

## **THESIS SUMMARY**

**Péter Tamás BALKÁNYI**

**The ecosystem of e-learning content  
development from a design science approach**

Ph.D. dissertation summary

**Supervisor:**

**András NEMESLAKI, PhD**  
Professor

Budapest, 2019

**Department of Infocommunications**

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# **1 Significant prior research and justification of research topic**

## **1.1 Prior research**

Throughout my career I have often seen (typically large) organizations opt for the introduction and development of e-learning systems, tools and learning content when having to solve problems in connection with human resources and the general processes of the organization. I firmly believe these steps are taken in the right direction, as e-learning offers endless possibilities, tools and solutions for organizations facing the above problems. However, e-learning is not a panacea in itself. Without supporting leaders, strategic commitment and sufficient resources even e-learning may prove to be counterproductive.

Today's CEOs, Heads of HR or IT have to face the ever-changing demands of the market and also of their organizations. Everything changes fast: the environment, the legal background, knowledge, products, tools, technologies, people, internal and external organizations, etc. However, the velocity of changes is not aligned (1.) and cannot be compared to that of earlier processes. The continuous change requires us to acquire more and more knowledge and accumulate information (2.). Also, this constant change causes heavy fluctuation within the organizations (3.). The shift in the employment-related strategies of generation Y (Gibson et al., 2009) and generation Z's active entrance to the labour market (GKI, 2016) raise further issues and difficulties. The above create a need (and a pressure) to accumulate, organize and transfer knowledge (4.), which, in turn, will bring about

other changes (1.). The process will be, therefore, further stimulated by the positive feedback.

The possible solutions are to be analyzed and examined from a variety of angles, both methodological and technological. Thus, one of our focuses will be on methodological considerations which provide a context and framework for the developments. This includes innovative methods of learning and transferring knowledge *with online support* (Bodnár, Csillik, Daruka and Sass, 2017; Bodnár and Sass, 2015).

The methodology therefore calls for a complex framework and connecting IT solutions. Furthermore, these frameworks are not only technological tools, but they are strongly linked to shaping the corporate culture and the organization (Kő and Klimkó, 2009). When creating complex frameworks, several perspectives and factors need to be taken into account, such as environmental factors, corporate processes, technological issues and the identification of targets (Klimkó, 2001). These approaches are to be simultaneously considered not only when building the whole system, but also when forming and developing its specific elements. It is true regardless of whether we strive to find the solution through simple digital learning content development or in *learning management system* (LMS) embedded in a complex, ontology-based e-learning environment, which also supports corporate codification efforts (Kő, 2011).

An e-learning supported training framework can be a significant integrating drive in an institutional or corporate environment. A

conscious effort to design, create and apply a multi-perspective system of trainings may provide the right answers and may successfully solve the problems outlined above (Chang, 2016; Griggs, Wild and Downing, 2002). E-learning systems, learning content and digital toolkits will make the usage of existing corporate and external knowledge more efficient, faster and more readily available in the medium and long run. All of the above may help overcome the problems caused by the swiftly changing environment and structures and help mitigate the effects of the feedback “whirlpool”.

## **1.2 Research questions**

Consequently, I seek to answer the following main questions:

- RQ1. How to organize the *associated fields* of the e-learning ecosystem which are required to analyze it?
- RQ2. What kind of typical *problems* or group of problems – of large organizations – can be solved by e-learning content development?
- RQ3. How can be characterized and described the *developmental ecosystem* of the e-learning content creation?
- RQ4. What are the direct and indirect *results* and *impacts* of a learning content which is specifically designed for on-screen or supported learning?

## **1.3 Hypotheses**

Now I would like to state the hypotheses, conjectures and expectations regarding to the above-mentioned research questions.

H1. Based on the literature review, it is presumable that the relevant counterparts of the e-learning content development ecosystem can be organized into three broad groups. The first is the *project management* knowledge related to the content development e.g. waterfall model, agile principles. The second is the *methodologies* used during the development e.g. constructivism, web development principles. The third is the scientific areas related to *organizational knowledge*, e.g. knowledge management.

