Influential factors impacting on the implementation of e-learning: a perspective from technological education

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ABSTRACT: In the digital era, new competition has resulted from rapid changes in technology and the global economy. Most past studies have concluded that organisational advantages originate from external factors. After facing the challenges of the change of information technology and global economic competition, more studies have reflected on how to take advantage of internal circumstances. After employees enter the work market, they soon depart from the regular educational system. Due to the progress of technology and changes in the labour market's needs, school education can hardly match enterprises' human resource needs; therefore, enterprise training is becoming increasingly important. Consequentially, the development of technology must be followed and various learning methods adopted for enterprise training to maintain it as a long-lasting business and meet employees' learning expectations. The study is aimed at providing enterprises with some concrete suggestions and it is hoped that this may assist enterprises to build the concept of e-learning into training programmes and break through the traditional training paradigm to enhance electronic training efficiency and gain competitive advantages.

INTRODUCTION

Background and Motivation

Rapid developments in information technology (IT) have changed the living styles of human beings, enterprise management and social values, yet this has also made the dream of a *global village* come true and has transferred a national economy into a worldwide one. Although it brings pleasure, most of all, it creates some burden and challenges that need to be dealt with.

The main trends of economic styles nowadays are moving forward to global management, the application of the World Wide Web (WWW) and a knowledge-based economy. All of these elements focus on IT. The application of computers and the Internet changes school education and promotes e-learning for enterprises.

In addition, there are some new trends to be considered, which are described below.

New Competitive Advantage from Inner Enterprises

The concept of the learning organisation has been elaborated on since the 1990s. Theories that have attributed organisational advantage to outside factors meet with a great deal of challenges; many researchers have reconsidered the possibility of gaining competitive advantage from the inner part of an enterprise [1]. Simonin and Helleloid inferred organisational learning as important for building core knowledge and gaining persistent competitive advantages for enterprises [2]. Nevis et al regarded the organisation itself as a learning system, inclusive of learning styles and helpful learning factors [3]. In summary, the origins of competitive advantage come from both employee and organisational learning.

The Universality of the Internet

The universal rate of the WWW has reached 27% [4]. The population of surfing on the Internet in Taiwan has been rated highly at seven million, ranking it 11th place globally, and 4th place in Asia [4]. This shows that the acceptance and application of the Internet have advanced greatly, which means that Taiwan has been keeping up with the trends of the electronic era.

The Challenge of Imposing Training

In order to ensure the function of constant growth and management and to satisfy employees' learning expectations, the only way for enterprises to bring training into practice is via a correspondent development of information that is broadcast utilising Internet technology. This also involves applying multiple learning approaches in training so as to offer greater convenience and more effective educational training.

The Origins of Knowledge Management

Ever since the information revolution, knowledge management has made a tremendous impact on enterprises. Because knowledge can be considered a fortune in itself, knowledge is capital; knowledge will replace earth, human labour, capital and machine facilities in their traditional ways. It holds the key to success or failure in the enterprises.

In a knowledge-based economic system, information technology is the main source for producing knowledge. It can maintain the function of transferring knowledge, especially when applying to research and the developments or renewing of any technology. As a consequence, it has become the main source of power for obtaining and operating knowledge for enterprises, industry and, indeed, a nation's economy.

According to these new trends, the study presented here has assumed that the advantage provided by educational training, from the inner part, is the power that cannot be neglected in a competitive industry environment. In order to signify the effectiveness of training, a planning department should take the learning character of adults into account so that employees can effectively transfer their training.

Research Purposes

In this study, according to the research background and motivation, the researchers seek to understand the implementation of e-learning for enterprises in Taiwan, and to try to explore the needs and expectations of e-learning for both employees and organisations.

The concrete purposes of this study are listed as follows:

- Explore the implementation of e-learning for enterprises in Taiwan nowadays.
- Understand the motivation, needs and expectations of employees with regard to e-learning by examining their individual backgrounds.
- Understand the motivation, needs and expectations of employees concerning e-learning by measuring organisational attributes.
- Group learners so as to understand the relationship between different employee groupings and different e-learning implementations.
- Offer an adequate model to fit learners' multiple-learning needs.

