

# **INNOVATION ADOPTION CASE STUDY - INTRODUCTION OF 'LEARNING MANAGEMENT SYSTEM' INTO TOURISM STUDY PROGRAMME**

*An outline for development and evaluation of innovations in teaching and learning*

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## **ABSTRACT**

The article describes an innovation adoption case study conducted at Turistica - College of Tourism. Turistica is member of University of Primorska, located in Slovenia. Information and communication technologies were identified as an innovation opportunity and were planned, diffused and adopted in the education and learning process. The theoretical approach included a basic study of the innovation phenomenon, concentrating further on service, learning and education sector. The constructive approach and collaborative computer supported learning were identified as core issues. Findings resulted in chosen and redesigned learning management system and process. Further, the successful innovation adoption was observed by combining different theoretical approaches. The results of the pilot project encourage the college to further accomplish its employed strategy. While common innovation metrics are still lacking in general, this article offers additional outlines for development and evaluation of innovations in tourism higher education sector.

## **Key words:**

computer supported collaborative learning, diffusion of innovations theory, tourism higher education, innovation management, learning management system

## **FOREWORD**

Innovations and their development, diffusion, adoption, management and evaluation are important recent topics in all aspects of science, professional and business life. At Turistica – College of tourism we merged the issue with the learning and education sector. The college was established in 1995 and is a member of University of Primorska. University is one of four Slovene universities and lies in a young and small country. Slovenia has 2 million inhabitants and has been a member of the European Union since 2004, after gaining its independence in 1991 by ending a more than 40-year-long membership in the Socialist Federative Republic of Yugoslavia (22 million inhabitants). Slovenia is one of highly successful new European Union Member States. Its latest achievement is an official confirmation of the introduction of the Euro in January 2007, which is the very first introduction among all new Member States. Over the last decade, our country and college had to face many new challenges - also to learn how to innovate. The following sections of the article describe the Turistica's journey through the innovation adoption case study. The innovation phenomenon, covering social, business and educational fields, is presented in 'Innovations'. The 'Education and learning innovation opportunity' section sketches one of the innovation orientations in the field of education and a

recent opportunity for our college. The following sections present the innovation implementation with its results. In conclusions, our case is not only closed, but also examined with the help of dispositions of two innovation theories.

In general - common innovation metrics are still lacking and this article will hopefully provide additional parts to the outline for development and evaluation of innovations in education.

## **INNOVATIONS**

### **The Innovation Phenomenon**

There are many definitions and many interpretations of the innovation phenomenon (Schumpeter, 1961, pp. 5ff; Drucker, 1985, pp. 7ff; Sundbo, 1995, pp. 399ff; Rogers, 2003, pp. 12ff; Fagerberg et al., 2006, pp. 1ff). In a wider social context, innovation is an idea, practice or object perceived as new by an individual or other unit of adoption (Rogers, 2003, pp. 12ff). Diffusion and adoption of innovations cause changes in society and there are two ends of the 'cause-and-effect innovation explanation continuum': technological determinism and social constructivism (ibid.)

In economic terms, innovation is usually described as the activity, in which invented entity is further developed into a commercially useful entity, which becomes accepted in a social system (tribe, company, society etc.) (Schumpeter, 1961, pp. 5ff; Drucker, 1985, pp. 7ff). 'Economic' innovation is not limited to technological innovations and can comprise novelties in form of a product, a process, an organisation or market behaviour.

According to (Sundbo, 1995, pp. 399ff), there are three competing basic explanations or paradigms of the innovation phenomenon: entrepreneur, technology-economic and strategic innovation paradigm. (1) The entrepreneur paradigm underscores the entrepreneurial act as the motive for the innovative process. As such, it is psychologically determined since entrepreneurial personality is the condition for innovative behaviour. (2) Technological development serves as a core of the technology-economic paradigm. Innovation is ignited by technicians who develop new technologies. (3) The youngest and least evolved is the strategic innovation paradigm. It emphasises the organization's strategies as the core incentive for innovation. Managers are responsible for setting a correct strategy. They act as agents in systems where they cooperate with other individuals, what makes this explanation sociological.