H2. In contrast to the traditional, narrow approach of the e-learning content creation is not just about curriculum development, but is broadly interpreted as an ecosystem, some of the *wicked* organizational problems of large entities can be addressed in the *field of the human resources management*.

H3. I believe that the ecosystem approach of the e-learning content development can be methodologically supported. From this point of view, we can achieve results through *design cycles* with *optional point of entries* and with continuous feedback within the *framework of the design approach*.

H4. I assume that, there is empirical evidence about the broad (ecosystem-based) approach of the e-learning content development which can lead to new *direct and indirect outcomes and impacts* beyond the narrowly defined e-learning content development results.

## 2 Methods applied

In this chapter we shall introduce the methods applied in the investigation of the e-learning content development ecosystem which is the main focus of the present dissertation. The applied research framework, strategies and concrete techniques will be introduced.

To reach my research goals I will apply the “design science” method introduced by Hevner et al (2004) which is a major trend today in the field of ICT research. The dualism that Nemeslaki (2011) emphasized in the case of complex system developments in connection with the business informatics trainings is also relevant here. On the one hand we face *pragmatic questions* and innovative, practical answers provided by ICT teams, while, on the other hand we have the *scientific or theoretical representation* of these problems, which corresponds to the international development of the profession (Sein, Henfridsson, Puroo, Rossi és Lindgren, 2011). The design approach and the applied research are very closely related to the world of education as well. The design experiments Schoenfeld (2006) conducted for 10 years led him to the conclusion that methodological experiments on laboratory study always yielded very different results when repeated in a practical, classroom environment. He emphasizes that such studies need not be conducted in laboratory settings at all, since only practical situations will provide appropriate research results. Design Science Research (DSR) seems to be aligned with one of our research objectives, that is, to identify an innovative solution that may prove its worthiness on the market by providing good enough solutions. DSR may not be measured



in all its dimensions and raises interdisciplinary questions; however, it may be researched with stringent and objective methods (Sargent, 1991).

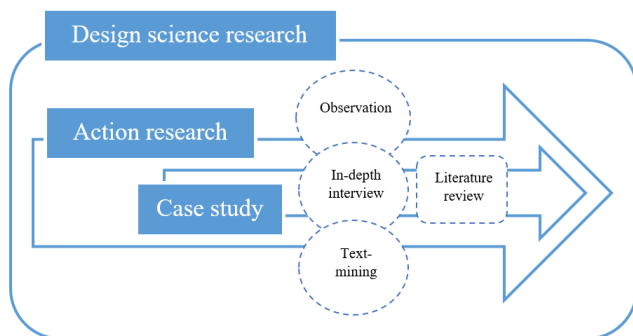


Figure 1. – Summary of research methodology (prepared by the author 2019)

In Figure no. 1. it can be seen how the personal and practical aspects of the dissertation are reflected in the application of the (primarily participative) “*action research*” perspective. Such perspective is for example the cooperative view, the foundation of which is the active participation in the research and development process, but besides such theoretical considerations the research and analysis of practical results is also a very important factor (Csillag, 2016). According to existing literature there is a powerful relationship and mutually supporting aspects between AR and DS (Cole, Puroo, Rossi and Sein, 2005; Järvinen, 2007). Both approaches are proactive and regard the researcher as an actively involved participant of the research. Although the authors identify certain epistemological differences, both applied methodologies are built on pragmatic foundations in terms of

research and the approach of problems. I also wish to apply this practice-focused perspective and integrate it into the methodological framework of the present paper, while observing the stringent research framework and conditions as defined by DS.

The “*case study*” method is closely related to the research methodological approaches outlined above and as it can be applied with a different focus depending on the research perspectives, it very well complements the holistic AR perspective adopted by this present study. When it comes to CS-angled research, it is essential to observe and analyze the situation, seek to answer questions of “how” and “why”. However, in itself (and without knowing the environment) the research does not offer, or seek, a solution; rather it means a systematic investigation in a practice-oriented subject matter (Benbasat, Goldstein and Mead, 1987; Yin, 1984; Zolnai, 2016).