LITERATURE REVIEW

E-learning: the New Trend in Training

The 21st Century is a fast changing era typified by brainstorming. This era is characterised by the *three Cs*: change, competition and complexity [5]. In order to cope with these changeable times, knowledge and life-long learning have become more important than ever. The root of consistent growth for enterprises involves personal continuing learning, while training is the main task for developing and enlarging the human resources [6].

Huang pointed out there are three main purposes that can be achieved by way of conducting training, namely:

- Accumulating technology and cultivating talent;
- Strengthening disability;
- Enhancing communication and promoting cooperation [7].

Huang and Wu urged that training itself is not an independent function; it should maintain a close relationship with management systems and functions [8]. Its importance for any organisation can be displayed through the following aspects: shaping an enterprise's culture, accelerating employee quality, promoting positive employee work habits and quality of life, and storing the managerial talent for the future.

Under the trend of nationalisation, globalisation and electronic information, many enterprises not only put forward transnational enterprises, but also try to adopt an *alternative workplace*. This so-called *alternative workplace*, sometimes also called the *virtual workplace*, is a workplace that is far from traditional work habits, locations and work styles. Rand claimed that information technology deeply influences every aspect of society and organisation [9].

There are five obvious developmental trends in training, including the management system of training, Web-based learning systems, interactive computer-assisted training, long-distance learning systems and electronic performance-assisted systems. Moreover, in order to trigger the motivation of learners and promote learning efficiency, Computer-Based Training (CBT) has become a type of teaching trend [10]. Due to the character of being able to be reached everywhere, the method of teaching over the Internet has gradually invaded into the domain of traditional teaching [11].

E-learning, to be simple, is type of Web-based learning, a brand-new manner of learning, which breaks through the obstacles of space and time. Its definition is that the organisation or enterprise helps employees to undertake training and provide the relative programmes or activities by way of access to the Internet or intranet, to promote their knowledge level and skills, and motivate their self-development. In turn, this then accelerates the advantage of organisational competitiveness and being able to attain consistent management.

As already mentioned above, the primary bottleneck for urging training in enterprises is the differences that exist between the cognition of employees and the expectations of the organisation. Therefore, without real meaning of training, this effect cannot be manifested. Judging from the condition of e-learning, the prime task is to understand their characteristics to effectively apply information technology and the Internet into an enterprise's training programme.

PERSONAL CHARACTERISTICS

Many research studies indicate that personality during adult period develops steadily, while age has only a little influence on personality. Therefore, the present study seeks to explore the relationship between employees' personality and e-learning by way of discussing patterns of personality.

Holland, who developed the *Vocational Preference Inventory*, first probed into the relation between occupation and personality [12]. He inferred that work satisfaction and quitting tendency depended on whether a person's interest was compatible with his/her occupation. Holland proposed six personality types, namely:

- The *realistic* type: People like to undertake their activities with more technique, vigour and have a focus on balance;
- The *investigative* type: People prefer mental activities concerning thinking, organising and understanding;
- The *artistic* type: People like to express themselves without any limitation from regulations;
- The *social* type: People like to participate in interpersonal activities and help others;
- The *enterprising* type: People prefer to persuade and influence others in order to gain power and privilege;
- The *conventional* type: People who like more orderly and straight activities with regulations [12].

On his hexagonal model, the shorter the distance between any two types, the greater their similarity or psychological resemblance is.

Most prior studies focused mainly on the relationship between learning effectiveness and personal characteristics [13][14]. These characteristics can be summarised within personality, such as vivid, integration, complexity, stability and uniqueness. It is hoped that the relationship between personality and e-learning can be enhanced through the stability and uniqueness of personal characteristics. Holland's six personality types have been applied to occupational interest in this study, integrating them with other researchers' opinions [12]. Holland's six types have been taken as the primary construction to explore employees' personality patterns [12].