Following the presented paradigms' core incentives we can recognize three indicators for defining success of innovation activities in a social system (ibid.). In the entrepreneurial paradigm, the indicator is the establishment frequency of new businesses by individuals. Investment in and support of R&D activities are core indicators for the technology-economic paradigm. In the third, strategic innovation paradigm, the core factor is organization's strategies contents: how organizations interpret their suprasystem situation and their internal sources to cope with it. Strategies combined with past actions give us the actual state of successful innovative effects and future trends.

### **Innovation Observation**

An important contribution to the innovation phenomenon observation was conducted by Everett M. Rogers in his five (1962-2003) editions of the widespread book (Rogers, 2003, pp. 12ff). He describes four main elements in diffusion of new ideas. (1) **Innovation** with perceived attributes: relative advantage, compatibility, complexity, trialability and observability. (2) **Communication channels** for innovation information flow. (3) **Time** used to evaluate rate of adoption in the observed (4) **social system**.

Apart from perceived innovation attributes, there are some important issues in social system, which affect the rate of successful adoption: the system's **structure** with its **norms** and individuals' **opinion leadership** (influence of certain individuals on attitudes and behaviour of others). The idea of innovation diffusion comes from a **change agency**, which engages a **change agent** to stimulate the diffusion with the help of his/her **aides**.

In the final Rogers' volume (ibid.), diffusion of innovations theory is explained and analyzed in detail. An important suggestion is made, saying that the *entire* innovation development process should be observed in order to comprehend the phenomenon completely. Six main stages of the process are proposed: (1) **Recognition of a problem or need**, affected significantly by technological and social issues. (2) **Basic and applied research** through which scientific knowledge is enriched. (3) **Development**, where a newly developed idea meets practical needs of potential adopters. (4) **Commercialization** of innovation through processes of production, packaging, marketing, distribution etc. (5) **Diffusion and adoption**, where important innovation's preconditions about efficacy, safety and other factors are to be met. At this point, it should also be noted that during the process of adoption, the innovation can be re-invented by users. When innovation is successfully accepted, it causes (6) **consequences**, which can be: desirable or undesirable, direct or indirect and anticipated or unanticipated. However, this suggestion is general. Six stages may not always occur in such sequence and some of them may eventually not occur at all.

Another universal observation approach is a powerful concept used in business measurement systems: A Balance Scorecard that originally focuses on the business strategy. As proposed in (Davila et al., 2005, pp. 149ff), its main idea is applicable to any (business) process. Authors used it to design a measurement system in their model of innovation management. In its basic form, it concentrates on four main elements: input, process, output and outcome of innovation process (ibid.). **Inputs** are tangible and intangible resources, devoted to innovation effort (measures: people, money, equipment, office space, time, motivation, company culture). **Processes** transform inputs to outputs. Process measures include time, cost, people and technology performance etc. **Outputs** are results of the innovation effort and they describe quality, quantity and timeliness (measures: number of successful new products and services, their acceptance, customer share...). And **outcomes** describe value creation. As a final result, they describe how the innovation effort transformed the outputs into value for the innovation developer. Within for-profit firms, value creation is measured through financial performance. For non-profit firms value creation depends on the particular mission of the organization. In the same manner, the set of measures in any innovation model is unique for different kinds of innovation, such as physical product or service innovation.

## **Innovations in the Service Sector**

Between services and physical goods, there are many differences. Services, which are becoming a major part of economic activity in most developed countries, tend to be intangible, simultaneously produced and consumed, and perishable (Jong & Vermeulen, 2003, pp. 844ff).

