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A Text Mining Approach for Extracting Lessons Learned from Project Documentation: An Illustrative Case Study

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Lessons learned are important building blocks for continuous learning in project-based organisations. Nonetheless, the practical reality is that lessons learned are often not consistently reused for organisational learning. Two problems are commonly described in this context: the information overload and the lack of procedures and methods for the assessment and implementation of lessons learned. This paper addresses these problems, and appropriate solutions are combined in a systematic lesson learned process. Latent Dirichlet Allocation is presented to solve the first problem. Regarding the second problem, established risk management methods are adapted. The entire lessons learned process will be demonstrated in a practical case study.

Keywords: project knowledge management, project documentation, lessons learned, text mining

Introduction

Lessons Learned (LLs) can be described as key experiences (e.g., failures or success factors) that have a specific business relevance for correcting future behaviour in a positive way (Jugdev, 2012; Kotnour & Kurstedt, 2000; Weber, Aha, & Becerra-Fernandez, 2000; von Zedtwitz, 2002). By their very nature, LLs are therefore particularly important building blocks for continuous learning in constantly evolving project-based organisations (Boh, 2007; Disterer, 2002; Jugdev, 2012; Kotnour, 2000; Navimipour & Charband, 2016; Schindler & Eppler, 2003; Williams, 2007). A corresponding LL process has the specific purpose to support the acquisition, archiving and the targeted reuse of the key experiences gained during completed projects in planning future projects (Disterer, 2002; Keegan & Turner, 2001; Middleton, 1967; Parnell, Von Bergen, & Soper, 2005). The aim is to avoid repeating already made mistakes or solving problems that have already been solved in previous projects. In this context, several studies show that the consistent reuse of this wealth of experience can have a positive influence on performance in projects (see, e.g., Hong, Kim, Kim, & Leem, 2008; Kululanga & Kuotcha, 2008).

Nonetheless, the practical reality is that LLs are often not consistently reused for organisational learning and for the necessary modification of existing policies, procedures or tasks in project-based organisations. Several research studies have proven that historical key lessons often remain disregarded in future projects, even if such evidence is codified in LL documentation and has been made available in public knowledge databases for project managers (see, e.g., Almeida & Soares, 2014; Carrillo, Ruikar, & Fuller, 2013; Duffield & Whitty, 2015; Newell, Bresnen, Edelman, Scarbrough, & Swan 2006; Williams, 2007). In this context, two problem areas are commonly described in studies on the reuse of LLs. First, the archives of mostly text-based LL documentation are too extensive to manually identify and summarise the relevant knowledge by project employees with reasonable effort (Barclay & Osei-Bryson, 2010; Choudhary, Oluikpe, Harding, & Carrillo, 2009; Haksever, 2001; Newell et al., 2006; Menon, Tong, & Sathiyakeerthi, 2005). This problem of information overload (see Haksever, 2001) becomes even more obvious when one looks at large project-based organisations where several hundred projects are often being carried out in parallel and at least as much project documentation is being archived (see Prencipe & Tell, 2001). Several researchers therefore emphasise the need for computer-aided techniques that can process the comprehensive, mostly textual inventories of documents and can identify, query and also summarise the knowledge that is relevant for the respective project task (Al Qady & Kandil, 2013; Choudhary et al., 2009; Menon et al., 2005). The second problem with the consistent reuse of LLs is that even when LLs have been identified and the project manager is aware of them, they are rarely implemented effectively into an organisational learning process (see Almeida & Soares, 2014; Barclay & Osei-Bryson, 2010; Newell et al., 2006). In this regard, Newell et al. (2006) were able to determine a general lack of awareness of the existence and the actual value of the knowledge contained in project documentation. Furthermore, Barclay and Osei-Bryson (2010) also make the critique here that appropriate assessment and subsequent implementation of LLs into project planning practices often lie with the intuitive judgements made by the individual project manager, influenced by his or her subjective opinions, experience, diligence or care. However, in order to learn consistently from the collective experience of project-based organisations, project management methods and appropriate LL processes are required to ensure that LLs are not only recorded, but are also properly assessed and consistently utilised in future projects (see Fosshage, 2013; Weber, Aha, & Becerra-Fernandez, 2001; Wellman, 2007; Williams, 2007).