METHODOLOGY

Research Framework

In this study, the authors have defined independent research variables as: experience in e-learning, educational background, marital status, workplace, number of employees and personal characteristics (ie realistic type, investigative type, artistic type, social type, enterprising type or conventional type). The survey research method was used to collect the data. The research framework is shown in Figure 1.
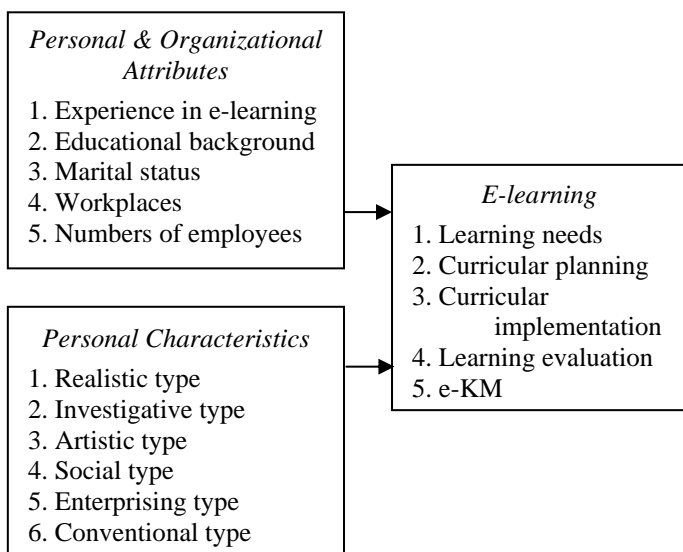

Figure 1: The research framework.

Research Hypotheses

According to the research purposes, the study assumed the following hypotheses:

- There are differences in employees' backgrounds in e-learning;
- There are differences in the organisational background in e-learning;
- There is a significant correlation between personal characteristics and e-learning.

Research Instrument

Four main elements were developed in the research questionnaire. The first part covered basic data, including the employee's personal background and the organisational background. Part 2 tackled e-learning. The third part covered organisational knowledge management, and was inclusive of knowledge collection, creation, storage, sharing, operation and evaluation. The last part concerned personality types, sorting them into realistic, investigative, artistic, social, enterprising, or conventional types, respectively.

Data Collection

The study targeted the top 2,000 enterprises referred to in the *Commonwealth Magazine* as its population. A convenience sampling method was adopted. Employees from every level and department were selected as subjects. The researchers tried to understand the relationship between the e-learning model and efficiency for employees who had never had contact with e-learning before. An attempt was also made to realise the expectations of e-learning through those who had prior contact with e-learning, and hence helped the organisation to implement e-learning in a more effective manner.

The study distributed 800 questionnaires by mail. The researchers distributed 800 copies of a questionnaire to different kinds of industries, including 90 copies to enterprises in the petroleum chemistry industry, 230 copies to companies in the semiconductor industry, 95 copies to mental and production firms, 188 copies to companies engaged in information and communication, as well as 197 copies to other industries (mobile, food, foraging, clothing, paper, pharmacy and finance).

In total, there were 465 questionnaires with valid response returned. This comprised 470 copies gathered, minus five copies that had too many missing answers. The valid response rate was 58.13%.

Data Analysis

In order to examine the research hypotheses, statistical software was employed as the instrument to analyse the research results. Therefore, after gathering the response questionnaires, *SPSS for Windows* was used as the analysis instrument. The main methods involved were descriptive statistical analysis, one-way ANOVA and Pearson correlation analysis.

FINDINGS AND DISCUSSION

Differences from Personal Attributes in E-Learning

With regard to contact experience, significant differences were found between those who had experience in e-learning and those who did not. Those who had no experience in e-learning took more consideration in curricula planning than those who did have experience (t=4.091, p<0.05). They held a high degree of expectations on e-learning. In other words, enterprises should think highly of curricula planning in advance for those employees who have no prior experience in undertaking an e-learning programme.

The results showed that there were differences detected in learning evaluation (F=3.022, p<0.05) concerning personal education. Because of a lack of autonomy, enterprises have to supply a ready-made evaluation model for those who have a lower educational background. Multiple teachings, flexible evaluation on learning and more cordial and harmonious

learning circumstances should be offered to those who have a higher educational background so as to encourage their motivation and promote training effectiveness.

It was found that the personal emphasis placed on learning needs and curricula implementation depended on employees' marital status. The study results indicated that unmarried employees emphasised curricula implementation more than those who were married (t=4.377, p<0.05). The reason for this may come from the differences in age. Those who are not married tend to be younger and have greater vigour towards their work. They actively engage in any activities inside and outside of companies. They like to exchange what they have learned from their work with their colleague in order to obtain new knowledge and to broaden their perspective and experiences.

Differences also existed with regard to the workplace. Those employees who worked at the firm's headquarters placed more value on learning needs and curricula implementation (t=6.954, p<0.01) than those who worked at the branch level (t=17.458, p<0.001). Most trainings scheduled by headquarters formed part of the reason for this. Employees at the head office expected training plans to keep improving staff skills and multiplied e-learning systems.