Services can be roughly divided (ibid.) in three basic groups: **product-intensive** (banks, insurance, telecommunications, transport, and wholesale), **knowledge-intensive** (scientific, engineering, IT services) and **supplier-intensive** (personal services, hotels, restaurants and retail stores). Innovations in services are easier to imitate and they do not require much R&D. They mostly consist of small and incremental changes caused in several service domains. Changes mostly include one or a combination of following: **service concept, client interface, delivery system and technological options**.

Results of such innovation changes lead to *financial benefit, creating customer value and increasing strategic success* (Jacob et al., 2003, pp. 283ff). What is more, service innovations typically transform the state of customers (Jong & Vermeulen, 2003, pp. 844ff).

## **Innovation Theory in Learning and Education**

Although they are mainly non-profit oriented, many learning and education issues can be implemented in innovation theory. Learning and education is a service. It deals with people and is knowledge and supplier intensive. It has its own service concept, client interface, delivery system and technological options. It typically transforms the state of customers – students.

Each institution exists for a specific purpose and mission: it has a special social function (Drucker, 1974, pp. 15ff). Learning and education's sets of innovation measure thus differ from others, but still – learning and education institutions are a part of a general social system in which all three innovation paradigms try to explain innovative behaviour (Sundbo, 1995, pp. 405ff). As such it is merely explained by the strategic innovation paradigm.

Although innovation paradigms are primarily business oriented, they can be widely implemented according to Drucker's definitions of institution's social function (Drucker, 1974, pp. 15ff). For a business enterprise, the social function is economic performance. The differences between business and non-business institutions exist only in this task. Concerning every other task, they are similar. All non-business institutions also have to deal with economic performance every day. However, it is not their purpose but their restraint.

With its mission to educate a student, who will learn something and will reinvest his/her knowledge in the social system a few years later (Drucker, 1989, pp. 89ff) the learning and education institution can similarly have its own innovation strategy and its model of innovation with adequate inputs, processes, outputs and outcomes. And its stages of the innovation development or the re-invention process are the same as in other innovation diffusion theory examples (Rogers, 2003, pp. 17ff).

## **EDUCATION AND LEARNING INNOVATION OPPORTUNITY**

### **Constructivist View and Collaborative Computer Supported Learning**

One of the predominant views in teaching and learning is a constructivist view. Individual constructivism focuses on an individual and its mental functioning, emphasizing that knowledge can only be acquired by individual learner itself and that it is shaped on an existing structure of knowledge (Ausubel et al., 1978, pp. 10ff). The teacher's role in a learning process of developing learners thinking and understanding is supportive (Glaserfeld,

1995, pp. 3-16). Social and cultural constructivists emphasize that human mental functioning is inherently situated in social interaction and cultural context (Resnick, 1996, pp. 1-20).

How teachers approach their teaching mainly depends on their conceptions of teaching and learning (Prosser & Trigwel 2000, pp. 138). Conceptions of teaching as a transmission of information significantly differ from conceptions of teaching as supporting students in developing knowledge (Prosser & Trigwel 2000, pp. 11-25).

According to the conceptions of teaching as a transmission of information, students are more or less passive recipients. Focus is not on students' prior knowledge structure, abilities, learning style and approaches and as such doesn't support them in active acquiring of concepts and theories.

The notions of social and cultural constructivism enhance collaborative learning, which fosters active construction of knowledge and the exchange of knowledge and experiences among peers. Knowledge can only be built by students themselves and can not be transmitted by teachers. "Concepts can not simply be transmitted from teachers to students – they have to be conceived." (Glaserfeld, 1995, pp. 3-16) An individual builds his/her knowledge in a social and cultural context. Mental activity of an individual proceeds from individual's involvement in social life (Vygotsky, 1978, pp. 52-57). Students learn well when they build their knowledge in a group of peers through collaborative work. In the process of interaction, students reveal inadequate reasoning and develop understanding of concepts and theories in a peer to peer explanation. Johnson et al. discovered that the manner of interaction during group work influences students' motivation (Johnson et al., 1985, pp. 668-677). Group work on authentic learning problems and tasks fosters development of generic competences, which will be needed for successful professional careers. In this way, students become autonomous learners and take responsibility for their learning and learning outcomes.