For question RQ1 I have extensively read existing literature on the subject, analyzed texts and performed action research; for RQ2 I have performed in-depth interviews, nested problem solving, and case-study processing (mindmap). When answering RQ3, I once again turned to the results of the in-depth interviews; besides I performed action research (documentation processing, empirical experience) and read existing literature extensively. I sought to answer RQ4 through action research strategy and my tools were text mining and in-depth interviews.

## 3 The findings of the dissertation

### 3.1 Identifying associated fields

There are several fields the knowledge and results of which are integral parts of e-learning content development. Without this knowledge, development would certainly have deficiencies. The in-depth analysis and description of the above summarized fields are well beyond the scope of the present dissertation, but I think it is of importance to briefly review these connecting fields. I did not use my own professional experience only when attempting to involve the associated fields. I applied a text analytical procedure to decide which fields prove to be relevant for my research. Thus I answer the first research question (RQ1). I have identified these fields with a methodology based on keyword analysis (Nemeslaki, 2018). On the one hand I used Laurence Anthony's AntConc<sup>1</sup>, a freeware corpus analysis toolkit for concordancing and text analysis. On the other hand, I used VOSViewer<sup>2</sup> visualization software.

Based on the results of the two investigations I identified the following categories: *methodological topics, publications concerning organizations or environment, the analysis of technological issues*. Interestingly, healthcare was the one professional field most often mentioned in the articles.

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<sup>1</sup> <http://www.laurenceanthony.net/software/antconc/>

<sup>2</sup> <http://www.vosviewer.com/>

Besides text-analysis, I also reviewed existing literature on the subject (Adkins, Parsons and Greer, 2017; Blackburn, 2016; Hung, 2012; Molas-Castells and Fuertes-Alpiste, 2018; Tibaná-Herrera, Fernández-Bajón and De Moya-Anegón, 2018; Zawacki-Richter, 2009) and I have found that the following fields are relevant if one wants to understand the ecosystem of the e-learning content development:

- a) *project and software development management,*
- b) *learning content development and methodology,*
- c) *knowledge management and organizational innovation.*

### **3.2 Identified problems**

In order to identify the problems, I have made use of findings and observations of the projects described in the dissertation. The most important of these were the results of a DS-approached problem exploration and solution-finding project linked to a development called “Field specific basic and product knowledge”. Furthermore, I carried out 12 in-depth interviews with mid-level and senior managers from the HR or the Training departments of the organizations I came to know through the projects, and in part with professionals working in the field of e-learning. I also incorporated this knowledge in the results as they took shape while I was creating the mind-map.

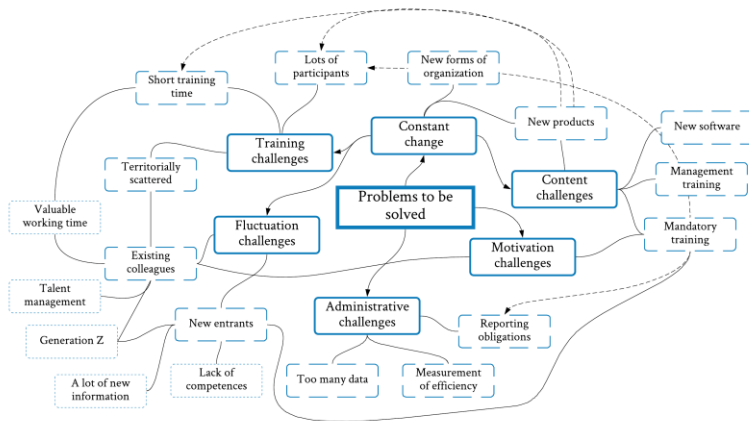


Figure 2. – Problem map of organization development and operation (prepared by the author 2019)

During the analysis I created six major problem categories as seen in Figure no. 2.: 1. training challenges, 2. fluctuation challenges, 3. administrative challenges, 4. motivational challenges, 5. content challenges, 6. continuous change. These major categories constantly affect one another which is also represented by the fact that problems identified on the second level are often interconnected (dashed line arrows). Because of the focus of the dissertation I represented such problems and challenges in this figure that have a direct or indirect relationship to e-learning content development. Apart from these, many other questions need to be answered in the case of large organizations.

