Model of Impact of Technology-Enhanced Organizational Learning on Business Performance

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Abstract: Nowadays, the information-communication technologies and technology-enhanced learning are making access to a wide range of different sources of knowledge. In companies, knowledge is being expressed via employees and their intellectual capital. Mastering of this knowledge is becoming crucial for successful working and presents an important source of competitive advantages in companies. The paper focuses on the presentation of conceptualization of a structural model that had been developed to test the impact of technology-enhanced organizational learning on companies' business performance with more than 50 employees. In accordance with stakeholder theory and balanced scorecard, both financial and non-financial aspects of performance are considered. In this paper, special attention is given to the presentation of definitions of four main construct of research model: technology-enhanced learning, organizational learning, financial and non-financial business performance and their operationalisation. Theoretical and empirical basis for the relationship between the above mentioned constructs are being examined. The paper concludes with the presentation of the hypothesized research model.

Keywords: technology-enhanced learning, organizational learning, business performance, operationalisation, hypothesized research model

1. Introduction

The employees' knowledge significantly contributes to the companies' ability to react to requirements of fast market changes, customer needs and successful business processes. As such, companies need to manage the knowledge of their employees. Maintaining the knowledge means to evaluate the employees' tacit and explicit knowledge as well as provision of the knowledge within the company with suitable tools.

When companies intend to acquire knowledge by educating their employees, suitable methods are based on technology-enhanced learning (TEL). Technology-enhanced learning as a means of knowledge and competences acquisition, has been widely adopted as a promising solution by many companies to offer learning-on-demand opportunities to individual employees in order to reduce training time and cost. Technology-enhanced learning, referring to learning via the Internet, has become a major phenomenon in recent years. Through TEL, workers have access to various online databases, tools and e-services that help them find solutions for work-related problems [13, 14].

To perform effectively, employees and all members of the company need to continuously refresh and enhance their skills and knowledge. As human capital replaces physical capital as the source of competitive advantage, organizational learning (OL) has emerged as a key enabler of success. The study of organizational learning is relevant as it

seeks to respond to the challenges that arise in a constantly changing business environment and can help companies to confront to their long-term survival difficulties. Organizational learning thus represents a source of heterogeneity and of potentially sustainable competitive advantages, because of the companies' different capabilities for learning and absorbing knowledge [1, 2].

The analysis of organizational learning has become an increasingly important study area over the recent years. Various works have dealt with the analysis of this construct from different viewpoints. There are studies that focus on this construct using a psychological approach [3, 4], a sociological approach [5, 6], or from the point of view of organizational theory [7, 8, 9]. More recently, learning has been considered, from a strategic perspective, as a source of heterogeneity among organizations, as well as a basis for a possible competitive advantage [10, 11, 16, 17, 18, 19]. Recently it is coupled with the question of organizational business performance. Stakeholder theory addresses organizational performance evaluation from multiple perspectives - shareholders, employees, customers and suppliers of a certain company.

This paper aims at presenting the conceptualisation of a research model for impact and connection assessment of four basic constructs: technology-enhanced learning (TEL), organisational learning (OL), financial (FP) and non-financial (NFP) performance, in accordance with the shareholder theory [12, 25], and balanced scorecard [23]. The paper provides definitions of technology-enhanced learning and technical terms related to it, its scope and the process of organisational learning, as well as a method for business performance assessment. Special attention is afforded to the presentation of the observed correlations between the aforementioned constructs.

The paper is divided in three parts: (1) conceptualisation of a structural sub-model, which entails constructs and relationships among them; (2) operationalisation of constructs (latent variables) with the purpose of developing a measurement sub-model and a measurement instrument, and (3) the presentation of a hypothesized research model, aimed at empirical assessment of impact and correlations among TEL, OL, FP and NFP.

2. Conceptualisation of Structural Sub-model

A complete research model normally consists of two sub-models: measurement and structural. The measurement sub-model shows how each latent variable is operationalised through observations of corresponding indicators. The structural sub-model describes relationships between the latent variables.