Differences in Organisational Attributes in E-Learning

Based on an analysis of the results, the degree of emphasis on learning needs was reliant on the number of employees (F=3.031, p<0.01). A company with 501 to 1,500 employees placed higher priority on learning needs than for firms with less than 500 employees. It also seems apparent that employees working in large sized enterprises expected a higher correspondence between both enterprise and personal career development, and to promote competitive advantage through learning and training.

The Relationship between Personality Type and E-Learning

There was considerable correlation found between curricula planning, curricula implementation, learning evaluation and the personality types of realistic, investigative, artistic, social and conventional. The results are shown in Table 1. Basically, people of realistic, investigative, artistic, social and conventional types thought highly of the above-mentioned variables in e-learning.

It was found that there were significant effects on e-learning effectiveness with regard to the attitude and motivation of employees with an investigative type of personality. Therefore, when implementing e-learning for the investigative type

employees, enterprises should focus on their special characteristics of analysis, curiosity, independence and creativeness.

With reference to employees who have conventional personality types, enterprises should arrange e-learning programmes according to these persons' characteristics of obligation, efficiency, realistic nature and lack of imagination and flexibility. Learning motivation made no difference in e-learning effectiveness. Therefore, when pushing through e-learning programmes for conventional types, enterprises need to direct the way and offer regulated circumstances, rather than to intrigue their attitude or learning motivation.

Judging from the perspective of encouraging motivation, curricula implementation had a noteworthy influence on the potential effectiveness for e-learning for employees with realistic personality types. It is suggested that enterprises should aim at their shyness, honesty, stubbornness, stability, obedience and realistic characteristics in order to help them undertake an e-learning programme and accelerate its effectiveness by way of encouraging their motivation.

As for artistic personality types, from the perspective of attitudinal motivation, e-learning effectiveness was deeply influenced by learning needs, curricula planning, curricula implementation, evaluation of learning reaction, and e-knowledge management. The evaluation of learning reaction also influenced e-learning potential effectiveness. With regard to encouraging motivation, it was found that learning needs, evaluation of learning reaction, and e-knowledge management had significant influences on e-learning effectiveness. Learning needs and e-knowledge management also significantly influenced potential e-learning effectiveness. These factors indicate that enterprises should emphasise the key characteristics of artistic personality types of employees, such as imaginative, idealistic, emotional, unrealistic, so as to trigger their value of learning needs, curricula planning, curricula implementation, evaluation of learning reaction, and e-knowledge management by way of evoking their attitudinal motivation. In addition, it also necessary to trigger learning needs, evaluation of learning reaction and e-knowledge management by encouraging motivation to promote e-learning effectiveness.

Regarding motivating the social personality type of employees, it was determined that evaluation of learning reaction had a significant influence on e-learning effectiveness. This means that enterprises should focus on the characteristics of being good socially, kindness, getting on well with others, and consideration in order to promote their evaluation of learning reaction and to promote e-learning effectiveness.

Table 1: Correlations between e-learning and personality type.

| | Research Variables | E-Learning | | | | |
		Learning Needs	Curricula Planning	Curricula Implementation	Learning Evaluation	E-Knowledge Management
Personality types	Realistic	0.059	0.157**	0.129**	0.115**	0.154**
	Investigative	0.105*	0.216**	0.155**	0.201**	0.165**
	Artistic	0.064	0.189**	0.100**	0.205**	0.150**
	Social	0.069	0.246**	0.197**	0.261**	0.187**
	Enterprising	0.065	0.197**	0.163**	0.154**	0.169**
	Conventional	0.020	0.105*	0.055	0.219**	0.024

*p<0.05 **p<0.01

It was found that learning evaluation had a great effect on e-learning effectiveness for enterprising personality types. The study indicated that it would be helpful to encourage employees of the enterprising personality type to value and operate learning evaluation in order to foster motivation.

CONCLUSIONS AND SUGGESTIONS

Promoting the E-Learning Method

Enterprises should base an evaluation of online learning needs according to the places that employees work. It would be inappropriate to push forward an e-learning model in operation at a firm's headquarter into every branch. The firm should make some adjustments according to the condition of branch companies and take into consideration the various factors to evoke employees' learning motivation. In addition, judging from the numbers of employees, e-learning programmes that match the needs of employees and enterprises should be supplied, and programme information forwarded to staff via e-mail.