The two problem areas described above are evident in the project management practice and research. Conventional project management guidelines, such as the PMBOK® guide or the PRINCE2 framework (see Project

Management Institute, 2013; Office of Government Commerce, 2009), reinforce the importance of reusing historical LLs in future projects, but they do not provide any concrete recommendations for extracting them from the extensive knowledge repositories for assessment (see also Duffield & Whitty, 2015). The present work addresses these problem areas, and appropriate solutions are combined in a LL process containing the semi-automatic extraction of LLs, their assessment and implementation. The ultimate goal is to contribute to the further development of dealing with LLs in project-based organisations. For this purpose, Latent Dirichlet Allocation (LDA) is presented in relation to the first problem described above. Regarding the second problem, risk management processes and methods are adapted and subsequently implemented in the assessment and implementation of the previously extracted LLs. For a better understanding, the entire LL process will be demonstrated and evaluated in an illustrative, practical case study. This case study demonstrates how 13 meaningful LLs are extracted from a textual database consisting of a total of 68 sets of project documentation. The extracted LLs will then be assessed and implemented by means of established risk management tools.

This article is structured as follows: the second section describes the essence of LL processes in project-based organisations. The third section presents the design of the proposed LL process. The fourth section contains the demonstration of the LL process in a practical case study. The fifth section provides a final discussion of the contributions, implications and limitations of the proposed approach.

Lessons Learned Processes in Project Environments

Project-based organisations are characterised by the fact that essential business functions of a company are not actually carried out in a rigid functional organisation, but rather executed in unique, temporary and interdisciplinary projects (see Middleton, 1967). In such a constantly evolving project environment, LLs play a central role in organisational learning (Disterer, 2002; Jugdev, 2012; Kotnour, 2000; Schindler & Eppler, 2003; Williams, 2007). To be able to understand LL processes in project-based organisations, it is helpful first to understand the fundamental nature of a LL as such. A common definition of LLs was formulated by the American, European, and Japanese space agencies (Secchi, Ciaschi, & Spence, 1999, as cited in Weber et al., 2001):

> A lesson learned is a knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative, as in a mishap or failure. Successes are also considered sources of lessons learned. A lesson must be significant

> in that it has a real or assumed impact on operations; valid in that
> is factually and technically correct; and applicable in that it identifies
> a specific design, process, or decision that reduces or eliminates the
> potential for failures and mishaps, or reinforces a positive result.

Two central understandings of LLs can be derived from this definition. First, LLs deal with valid, correctly represented experiences (positive as well as negative) that have a significant influence on existing business operations. Consequently, LLs must be assessed in project management practice for validity, correctness and significance. Second, LLs are designed for consistent reuse in future endeavours. Therefore, LLs must be immediately usable and applicable within their own specific practical environment. This requires first a systematic identification of relevant LLs and then also a consistent implementation in their respective business functions. In general, these tasks are performed in the discipline of project knowledge management (see Handzic & Bassi, 2017; Hanisch, Lindner, Mueller, & Wald, 2009; Oun, Blackburn, Olson, & Blessner, 2017). Corresponding knowledge management processes support the project managers during the identification and creation of relevant knowledge, the transfer and sharing of knowledge and, finally, the acquisition and implementation of helpful knowledge in the planning of new projects (Gasik, 2011; Navimipour & Charband, 2016).

To ensure consistent reuse of LLs in accordance with the understanding presented here, formalised, i.e. standardized, processes are necessary for the purposes of project knowledge management (see Fosshage, 2013; Herbst, 2017; Weber et al., 2001; Wellman, 2007; Williams, 2007). A comprehensive definition of such a LL process is provided by Weber, Aha, Muñoz-Ávila, & Breslow (2010, p. 39): 'Lessons learned (LL) processes [. . .] are knowledge management (KM) solutions for sharing and reusing knowledge gained through experience (i.e., lessons) among an organisation's members.' A more specific definition is given by Fosshage et al. (2016, p. 25): 'A lessons learned process describes the tools and practices whereby information about experiences (lessons or good practices) is collected, verified, stored, disseminated, retrieved for reuse, and assessed for its ability to positively affect organisational goals.' The tools and practices used in such a process can take various forms (see Weber et al., 2010), with differences being recognised in principle between organisational components (e.g., responsibilities, work instructions, organisational culture) and technological components (e.g., information and communications technology, knowledge databases, intelligent expert systems). Fosshage et al. (2016) describe a LL process at Sandia National Laboratories, where an electronic LL database forms the basis of the LL process. In this database, LL documentation is prepared from the LL owner and is saved according to a prede-