Development of a quality model requires first to establish a structural framework, which is usually implemented in two steps: presentation of fundamental constructs and review of potential correlations between them. Consequently, the next sub-sections focus on the presentation of theoretical foundations of the observed constructs, the presentation of hypothesized relationships between the latent variables and the issue of operationalisation of these constructs.

2.1 Technology-Enhanced Leaning

Kirschner and Paas defined technology-enhanced learning as a learning process in which Internet plays the key role in the presentation, support, management and assessment of learning [22]. Rosenberg defines technology-enhanced learning as a learning process in which information technology partially or fully undertakes the role of a mediator between different stakeholders involved in the learning process [34]. We refer to the process of studying and teaching as technology-enhanced learning when it includes information and communication technology, regardless of the mode or the scope of its use [20, 21].

2.2 Organisational Learning

Despite its importance or maybe precisely because of it, organisational learning is defined in numerous ways and approached from different perspectives. The pioneers [26, 8] defined organisational learning as an individual's acquisition of information and knowledge, and development of analytical and communicational skills. Understanding organisational learning as a process, which can take up different levels of development, makes the learning organisational structure an ideal form of organisation, which can only be achieved once the process of organisational learning is fully optimised and the organisation is viewed as a system [8]. Jones emphasizes importance of organizational learning for organizational performance defining it as "a process through which managers try to increase organizational members" capabilities in order to understand better and manage with organization and its environment to accept decisions that increase organizational performance on a continuous basis"[15].

The aforementioned statements regarding the lack of unity of organisational learning definitions are also supported by the findings of [27, 18]. The former states that extensive research carried out in the field of organisational learning has mostly been fragmented, while the latter adds the fragmentation lead to the multitude of definitions, for ex. [28, 29], differing according to the criteria of inclusion, scope and focus [30]. Dimovski provided an overview of previous research and identified four varying perspectives on organizational learning. His model managed to merge informational, interpretational, strategic and behavioural approaches to organizational learning and defined it as a process of information acquisition, information interpretation and resulting behavioural and cognitive changes which should, in turn, have an impact on company's performance [18, 31].

Development of our research model is based on DiBelle and Nevis' model [32] of integrated approach, according to which the organisational learning factors are divided into study guidelines and study promoters, and on the Dimovski approach [18], which combines aforementioned four aspects of organisational learning.

2.3 Companies' performance

Company performance assessments have advanced over the past years, and developed from traditional, exclusively financial criteria, to modern criteria, which include also non-financial indicators. The theory of economics started developing improved models for performance assessment, taking into account all shareholders: employees, customers and supplier's employees and the wider community, also advocated by the Freeman's theory of shareholders [25, 12]. The existing models, based on accounting categories, combine with non-financial data and the assessment of the so called "soft" business areas, which mostly improves the assessment of companies' perspective possibilities [33]. For a good performance of a modern company we need to introduce, along with the financial indicators (FP) also non-financial indicators (NFP). There are several approaches to choosing the non-financial indicators, among the modern performance assessment methods, the best known ones are the Total Quality Management (TQM) model and the Balanced Scorecard model (BSC) [23].

2.4 Relationship among Constructs

Findings based on a rather wide overview and systematisation of literature has shown that we can expect positive impact of ICT and technology-enhanced learning on organisational learning. Robey et al. do warn that technology-enhanced learning and relative ICT may take either the role of a promoter or the role of an inhibitor of organisational learning [35].

Correlation between organisational learning and business success is often a controversial issue when it comes to company's management [36]. Some authors believe better performance is related to organisational learning, though their definitions of business

results differ greatly. In relation to this we can mention the capacity of organisational learning to have a positive impact on the financial results [37, 38], on the results related to shareholders [39, 40] and on the business results, such as innovativeness and greater productivity [41]. Mintzberg says the company performance is important feedback, information on effectiveness and efficiency of the learning process [42]. The recent study of Perez, Lopez, Montes Peon and Vazquez Ordas has shown organisational learning has a significant impact on companies' performance [43]. It is also interesting to look at the past findings related to the correlation between financial and non-financial business performance indicators. Empirical literature is still very limited in this field, yet surprisingly enough Chakravarthy's [24] findings indicate there is no correlation between the two.