### **ICT and its Rate of Adoption in the Higher Educational Sector**

A more intensive student-student and teacher-student interaction during the learning process and collaborative methods of learning and teaching can be supported by **information and communication technologies (ICT)**. Oliver argues that "Technology has the capacity to promote and encourage the transformation of education from a very teacher directed enterprise to the one which supports more student-centred models (Oliver, pp.1ff2002)".

The ICT innovation adoption in the educational sector is much slower than in all other sectors (Leidner & Jarvenpaa, 1995, pp. 265). The adoption of ICT in teaching and learning is slow (Cuban, 2001, pp. 93ff) and sustainability of innovation is a major issue. The sustainability is provided by developing a stable structure of e-learning innovation, which is integrated institutionally and results in a shift in teaching and learning. The sustainable implementation involves pedagogical, technological, organisational-administrative, economical and socio-cultural dimensions (Kruppa et al., 2002, pp. 8-16). There is little evidence showing that the e-learning demand in European universities had increased as much as in the USA, where the growth is significant (DTI and Massy 2004).

The results of a research conducted among higher education teachers in Slovenia in 2002 illustrate that the majority of teachers have conceptions of ICT supported teaching aligned with conceptions of teaching as a transmission of information (Istemic Starcic, 2002, pp. 138-198), which is a major obstacle for a productive use of ICT in teaching.

### **Learning Management System**

Improvement of teaching and learning in traditional higher university courses can be supported by an introduction of a learning management system (LMS). The LMS provides facilities for design, development and sharing of learning materials, individual and group

learning activities, evaluation and assessment of student work and management and administration of course work at classroom and organisational level (Istemic Starcic & Subic Kovac, 2006, pp. 647; Kravcik et al., 2004, pp. 25; Paulsen, 2003, pp. 134-135).

The LMS with its orientation to student-centred teaching, which is not content-driven but activities-driven, supports the individualisation of the study process i.e. student-centred teaching. The LMS can significantly impact the development of new organisation of higher university teaching and learning and blend traditional organisation with e-learning (Istemic Starcic & Subic Kovac, 2006, pp. 647). Individual student's progress can be tracked in the process of learning and adopt teaching and learning approaches to the individual learning style, prior knowledge and abilities.

The LMS supports various teaching and learning methods for individual, peer and group learning. Effectiveness, efficiency and quality of teaching and learning additionally foster communicational patterns with synchronous and asynchronous communication modes. The computer mediated communication (CMC) with its "integrative nature has led to a rather spectacular transformation: The CMC has been able to replace the traditional oral dimension of education without destroying what has until recently seemed to be an irreplaceable privilege of the classical face-to-face classroom situation (Istemic Starcic, 2001, pp. 12)".

### **Turistica and University of Primorska**

A predominant organisation of study at a traditional university, which supports teaching in large lecture theatres and tutorials for semi-large groups of students, usually doesn't foster students to develop a capacity for self-regulative learning. University of Primorska as a whole and Turistica as its member are facing many problems of traditional universities, such as large classes with inadequate student-teacher ratios, diversified classes in terms of students' prior knowledge, ability and motivation, students dropping-out in different years and teacher conceptions of teaching as a transmission of information. The study process is mainly designed for an average student and is as such insufficient for better students and for those with poorer prior knowledge. We estimate that a range of improvements in teaching approaches by shifting towards the student-centred teaching could improve the quality of the learning process and raise students' achievements. We intend to renew the curriculum towards an organisation of study, which will support a more flexible organisation and enhance individualisation, i.e. student-centred teaching for fostering quality learning and learning outcomes.