fined taxonomy. An organisational control board checks the corresponding entries and ensures that the LLs meet a certain standard of quality and then distributes them within the organisation. Project team members and special LL analysts should then access the stored documents, search for and interpret the relevant LLs and, if valuable, direct them into the planning of new projects. Weber et al. (2010), as another example, propose an intelligent lessons learned process that facilitates LL reuse through a specially developed representation that highlights reuse conditions for decision-making tasks.

The typical LL processes, like the example here demonstrates, usually focus on the first steps of the process, i.e. the acquisition, storage, distribution and retrieval of LL contents. The steps entailing the summary of relevant LL content (i.e., reading, interpreting, and synthesizing comparable findings into meaningful LL), as well as their assessment and final implementation into project planning practices, are mainly the responsibility of the project manager and are left up to his or her individual discretion. The approach described in this paper addresses these steps by first proposing a solution for the computer-aided, semi-automatic extraction of LLs from large collections of LL documentation, and then recommending a tool set for subsequent assessment and implementation of the extracted LLs.

Methodology

Lessons Learned Process

The goal of this article is to contribute to the further development of dealing with LLs in project-based organisations. A solution will be presented for the semi-automatic extraction of LLs and their subsequent assessment and implementation. Other typical tasks in LL processes, such as the steps of codifying and storing the LLs in databases, are not being considered here.

The conceptual framework for the proposed LL process is provided by the established COSO (Committee of Sponsoring Organizations of the Treadway Commission) framework for enterprise risk management (see Moeller, 2011), which also has parallels to typical project risk management cycles (see, e.g., Chapman & Ward, 2003) but is less complex and therefore more suitable for the purposes of pragmatic LL handling. A central assumption is that LLs (i.e., positive or negative experiences) can basically be handled the same as risks (or opportunities). The process (including the tools and methods used) is illustrated in Figure 1. It includes the following sub steps:

- Semi-automatic extraction of LLs from a collection of textual project documentation using Latent Dirichlet Allocation (LDA).
- Assessment of LLs (assessment scale development, LL assessment, LL interaction assessment, LL prioritization) using risk management
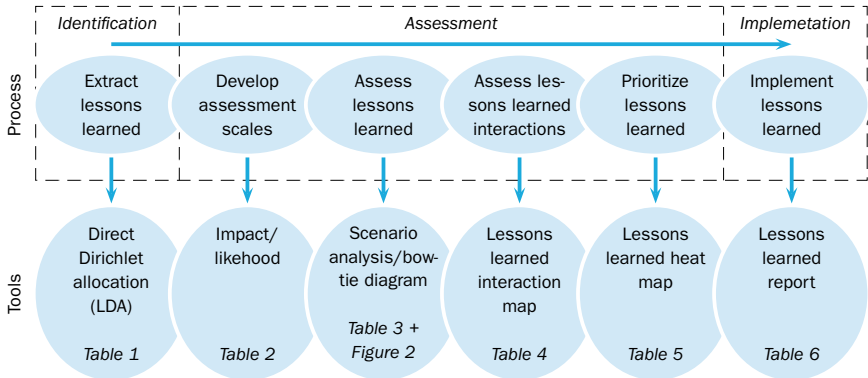
Figure 1   Process for LL Identification, Assessment, and Implementation

tools (i.e., scenario analysis, bow-tie-diagram, LL interaction map, LL heat map).
• Implementation of LLs into the project design using a LL report.

The application and practicability of the proposed approach is illustrated and evaluated below in a practical case study. The case study demonstrates the LL process in the context of an e-business project, which includes the conception, development and implementation of an online shop. The goal is to screen a collection of LL documentation for relevant LLs and then to assess and incorporate them into the conception phase of the project.