3. Conceptualisation of Measurement Sub-model

Having understood the hypothesized correlations between the latent variables, the following question is a logical consequence: how should these four constructs be operationalised and measured.

3.1 Development of the research instrument

The questionnaire used has been experiencing constant development and validation for more than 10 years. Dimovski [18] used it on sample of Ohio credit unions in order to measure the organizational learning process as a source of competitive advantage. Škerlavaj [30] upgraded it to include measures of non-financial performance, while he replaced industry-specific measures of financial performance with two measures valid for all companies. For this study the operationalisation of all four construct involved was improved and applied on a sample of Slovenian firms with more than 50 employees in 2007. The reason to include smaller companies is to improve the generalizability of the research findings. The measurement instrument used in this study has 22 items for the technology-enhanced learning construct, 29 items for organizational learning construct, three items for financial and four items for non-financial performance. Pre-testing procedures were conducted in the form of interviews and the studies with managers, focus groups with research and academic colleagues. Table 1 presents constructs, indicators used for construct assessment, number of items summed up to give the value of an indicator and theory or empirical research on the basis of which the measurement items were developed.

Latent Variables (constructs)	Indicators and Number of Items from Questionnaire	Theoretical Grounds, Research, Authors
Technology-Enhanced Learning (TEL)	▪ Information and Comm. Infrastructure (ICI) – 9 items ▪ Education Technology (ET) – 10 items ▪ Learning Contents (LC) – 3 items	▪ [22], [20], [34], [41]
Organisational Learning (OL)	▪ Knowledge Acquisition (KAC) – 9 items ▪ Knowledge Transmission (KTR) – 10 items ▪ Use of Knowledge (UoK) – 10 items	▪ [18], [32]
Financial Performance (FP)	▪ Return on Assets (FP1) – 1 item ▪ Return on Equity (FP2) – 1 item ▪ Added value per employee (FP3) – 1 item	▪ [12], [23], [25], [45]
Non-Financial Performance (NFP)	▪ Employee fluctuation (NFP1) – 1 item ▪ Share of loyal customers (NFP) – 1 item ▪ Number of customer complaints (NFP3) – 1 item ▪ Supplier relations (NFP4) – 1 item	

Table 1: Specification of constructs

In short, the hypothesized model shall be composed of four constructs and 13 indicators, and will be of recursive nature, meaning that there shall be no cases of two variables appearing simultaneously, i.e. as a cause and a consequence to one another.

4. Research Hypotheses and Model

Once the theoretical frame of the model is devised, illustration of conceptualisation by the means of a flow chart is to be tackled. Flow chart is a graphical representation of interrelations between various elements of a model. Measurement variables belonging to exogenous latent variables are marked with an x, while their measurement deviations are marked with a δ. Endogenous latent variable indicators are marked with a y, and measurement deviations with an ε. Structural equation deviations are ζ, exogenous latent variables are ξ, endogenous constructs are η, and one-way influence of exogenous latent variables on exogenous are γ. To describe relations between latent variables and their indicators (measurement variables) we use λ. Figure 1 below illustrates a conceptualised research model, presenting all basic constructs and hypothesized correlations between them. We aim at proving: (1) that the latent variable of technology-enhanced learning (TEL) has positive impact on organisational learning (OL), (2) financial (FP) and (3) non-financial performance (NFP); (4) that the latent variable of organisational learning (OL) as a process of knowledge creation leads to improved financial results (FP), as well as to (5) improved non-financial results (NFP); (6) that it is impossible to expect significant statistical correlations between financial performance (FP) and non-financial (NFP) performance.
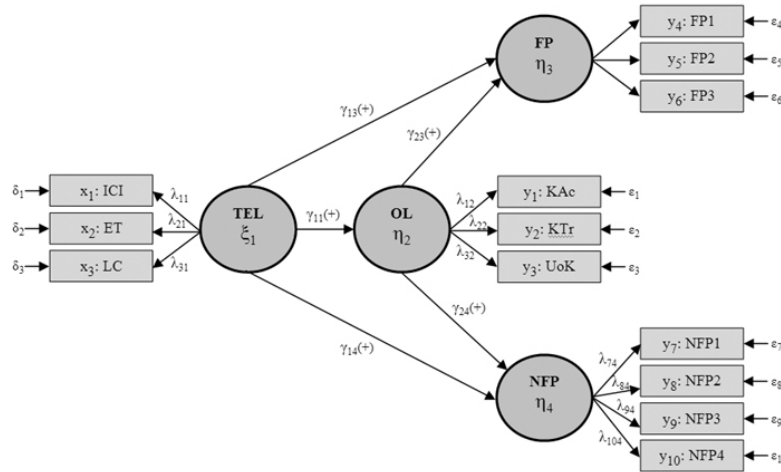