### 3.3 The “five cycles” learning content development procedure

To construct the new, five cycles (5C) learning content development I used the experience gained from the projects that were

introduced in detail as case studies, as well as the conclusions of the in-depth interviews and the secondary literature on the design perspective. I have created the new procedure by synthesizing these research elements.

The following table (No. 1.) contains the summary of the cycles and the most important information about them.

<b>Phase</b>	<b>Connecting cycles</b>	<b>Key-roles</b>	<b>Result-product(s)</b>
<b>knowledge acquisition, exploration</b>	key player cycle	learner	research report
<b>understanding, realization</b>	concept cycle	e-learning professional	learning content development concept
<b>design, planning</b>	design cycle	e-learning designer	prototype(s)
<b>application, production</b>	learning cycle	production manager	learning content (current version)
<b>measurement, preparation</b>	evaluation cycle	learner	research report

*Table no 1. – Summary of the e-learning content development process (prepared by the author 2019)*

### **3.4 Direct and indirect impacts**

Following the exploration of problems and the construction of a solution, the next major step of DSR is the evaluation, which is a critically important factor among the DSR guidelines. The research question (Q4) focuses on the direct and, beyond that, the possible indirect impacts of the learning content developed as a result of the research. Below, I will discuss these impacts. In doing so, I rely on in-depth interviews with professionals, my own observations and on

evaluations written by the students of “product-specific” learning content specifically developed for screens.

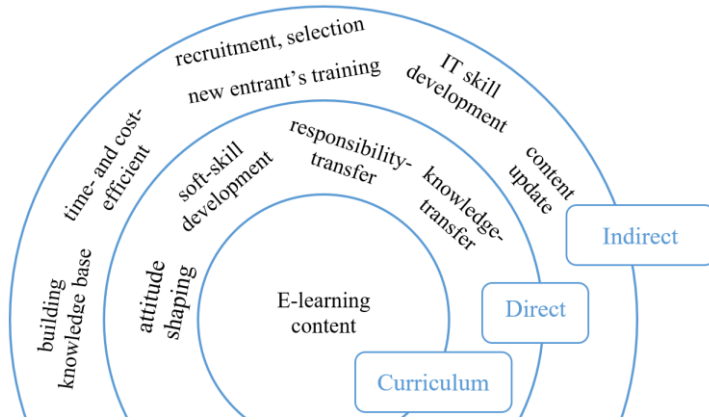


Figure 3. – The impacts of the learning content development (prepared by the author 2019)

In figure no. 3. I summarize the direct and indirect impacts of the development process and present the major findings. These show that the e-learning content development provides knowledge directly about the developed content; however, if we are talking about perspective management or soft skills development, the indirect impact will be linked to those areas. It is also important to observe the indirect impacts. Generally speaking, through the development and organization of the learning content a knowledge base will be created which is available after the training period so employees can return to it any time. It is most important for software simulation learning contents, since, as I9. pointed out in the interview, there may be several instances when an employee

hardly ever uses a function (e.g. holiday management) and needs to brush up his knowledge. They can watch the learning content again without having to ask for help from their line managers or the customer service. Similar impact can be observed in the case of learning content aiming to transfer legal knowledge. It is always again a content which employees do not need to know in its entirety. Searchability was also important, so the elements of knowledge can be accessed for later reference. Another general impact is that the trainings scattered in time and place become more time- and cost-efficient, although if we take into consideration the development costs, it takes years for the investment to return. Where employees are allowed (or encouraged) to learn outside working hours, it is worth considering that there is no lost time, which is an important factor when calculating the ROI. Another general observation is that trainings containing basic knowledge made the onboarding process simpler and faster for the newly hired (I7.), which, in turn, impacted recruitment and selection processes. In organizations where general knowledge of IT devices is low, as one of my respondents (I6.) pointed out, the introduction of e-learning content generally improved the IT skills of the employees. In the case of perspective management material or content to develop soft skills, the impact beyond acquiring the knowledge is hopefully self-evident and it was also confirmed by I6. Typically, the impact of blended type trainings was also accentuated in this case. Another impact of these trainings, as it was mentioned by respondents I2. and I7. is that these are positive incentives for the employees and therefore they are easier to retain. If



the organization pursues licensed activities, the acquisition of the learning content by the employees may directly impact sales (18.).