### **LMS ADOPTION CASE STUDY**

#### **Pilot Project**

A new concept of the LMS was experimentally introduced through a pilot project at the Turistica's Tourism management higher education study programme in academic year 2005/06. The Course '**Management of Business Systems**' was chosen as the one that in its own nature already teaches students of innovative attitudes in the field of organizing processes and systems.

The **curricula objectives** are focused on organization, management and leadership of tourism enterprises. Through examination of organizational paradigms students perceive the fundamentals of objective-oriented organization, systems' and subsystems' functions. Major topics include: system theory, processes, classification, structures and functions, management and leadership, projects, decision making, planning, innovation, negotiation, cooperation, team, changes, risks and crises etc.

Important parts of the course are tutorials through which students get a practical insight into the topics studied. During tutorials, a skeleton of practical understanding is placed upon

following basic topics: enterprise planning, the role of innovations in enterprise and team work in enterprise.

### Students' Tasks

Basic topics were introduced to give students a pedagogic guidance for 'business system concept cognition' through following tutorials:

1. **Tutorial content and LMS introduction:** tutorial objectives, team work principles, LMS tools practise
2. **Business idea generation:** intrinsic and extrinsic motivation, innovative models, project planning, group and reverse brainstorming
3. **Successful business system analysis:** study visit and analyses of the Hit Group. The company ranks among Europe's largest entertainment providers.
4. **Innovative ideas evaluation and strategic planning:** business strategies, information search, criteria definition, business idea evaluation
5. **Business plan draft:** business idea development, business objectives, customer analysis, capability analysis, resources analysis, mission, values, organization structure, SWOT analysis, risk evaluation, investors, scorecards

104 students were divided in 15 teams. They were invited to freely delegate tasks inside their work groups. At the same time, members were reminded that their work contribution will be evaluated by all team members at the end of the course. The combination of the final 'Business plan draft' evaluation (performed by course assistants) and team's **self-evaluation** grades represent 30% of the final course grade.

Prior to LMS and cooperative learning concept introduction in previous years, the tutorials implementation was limited to several consequential and non-integrated lessons. This year, the teams got their fundamental collaborative assignment based on the project-oriented learning. The assignment integrated all lessons into **one common task**: To build team-best-suited innovative tourism enterprise. Students had to find out what the motives and strengths of their team were. Consequently, they were directed to choose such innovative business ideas and objectives that were the most suitable for their group's competences, values and life expectations. Finally, they had to prepare a basic business plan to establish their enterprise.

### LMS Introduction

The LMS served as an integration tool in this process for planning, operationalisation and monitoring of tasks. It served as a team office for students, where all theory, tasks, communication, reports and business information were located. Since all activities except 4 class lessons and 4 milestone deliveries were up to students, a lot of work and collaboration took place at home and in their free time. Group and reverse brainstorming, for example, were undertaken on LMS team forums, where all members of a team, located in different places (home, library, internet café ...) all over the country, had to attend at the same time. (During the study period, our students live mostly at home or in rented apartments since the campus is not built yet and Slovenia is a relatively small country - 200x200 km wide.)

The following LMS features allowed such functionality. **Theory, literature** and **instructions** were provided through Moodle server. The application is a course management system in the form of a free, Open Source software package, allowing educators to create online learning communities. **Team collaboration and reports delivery** took place in the BSCW - 'Basic Support for Cooperative Work' web application, developed by Fraunhofer Institute for Applied Information Technology. It enables web-collaboration in a form of a 'shared

workspace' system, which supports document upload, event notification and group management.

## **RESULTS OF LMS ADOPTION OBSERVATIONS**

### **Methodology**

The methods used in our LMS adoption observation included: regular web-surveys of all 104 students' activities and responses after each tutorial, interviews, active participation (through forums, e-mails, live and e-chat) and grade analysis. All survey items were measured on a five point Likert scale with a span from '1- strongly disagree' to '5 - strongly agree'.