Latent Dirichlet Allocation

A key contribution of this article is to demonstrate a semi-automatic solution for the extraction of LLs from large textual databases. In order to efficiently handle the large volume of documentation that can be found in normal project-based organisations, computer-aided text analysis is indispensable (Al Qady & Kandil, 2013; Choudhary et al., 2009; Menon et al., 2005). Against this backdrop, this article follows the idea of incorporating text mining approaches into the LL process. 'Text mining' can be understood as an umbrella term for a whole range of techniques for the computer-aided discovery of useful knowledge in texts (see Fan, Wallace, Rich, & Zhang, 2006). In this context, the Latent Dirichlet Allocation (LDA) is a specific text mining technique that allows the exploratory summarisation of large textual databases (see Blei, Ng, & Jordan, 2003; Blei, 2012). The LDA algorithm applies statistical analysis to extract the probability of co-occurring word patterns (i.e., correlating words regularly occurring together), which can be interpreted as latent topics hidden in the underlying corpus of documents. The underlying assumption of this probabilistic topic modelling

method is that each document is made up of a particular composition of a few topics and that a characteristic set of specific words (vocabulary) can be assigned to each of these topics. Based on this assumption, it is the statistical task of the LDA algorithm to estimate the probability distribution with which certain topics, each with specific word bundles, are to be found in the underlying collection of documents (0% = the discussion of a topic is missing from a document entirely; 100% = a document discusses only one specific topic exclusively). Using this method, such topics can be used for the exploratory summarisation of large textual databases by identifying the statistically most probable co-occurring words and interpreting these word bundles in combination. A simplified example: The co-occurring terms 'data,' 'exchange,' 'security,' 'client,' 'employee,' 'access,' 'digital,' and 'computer' can be interpreted collectively as the topic 'data security.' Likewise, each document is assumed to be composed by a specific set of such topics and, therefore, specific documents with the thematic content of 'data security' can be grouped together.

LDA is particularly suitable for the purposes of this article, because this exploratory technique is able to solve the problem of information overload in project-based organisations by mostly automating the knowledge discovery and summarisation of textual project documentation, which is very difficult or impossible to deal with manually. The practicability of this technique for extracting semantically meaningful topics from a large corpus of texts has already been proven in several studies (see, e.g., Chang, Boyd-Graber, Gerrish, Wang, & Blei, 2009). In addition to the demonstration of a LDA study in the following case study, the comprehensive tutorial of this technique in Debortoli, Junglas, Müller, and vom Brocke (2016) can be recommended as a supplement.

Demonstration

Lessons Learned Extraction

In the first step of the LL process presented here, meaningful LLs should be extracted from a larger text database using LDA. The typical implementation of the LDA technique involves the following steps (see also Debortoli et al., 2016): (1) compiling and preparing the textual database; (2) defining the number of topics to be extracted; (3) preparing the text data in the context of pre-processing; and (4) interpreting and titling the extracted topics. In the following, the individual steps are described in more detail.

1. *Compilation and preparation of the textual database.* In total, a collection of 68 post-project reports from previous e-business projects (i.e., conception, development, and implementation of online shops) was available for this case study. The authenticity, credibility, represen-

tativeness and meaningfulness of the documentation was checked prior to being used. Since the results of the LDA essentially depend on the contents of the database to be summarised, the database must be thematically specified, which ensures the exclusive extraction of LLs and thus also guarantees the significance and validity of the results. For the purposes of this analysis, only the LL sections of the documents were exclusively selected (i.e., the discussion of positive and negative experiences; each between 0.25–1.50 pages long). Other contents contained in the project reports (e.g., general project descriptions, cost statements or technical details) were excluded from the analysis. To put the text data into a format more efficiently analysable by a computer, the text content was transferred to a relational database consisting of the document number and LL description.