### **3.5 Recurring experience**

Presenting the practical results of the research is an important part of DSR (Hevner et al., 2004), therefore I summarized the principles of the “*e-learning by design*” as they were formulated in the dissertation. I also provide a general vision and practical advice for the research of the ecosystem of the e-learning content development. The eight principles are as follows:

1. A positive attitude and appropriate organizational culture is an imperative for efficient learning, therefore managerial commitment is indispensable.

2. It stands in the case of e-learning material too, that the content is of utmost importance. The developers need to present content that is relevant, can be taken in well and easy to understand in front of a screen.

3. Even though the content is the most important part, we must understand that even the best possible content may be insufficient without Learning Management Systems (LMS) and Learning Content Management System (LCMS) (Nemeslaki, 2011c).

4. It is essential to note that the learner- and content-centred learning materials create an alloy and a synergy of technological and methodological elements. Their design also motivates learners to participate.

5. The learning contents in a (particular) learning environment can be parts of a learning and teaching toolkit that can be complemented with other services, such as communicative or collaborative functions creating a so-called mashup learning environment (Auinger et al., 2009).

6. Good e-learning contents are learner- or content-focused and the three characteristics of e-learning trainings: fresh, mixed and blended.

7. Creating mixed contents means the application of various methodological and technological solutions to reach our educational goals.

8. I would like to highlight the importance of the blended approach. In order to attain the educational goals, we must take into account several digital content elements and methodological considerations that view e-learning content as a tool and actively involve the teacher, trainer, tutor as the persons best fit for the educational purpose.

## **4 Summary of conclusions**

Now I would like to summarize the scientific results which I see verified in the light of the hypotheses presented in the dissertation.

T1: During text-analysis and literature review, I identified those areas that provide an essential basis and framework for the ecosystem of the e-learning content development. These co-areas include project and software development *management*, pedagogical and technological

*methods* for content creation, and the *scientific areas* of knowledge management and organizational innovation.

T2: By analyzing the projects in detail and with the results of the in-depth interviews, I identified 23 problems, which I classified into 6 problem groups. Among these problems we also can find *wicked problems*. Which can be managed by the ecosystem-based content development approach.

T3: During design cycle, I defined the ecosystem of e-learning content development and creation by designing a unique *five-cycle process*, identifying and analyzing the key stakeholders and development tools, and defining the products. These results were supported by observations, interviews, and in-depth literature review along the action research strategy.

T4: In the course of the evaluation of the results, with the help of in-depth interviews, observations and text-mining research, I find 4 direct (eg. realized knowledge transfer) and 6 indirect (eg. obsolete content updates) impact and/or effect related to the development of the e-learning curriculum. These effects even related to wicked problems.

T5: Based on the literature review, the in-depth interviews and empirical observations, I summarized the *e-learning by design* approach, which consists of providing practical insights and advices that on the one hand can ensure the content creation meets the technological and methodological requirements of learning in front of a screen. And on the

other hand, also provides the learning outcomes expected by the stakeholders.

Starting from the abstract examination of scientific peer-areas in the dissertation, I have summarized the characteristics and practical specifics of the *student- and content-centered* e-learning curricula. I also described the design and development model of the *five-cycle content creation* process. I summarized the practical results by defining the *e-learning by design approach* that harmoniously integrates ideas related to the methodological and technological questions about the e-learning curriculum development.

The dissertation is intended to be a step in the broad discussion about an ICT based development, in this case the e-learning content development. How the e-learning content creation contributes to the efficiency of a large organizations? How is it integrated to the institutions' environments? The in-depth exploration of these questions is challenging and exciting. The purpose of these studies may be to integrate the training vision into the strategy of the organizations and to align the training strategy with the core objectives of the company to become a learning organization.

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## **6 The author's publications on the subject**

### **6.1 Referenced journals**

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### **6.2 Studies published in a book, book chapter or conference paper**

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