Main research variables were: self-evaluation of learning objectives; self-evaluation of the impact of LMS and of individual learning on knowledge; motivation for a high grade in the curriculum subject; motivation for new approaches to learning and for internet usage; self-evaluation of the impact of LMS on personal digital literacy; general evaluation of LMS: collaboration, relations among team members, responsibility; self-evaluation of personal input into team work and organisational abilities of the team leader.

Findings are presented according to the innovation theory framework used in the 'Innovations' section.

### **Main Elements in Diffusion and Adoption of LMS**

According to (Rogers, 2003, pp. 11ff) and his four elements, mentioned in previous sections, the introduced **innovation** was the new Learning Management System. Innovation was perceived as new for students (i.e. units of adoption).

**Communications channels** were formal assistant-students channels (during tutorials), interpersonal assistant-students channels (live and e-chats, e-mails, forums) and interpersonal channels between students.

**Time** for diffusion and implementation was strictly given. Students basically had to adopt the innovation in 2 weeks. There were different rates of adoption and different levels of adoption: from pure performing of student's duties to every-day innovation adoption in a wider scope of student's educational and personal activities.

**The social system** had several players. Students were the adopters, Turistica was the change agency, while two course assistants played the role of change agents with 15 aides: student team leaders. The norms of the student population were to be satisfied and that their attitudes and behaviour were influenced in order to adopt the innovation completely and successfully.

### **The Innovation Development Process**

Since the innovation-decision (Rogers 2003, pp. 20) was taken by Turistica (i.e. authority), it was of special importance that students values and attitudes were considered and their responses and suggestions recorded. Together with course content issues this was the most important part in all stages of the innovation development process.

The phase **(1) Recognition of a problem or need** was outlined in the 'Education and learning innovation opportunity' section. We concentrated on shifting towards student-centred teaching, with the support of information and communication technologies. Findings of **(2) Basic and applied research** presented in the 'Innovations' section were considered in **(3) Development** and **(4) Commercialization**. The idea of LMS introduction was not new (Istenic Starcic & Subic Kovac, 2006, pp. 647; Kravcik et al., 2004, pp. 25ff; Paulsen, 2003, pp. 134-135), but we wanted to meet the practical needs of our students and our contents. The new combination of learning and collaboration techniques, presented in the 'LMS adoption case study' section, was designed. **(5) Diffusion and adoption** ran smoothly. Adoption was

100%, although there was a possibility for students to object and explain the situation in which they would not be able to follow the tutorials' LMS concerned requests. There were all types of **(6) Consequences** that had been suggested by (Rogers 2003). The most important are presented in Table 1.

Table 1. Innovation adoption consequences

Desirable	student-centred teaching improvement
Undesirable	more-motivated students working instead of less-motivated
Direct	concurrent, fast and reliable information and assignment flow
Indirect	better digital literacy
Anticipated	students' general acceptance of LMS concept
Unanticipated	one of the teams got along and identified with their business idea so well, that they want to commercialize it

### Balanced Scorecard Model of Innovation Management

Following (Davila et al., 2005, pp. 149ff) methodology, we identified and managed four basic elements of innovation management.

**Inputs** as tangible and intangible resources devoted to innovation effort were in the first place Turistica's recognition of the student-centred teaching problem and the need of ICT assisted learning and teaching. Findings of student surveys presented in Table 2 show a relatively high motivation for grades and new approaches to learning and internet usage. Pre-tutorial self-evaluation of personal digital literacy was normally distributed.

Innovation implementation and adoption **process** variables in Table 2 showed modest to high satisfaction during the LMS introduction process and relatively high inter-organizational conditions in teams. The majority learned how to use LMS in 1 to 3 hours (0.5h - 9.4%, 1h - 27.1%, 2-3h - 47.9%, 4-7h - 8.3%, 8+h - 7.3%).

**Outputs** presenting results of innovation effort show modest to high fulfilment of learning objectives. Impacts of LMS and collaborative learning on knowledge are slightly higher than impacts of individual learning. Digital literacy has increased by LMS implementation.