2. *Definition of the number of topics to be extracted.* The database was then read into a text mining tool and prepared for analysis (the cloud-based tool MineMyText – minemytext.com – was used for the LDA application). In the first step, an adequate number of topics to be extracted must be determined. One recommendation here is to evaluate different numbers of topics in iterative test runs (see Debortoli et al., 2016). To evaluate the significance of the topics generated during the test runs, the general recommendation is to assess the individual topics on whether they provide a meaningful statement that is useful for the issue to be analysed and that is also coherent. Based on the available database, a variant with 13 topics to be extracted gave the most promising results. Relevant topics would be lost in a variant with fewer topics, and a variant with more topics would not lead to meaningful topics or would lead to duplicates. The corresponding evaluations were carried out by two analysts (one of the authors of this article and a project manager). Differences were discussed, and final decisions were agreed upon by consensus.

3. *Preparation of text data in the context of pre-processing.* In the next step, the database must be processed, i.e. cleaned, to ensure proper accuracy of the results. The goal of this pre-processing is to remove as much 'statistical noise' from the text data as possible. This process includes several steps. A tokenising process is carried out first. In this process, the database of the text descriptions is disassembled into separate, individual words, and these are assigned to the corresponding documents. Next, general stop words were removed from the database, i.e. words that do not carry meaning and thus do not contribute anything to interpretable topics (e.g., 'and,' 'or,' 'this'). The

analysts also defined special stop words that would not provide any added value to the analysis (e.g., the words 'lesson' or 'learned'). The technique of lemmatisation was also used to reduce to a basic form different variants of a word that were nonetheless identical content-wise (e.g., 'plans,' 'planning,' or 'planned' to their dictionary form 'plan'). This process reduces the complexity of the database for the subsequent statistical calculations.

4. *Interpretation and titling of the extracted topics.* Thirteen topics were extracted using the LDA algorithm, each topic consisting of bundles of most likely co-occurring words (see Table 1). The combined interpretation of these commonly associated word bundles makes it possible to title concrete LL issues. This interpretation was again carried out independently by two analysts and appropriate titles were then agreed upon by consensus. A specific example of this kind of interpretation and titling: Topic #4 contains the correlated words 'supplier,' 'order,' 'procurement,' 'online,' 'purchase,' 'company,' 'eprocurement,' and 'process,' which in combination can be interpreted and titled as the topic 'e-procurement.' Because this subject was extracted from a database that consists exclusively of text discussions of LLs of earlier e-business projects, this means that the importance or difficulty of e-procurement regularly seems to play a central role in such projects, and consideration of this fact should therefore be significant and applicable in comparable future endeavours. According to the definition of a LL in the second section, the necessary requirements in this example are thus fulfilled (= a lesson should be significant, valid, technically correct, and applicable). Other LLs extracted from the database include, for example, topics on system integration (topic #3), data security (topic #5), and supplier collaboration (topic #12). The last column contains the probabilities of the topics (the higher the probability, the more the documentation discusses these facts), which may be helpful in the next phase of the LL assessment, when these LL facts are specified, reflected, and prioritised.

Assessment Scale Development

To be able to assess and compare the extracted LLs consistently, a form of quantitative assessment is needed. Without the appropriate measurement scales, LLs can only be assessed and prioritised according to qualitative criteria and, finally, according to the subjective judgement of the individual project manager.

Typical assessment scales used in risk management include 'Impact' and 'Likelihood' (Moeller, 2011). 'Impact' represents the potential conse-

Table 1 Extracted LL from the LDA

#	Topic Title	Keywords (excerpt)	Probability
1	Project scope & planning	Solution, system, implementation, project, process, cost, time, change, customer, data, key, business, result	3.1%
2	Customer demand management	Customer, solution, system, offer, service, order, range, option, delivery, business, case	8.0%
3	System integration	Solution, system, software, integration, online, shop, eshop, erp, catalogue, product, launch, standard	2.9%
4	E-procurement	Supplier, order, eprocurement, purchase, online, company, procurement, process, support	7.7%
5	Data security	Client, access, exchange, security, employee, knowledge, digital, obtain, data, computer, stock, product	2.9%
6	Business chain & logistics	Business, chain, creation, supply, process, logistics, company, product, tool	7.5%
7	Customer relationship management	Service, crm, mobile, communication, application, experience, exchange, support, data, time	4.4%
8	Digitalisation potential	Process, cost, saving, document, electronic, interface, reduce, potential, supplier, invoice	1.3%
9	E-business strategy alignment	Company, internet, ebusiness, case, technology, trade, market, position, success, management, industry, cost, sale	25.2%
10	Software and platform usabillity	Employee, launch, function, user, software, platform, connect, requirement, advantage, benefit, clear, simple, difficult	3.9%
11	Electronic payment	Ebusiness, introduction, payment, card, online, pay, activity, distribution, transfer, channel, cost, impact	4.3%
12	Supplier collaboration	supplier, collaboration, erp, portal, trust, full, communication, define, workflow, advantage	11.8%
13	Stakeholder management & communication	project, partner, stakeholder, success, factor, process, network, invole, information, management, team, party, important	5.5%