Figure 1: Conceptualised research model

5. Research procedure

Table 2 provides the procedure of analyzing the data. First, item analysis is performed to describe the sample characteristics, to investigate the item means, and to assess item-to-total correlations. Second, exploratory factor analysis is performed to explore whether the items load highly on their intended latent construct, and have low cross-loadings. After the exploratory factor analysis, the reliability of the underlying factors is discussed in terms of Cronbach's alphas. Third, confirmatory analysis (CFA) is performed to ensure that the constructs are valid and reliable; this refers to the measurement part of the model. Consequently, CFAs (without any structural relationships) are performed with LISREL 8.80 to check whether the items meet the criteria for convergent and discriminant validity, as well as construct reliability. In this phase, the presence of multicollinearity is also investigated through regression and correlation analysis. The properties of the four research constructs in the proposed model (Figure 1) and the six hypotheses is tested using a LISREL 8.80 and PRELIS 2.30 package for structural equation analysis and procedures [44]. As estimation method for model evaluation and procedures, the maximum likelihood (ML) method and the two stage testing processes is utilized. Structural Equation Modeling (SEM) is designed to evaluate how well a proposed conceptual model that contains

observed indicators and hypothetical constructs explains or fits the collected data. It also provides the ability to measure or specify the structural relationships among sets of unobserved (latent) variables, while describing the amount of unexplained variance. Clearly, the hypothetical model in this study was designed to measure structural relationships among the unobserved constructs that are set up on the basis of relevant theories and prior empirical research and results. Therefore, the SEM procedure is an appropriate solution for testing the proposed structural model and hypotheses for this study. Presentation of research results is planned to take place mid-2008.

Stage	Analysis	Purpose
1.	**Item analysis**	Investigation of sample characteristics Investigation of item means Investigation of item-to-total correlations
2.	**Exploratory factor analysis**	Exploration of loadings; removal of items with low loadings and high cross-loadings; Assessment of number of latent factors Assessment of reliability (Cronbach's alpha)
3.	**Confirmatory factor analysis**	Assessment of convergent validity Assessment of discriminant validity Assessment of construct reliability Assessment of correlations and multicollinearity
4.	**Testing the hypothesis**	Assessment of structural relationship (H1-H6) Parameter Estimates for Overall Measurement Model Convergent and Discriminant Validity
5.	**Presentation of results**	Discussion of findings

Table 2: Research procedure

6. Conclusions

The aim of this paper was to present the conceptualisation of a model for assessment of impact of technology-enhanced learning, and the respective information and communication technology on the business performance of Slovene companies with more than 50 employees. We have studied the theoretical and empirical grounds for the correlations between the aforementioned constructs, and in the end presented a hypothesized research model. Empirical analysis of the model shall be presented in the second part of the research.

This study contributes to the technology-enhanced learning and organizational learning base of knowledge in three dimensions: (1) theoretical, (2) methodological, and (3) practical. Technology-enhanced learning contributes to sustainable competitive advantage through its interaction with other resources. Recent literature suggests that organizational learning is a process that plays an important role in enhancing a firm's competitive advantage [37] and which may benefit from the judicious application of technology-enhanced learning. It has also been argued that for firms to be successful they must complement TEL with OL. Within the broader conceptual framework, this study focuses on the relationship between technology-enhanced learning, organizational learning and business performance. As such, the conceptual model offers several research opportunities and provides a solid base for a further empirical testing of hypotheses related to technology-enhanced learning and organizational learning.

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