**Outcomes**, as final result, describe how the innovation effort transformed the outputs into value for the innovation developer. Innovative learning and teaching with LMS has been introduced for assisting teaching and learning in a large traditional university class of 104 students. Aims were: a shift in teaching and learning approaches from "teaching as transmission of information". With the LMS introduction we supported a more flexible organisation and provided the individualisation of teaching and learning i.e. student-centred teaching. The LMS supported the use of various teaching and learning methods for small group teaching. The LMS also supported tracking of group and an individual student progress. Quality, effectiveness and efficiency were provided by CMC communication patterns (synchronous and asynchronous modes), which would be impossible in a traditional classroom of 104 students. We expect that the adoption of LMS on the basis of the presented pilot project study will help Turistica to achieve university's common strategy, which, among other contents, intend to carry out high quality study and research programs and promote the excellence of educational and research work in Slovenia and abroad.

Table 2. Web-survey results

	Value	1	2	3	4	5
Variable	Frequency (%)					
<b><u>INPUTS</u></b>						
motivation for high grade in curriculum subject			8.7	32.7	58.7	
motivation for new approaches to learning		1.9	12.5	46.2	39.4	
motivation for internet usage	2.9	6.7	17.3	34.6	38.5	
self-evaluation of personal digital literacy	2.9	26.0	33.7	27.9	9.6	
<b><u>PROCESSES</u></b>						
satisfaction with LMS introduction	2.9	11.5	29.8	37.5	18.3	
satisfaction with LMS based tutorials	1.0	7.7	29.8	40.4	21.2	
satisfaction with course	1.9	6.7	38.5	39.4	13.5	
relations among team members		9.6	16.3	30.8	43.3	
collaboration among team members	1.9	6.7	27.9	30.8	32.7	
responsibility of team members	1.0	8.7	26.0	30.8	33.7	
self-evaluation of personal input into team work	1.0	1.9	25.0	47.1	25.0	
organisational abilities of the team leader	2.9	2.9	16.3	25.0	52.9	
<b><u>OUTPUTS</u></b>						
fulfilment of learning objectives: course	1.0	2.9	36.5	46.2	13.5	
fulfilment of learning objectives: tutorials	1.0	2.9	26.0	50.0	20.2	
impact of LMS and collaborative learning on knowledge	1.0	7.7	25.0	39.4	26.9	
impact of individual learning on knowledge	1.0	5.8	30.8	40.4	22.1	
impact of LMS on personal digital literacy		8.7	31.7	44.2	15.4	

## **CONCLUSIONS**

Following the innovation theory and contemporary learning and education issues, the article presents the innovation adoption case study conducted at the University of Primorska in Slovenia (EU). As defined in our strategy, the university is striving to improve teaching and learning methods by combining scientific knowledge, state of the art technologies and contemporary values and attitudes of its 'customers' - students.

The LMS innovation development and diffusion was conducted in six steps as defined by (Rogers, 2003, pp. 168ff). While focusing on four elements of innovation management (inputs, processes, outputs and outcomes), we proposed and measured a set of variables, which influence the excellence of LMS innovation development, management and diffusion. After a successful adoption of the innovation in a pilot project we identified several consequences as defined through diffusion of innovations theory. They confirmed our anticipations and at the very moment, the integration of the first group of university's LMS supported courses is being integrated into the common education system.

Apart from covering the successful LMS innovation adoption, the article fits in and confirms a diffusion of innovations theory dispositions, phases and elements. Further, it combines the findings with Balanced Scorecard innovation management model and identifies certain important variables. Although oriented in learning and education, universities can serve as an additional model in the search for an appropriate innovation metrics, which - according to BusinessWeek - is lacking in general: "If we think innovation is having a boom now, just wait until a commonly understood measure of performance finally emerges" (Rae, 2006, pp. 1).

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