quences of an identified LL not being implemented (i.e. the non-occurrence of a positive effect) or of its occurrence not being prevented (e.g., the recurrence of a problem). 'Likelihood' represents the probability that the consequences of a LL can be expected. A scale of 1–5 provides the basis for quantitatively comparative assessments. Sample scales are shown in Table 2. The assessment variables (qualitative/quantitative) for the concrete definition of the scale levels can vary depending on the company and project, and must be defined individually. An impact level of 5 would be reached in this case study if the targets of the project (e.g., time, quality or outcome) were fatally exceeded and the project was certain to be can-

Table 2   Assessment Scales

	Rating	Descriptor	Definition (examples)
Impact scale	5	Extreme	Project targets cannot be achieved (> 30%); certain project cancellation; game-changing loss of market share; extreme impact on stakeholders; multiple senior leaders leave and high turnover.
	4	Major	Major deviation from targets (20% up to 30%); possible project cancellation; major loss of market share; significant impact on stakeholders; key employees leave and high turnover.
	3	Moderate	Moderate deviation from targets (15 up to 20%); project delay; moderate loss of market share; moderate impact stakeholder; widespread staff morale problems and increase in turnover.
	2	Minor	Minor deviation from targets (10% up to 15%); minor loss of market share; minor impact on stakeholders; minor staff morale problems.
	1	Incidential	Calculated deviation from targets (5% up to 10%); no relevant loss of market share; no or minor impact on stakeholders; isolated staff dissatisfaction.
Likehood scale	5	Almost certain	Almost 90% or greater likelihood of certain occurrence in a project
	4	Likely	Likely 65% up to 90% likelihood of occurrence in a project
	3	Possible	Possible 35% up to 65% likelihood of occurrence in a project
	2	Unlikely	Unlikely 10% up to 35% likelihood of occurrence in a project
	1	Rare	Rare <10% likelihood in a project

celled. In this context, a 'Likelihood' of 5 describes a high probability of 90% or more for the occurrence of this impact.

Lessons Learned Assessment

In risk management, one of the main tasks is assessing potential risk impacts in the context of scenario analysis (Raz & Michael, 2001). The same understanding should also apply to LLs. In the present case study, the 13 extracted LLs were independently assessed and discussed along the 'Impact' and 'Likelihood' scales by two experts (see Table 3). The assumptions from the respective scenarios were based on the evaluation of past values from comparable projects and estimates. The probability distributions of the extracted topics also supported the assessment of the distribution of the individual LL facts. Furthermore, a closer examination of individual project reports assigned to the different LLs with a high probability supported this assessment as well. For example, LL #3 stands for the fact that the integration of the various systems into the online shop platform (e.g., content