Enhancing e-learning evaluation at enterprises should take employees' educational and marital backgrounds into consideration. Enterprises should play the role of director in e-learning courses for those personnel members who have lower educational background or are married. On the other hand, enterprises should play the role of supplier for those staff members who have a higher education background or are not married.

Enterprises should offer a fully shared channel for employees to facilitate e-knowledge management. In general, employees think of the Internet is the best way to share their viewpoints and experiences. Therefore, it is suggested that enterprises post some of their general programmes and organisational knowledge on the Internet so that employees can easily search and find information at any place and at any time.

Enterprise Internationalisation

Most enterprises in Taiwan have set up branches around the island and overseas. Therefore, promoting e-learning can breakthrough the limitations of space and time from the traditional trainings and arrange multiple educational trainings. To any internationalised enterprises, it is very important to promote e-learning which emphasise the design of correspondent to employee's individual differences, respect to multiple viewpoints, strengthening life-long education, and the spirit of organisational learning.

Personality Characteristics

Inflexible traditional training makes it difficult for enterprises to consider personality characteristics when practicing educational training. More costs are involved and more energy is required. In addition, the outcomes of educational training cannot be seen in a short space of time. Most enterprises are reluctant to take the risk. However, given the current trend of e-learning, the bottleneck that traditional training encountered will be gradually broken. Identifying how to cope with individual differences and offering e-learning models like a cafeteria will provide a new challenge for enterprises to facilitate e-learning.

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REFERENCES

1. Lee, H.H., A study on organizational learning strategy and core knowledge development of information technology in Taiwan. *J. of Technology*, 9, **2**, 139-150 (2000).
2. Simonin, B. and Helleloid, D., Organizational learning and a firm's core competence. *Competence-Based Competition*, 213-234 (1994).
3. Neivs, E.C., DiBella, A.J. and Gould, J.M., Understanding organizations as learning systems. *Sloan Management Review*, 36, **2**, 73-85 (1995).
4. Pan, S.K., Appraising the new institutional arrangements for privatization of Korean state-owned enterprises. *Inter. J. of Public Admin.*, 24, **5**, 423 (2001).
5. Chang, B.Y., The effective tool for administrator's education. *Vocation and Training*, 11, **2**, 17-22 (1993).
6. Liang, C.Y., On professional training for enterprises in the future circumstance. *Teaching Technology and Media*, 18, 44 (1994).
7. Huang, Y.C., *Human Resource Management* (3rd edn). Taipei: San-Min (1998).
8. Huang, Y.C. and Wu, J.M., The importance of training: from the perspective of win-win of enterprises and employees. *Vocation and Training*, 18, **3**, 6-9 (2000).
9. Rand, A., Technology transforms training. *HR Focus*, 73, **11**, 11-13 (1996).
10. Davis, D.L. and Davis, D.F., The effect of training techniques and personal characteristics on training end users of information systems, *J. of Management Info. Systems*, 7, **2**, 93-110 (1990).
11. Wu, C.I., Comparing Students' Learning Performance between Web-Based Teaching and Conventional Teaching: the Case of Word 2000. Thesis, Tan-Chiang University, Taiwan (1999).
12. Lee, C.F., Lee, Y.T. and Chao, M.F., *Organizational Behaviors* (6th edn). Taipei: Hua-Tai (1995).
13. Weng, C.W. (2000). A Related Study on Learning Effect and Personality of Industry Design Department Students. Thesis, Ta-Yeh University, Taiwan (2000).
14. Chiang, J.C. (2000). A Study on Factors of Learning Effect Under Web-Based Training Circumstance. Thesis, National Sun Yat-sen University, Taiwan (2000).

7th Baltic Region Seminar on Engineering Education:
Seminar Proceedings

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The very successful *7th Baltic Region Seminar on Engineering Education* was held between 4 and 6 September 2003 in St Petersburg, Russia, and was hosted by St Petersburg State Electrotechnical University, *LETI*. The papers cover a diverse scope of important and current issues currently facing engineering and technology education internationally; nevertheless, the Seminar still maintained a particular focus on the Baltic region, with strong participation from the host country. Indeed, the level of Russian participation reflects of the nation's commitment to advancing engineering education, both locally and generally.

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