment and atmosphere + .113 x Learning and growth + .102 x Organizational value and style

2. The multiple regression equation between the SDL and the performance of WBT
The performance of WBT = .213 x Learning efficiency + .201 x Love to learn + .157 x Learning motivation + .126 x Initiative learning + .111 x Independent learning + .105 x Learning creativity
3. The multiple regression equation between the CDSs and the performance of WBT
The performance of WBT = .301 x Training demand analysis + .191 x Strategic cost-benefit assessment + .133 x Training evaluation + .102 x Course design and development + .092 x Training implementation + .088 x Feedback and revision
4. The multiple regression equation between the TFs and the performance of WBT
The performance of WBT = .292 x Technology acceptability + .233 x Technology Support + .197 x Technology compatibility + .136 x Technology maturity + .101 x Technology complexity

TABLE 3
The Multiple Regression Analysis for OIE to the Performance of WBT (N=268)

Variables	Regression coefficients (β)
Resource provision*	.182***
Operation of working teams	.171***
Leadership style and capacity of top managers	.137***
Job characteristics and manner	.136***
Job environment and atmosphere	.121***
Learning and growth	.113***
Organizational value and style	.102***
R ²	.4501
Adjusted R ²	.4399
F	39.226

*p<0.05; **p<0.01; ***p < 0.001

TABLE 4
The Multiple Regression Analysis for SDL to the Performance of WBT (N=268)

Variables	Regression coefficients (β)
Learning efficiency	.213***
Love to learn	.201***
Learning motivation	.157***
Initiative learning	.126***
Independent learning	.111***
Learning creativity	.105***
R ²	.6601
Adjusted R ²	.6533
F	41.276

*p<0.05; **p<0.01; ***p < 0.001

TABLE 5
The Multiple Regression Analysis for CDSs to the Performance of WBT (N=268)

Variables	Regression coefficients (β)
Training demand analysis	.301***
Strategic cost-benefit assessment	.191***
Training evaluation	.133***
Course design and development	.102***
Training implementation	.092***
Feedback and revision	.088***
R^2	.7533
Adjusted R^2	.7501
F	29.89

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

TABLE 6
The Multiple Regression Analysis for TFs to the Performance of WBT (N=268)

Variables	Regression coefficients (β)
Technology acceptability	.292***
Technology Support	.233***
Technology compatibility	.197***
Technology maturity	.136***
Technology complexity	.101***
R^2	.533
Adjusted R^2	.501
F	47.226

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The Multiple Regression Analysis for OIE, SDL, CDSs, TFs to the performance of WBT

Table 7 shows that the construct, performance of WBT is specified as a criterion and the constructs, OIE, SDL, CDSs, and TFs, are specified as the predictor variables in the regression model. The analytical results reveal that the independent variables are significantly correlated ($F = 47.226$, $P < 0.01$ and Adjusted $R^2 = 0.67023$) and respondents think that the CDSs are the most important influence factors for SMEs when they implement WBT. Then the following factors are the SDL, TFs, and OIE. In other words, the SMEs will own a better performance of WBT if their organizations have better OIE, CDSs, and TFs as well as their learners having a better concept of SDL

As to the order of correlation strength between four variables and the performance of WBT can be depicted as the following equation:

$$\text{The performance of WBT} = .333 \times \text{CDSs} + .232 \times \text{SDL} + .212 \times \text{TFs} + .196 \times \text{OIE}$$

TABLE 7
The multiple regression analysis for OIE, SDL, CDSs, TFs to the performance of WBT (N=268)

Variables	Regression coefficients (β)
CDSs	.333***
SDL	.232***
TFs	.212***
OIE	.196***
R ²	.68333
Adjusted R ²	.67023
F	47.226

*p<0.05; **p<0.01; ***p < 0.001

In conclusion, as summarized in the above analysis, the performance of WBT is strongly affected by the OIE, SDL, and CDSs and TFs. This result completely coincides with what was hypothesized ahead.

Therefore, SMEs must put these critical factors into serious consideration when they want to carry out WBT in their organizations.

The more feasible WBT model for Taiwanese SMEs

Additional to the above analysis, the third portion of our questionnaire was trying to find out the more feasible WBT model for SMEs. Finally, by way of statistical analysis, research finds that more than 80 per cent of respondents think that the more workable WBT models for current SMEs can be depicted as follows:

1. Asynchronous training is more popular than synchronous.

Some training is difficult to use synchronous way to train employees due to hard to complete instruction by way of WBT. Besides, the cost of synchronous training is much higher than synchronous course and it is not something most SMEs can afford.

2. The way of e-mail is the best combination tool for WBT.

They think that the e-mail is the most suitable way for them to communicate in WBT due to it being convenient, rapid and inexpensive.

3. The basic training courses are better than the tough training courses.

Theoretically speaking, the basic courses with non-complex ways can attract more learners to participate than difficult courses. Based on this reason, this kind of course is worthy of SMEs to design more of, due to being able to produce the effect of scale of economy. In other words, the course design cost can be reduced due to much more learners participating.

4. The learning-centered instruction is more acceptable by learners

SMEs believe a learning program that ignores the learned-centered principles is less likely to be effective, particular for people who feel alienated or who see formal learning as either irrelevant or threatening.

CONCLUSIONS AND SUGGESTIONS

Conclusions

At this point, it is useful to ask what has been accomplished by this research.

First, there are very broad spaces for SMEs to adopt or implement WBT in the future.

Second, clear and definite data strongly suggest from those people who accept this investigation that the OIE, learners' concept of SDL, CDSs, and TFs are the CSF for SMEs when they wish to implement or adopt WBT.

Finally, this empirical study confirms that the asynchronous training, a way of e-mail communication, non-complex training course and learned-centered instruction are the most feasible ways for SMEs.

Hence, the SMEs must consider the all of the above findings if they want to implement WBT successfully.

Suggestions

It is important for decision-makers in SMEs to support WBT not only because it is cost saving with better return of investment rate, but also because WBT is a helpful mechanism to enhance employees' learning and performance. Managers with training professionals need to understand methodology of WBT and wisely determine in the markets which type of WBT can be suitable for their organizations.

As discussed above, there are several factors and efforts to take into consideration to take full advantages of WBT as a great resource of learning for individuals, as well as organizations. Integration of efforts by individuals, instructors, and management in the SMEs are essential to make WBT more helpful and effective as a prospective training mechanism.

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