Table 3 Scenario Analysis

#	Scenario Description	Detailed Assumptions	IR	LR
1	Project scope (time, cost, capacity, . . .) is underestimated and not met	Deviation from time schedule (up to 20%) Cost overruns (up to 15%)	2.5	2.0
2	Customer demand (offer, product range, . . .) and needs (services, . . .) are not met	Potential decrease in market share of 10% Lack of customer orientation and damage in reputation	4.5	3.0
3	System integration difficulties and disruptions	Extended implementation and testing phase (+ 2 weeks) Need for experts n and increase in capacity (+ 8.500$)	2.0	1.5
4	e-Procurement process inconsistencies and disruptions	Delivery problems and disruptions Loss of sales due to delivery problems (−x$)	3.5	2.0
5	Data security breaches	Reputational damage and loss of trust Loss of customers and loss in market share of 15%	4.5	2.5
6	Problems in the business chain and logistic problems	Delivery problems and disruptions Loss of sales due to delivery problems (−x$)	3.0	2.5
7	Customer relationship management (CRM) is inappropriate	Reputational damage Loss of customers (10%) and loss in market share of 5%	2.5	1.5
8	Digitalisation potential (e.g., cost savings) is not fully exploited	Data inconsistencies and data transfer problems Manual reworking and increased process costs (+ 15%)	2.5	1.0
9	e-Business strategy alignment is inappropriate	Inappropriate market penetration strategy Loss of customer (20%) and loss in market share of 15%	4.0	2.0
10	Software and platform usability is inappropriate	User and employee dissatisfaction Loss in market share of 12.5 %	2.0	3.0
11	Electronic payment is disrupted	Disrupted trade and payment functions Reputational damage and loss of customers (10%)	3.5	1.5
12	Supplier collaboration is ineffective	Increased level of problem management Extended implementation and testing phase (+ 2 month)	2.5	4.0
13	Stakeholder management and communication is inappropriate	Dissatisfaction of stakeholders Reputational damage	1.5	2.5

Notes IR – impact rating, LR – likelihood rating.

management system, warehouse management system) caused difficulties and delays (Impact = 2.0; Likelihood = 1.5). The assumption here is that this circumstance is unlikely (10%–20% likelihood of occurrence). However,

if it does occur, it will involve an extended implementation and testing phase (+ 2 weeks) requiring increased capacity (+ 8.500$). The examination of the project reports with the highest probability to contain this topic also supported this definition. Corresponding scenarios were also simulated for the other 12 LLs.

The bow-tie diagram is another potential tool that supports the analyses of the causes and consequences of LLs. The bow-tie method divides the LLs into their individual components (i.e., causal factors and consequences), making it possible to better analyse and understand the complex interrelationships of the LLs. Figure 2 demonstrates this type of analysis on LL #3 (system integration). A trigger event for the occurrence of this issue could be a data security breach, for example, which involves error analysis and error elimination (intermediate event), and ultimately leads to a delay in system integration (end event). The eventual consequences would be that required repairs delay the implementation and testing phase, and create additional costs associated with the expanded capacity.

Lessons Learned Interaction Assessment

LLs usually have interrelations with other LLs. A LL interaction map (see Table 4) covers corresponding networks of relationships with other LLs by placing them opposite each other in a matrix (× indicates a relationship between two different LLs). The knowledge of such relationships, which also includes any possible dependencies or influences, can be relevant when a decision must be made as to whether a LL should be implemented or not. This assessment was performed by analysing the previously constructed bow-tie diagrams and by discussing potential relationships together with experts. For this purpose, workshops with different domain experts can potentially improve the understanding of a LL by combining various perspectives (Moeller, 2011). Table 4 demonstrates that, for example, active consideration of LL #4 (data security) has a direct (positive) effect on LL #3 (system integration). On the other hand, neglect of LL #12 (supplier collaboration) would imply a most likely negative influence on e-procurement activities (LL #4).

Lessons Learned Prioritisation

A LL heat map (see Table 5) can be useful in providing an overview of the current LL portfolio and in precisely prioritising individual LLs. This prioritisation can help in the decision-making process if not all of the LLs can be implemented considering the usually scarce capacities in projects. This heat map combines the previously created assessments of 'Impact' and 'Likelihood' into a matrix and divides the LL portfolio into three visual areas with three different levels of strategic prioritisation. In the present case,
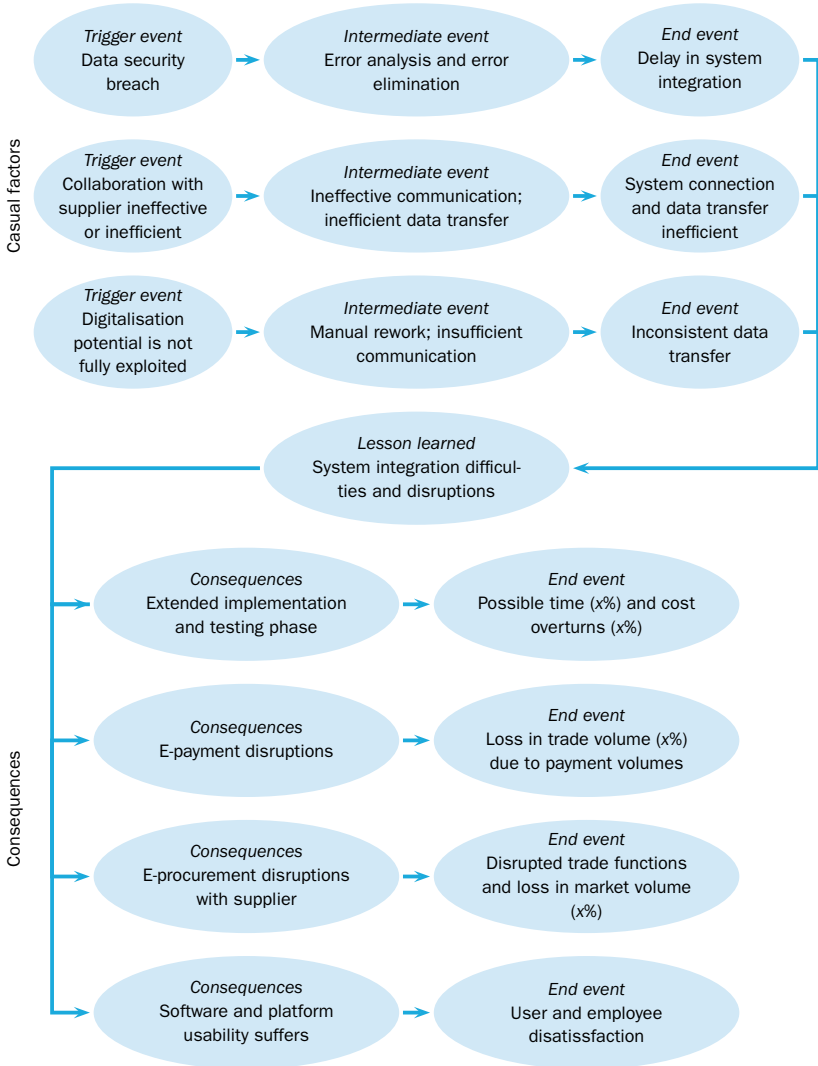
Figure 2   Bow-Tie-Diagram

this will define three groups, with the group that has both LL #2 (customer demand and needs) and LL #5 (data security) having the highest priority for implementation in accordance with the high likelihood of impact.

Lessons Learned Implementation

Reports are usually recommended in the PM guidelines for the implementation of the LLs that have been identified. The PRINCE2 framework pro-

Table 4 Lessons Learned Interaction Map

	1	2	3	4	5	6	7	8	9	10	11	12	13
1		×							×				×
2	×						×		×	×			
3				×	×	×		×		×	×	×	
4			×			×		×					
5			×					×			×		
6			×	×				×	×			×	×
7		×											×
8			×	×	×	×			×		×		
9	×	×				×		×					×
10		×	×										
11			×		×			×					
12			×	×		×							×
13	×					×	×		×			×	

Notes Column/row headings are as follows: (1) project scope, (2) customer demand and needs, (3) system integration, (4) eprocurement, (5) data security, (6) business chain & logistics, (7) customer relationship management (CRM), (8) digitalisation potential, (9) ebusiness strategy alignment, (10) software and platform usability, (11) electronic payment, (12) supplier collaboration, (13) stakeholder management and communication.

Table 5 Lessons Learned Heat Map

#	Lesson learned	IR	LR
1	Project scope	2.5	2.0
2	Customer demand and needs	4.5	3.0
3	System integration	2.0	1.5
4	Eprocurement	3.5	2.0
5	Data security	4.5	2.5
6	Business chain & logistics	3.0	2.5
7	Customer rel. man. (CRM)	2.5	1.5
8	Digitalisation potential	2.5	1.0
9	Ebusiness strategy alignment	4.0	2.0
10	Software and platform usability	2.0	3.0
11	Electronic payment	3.5	1.5
12	Supplier collaboration	2.5	4.0
13	Stakeholder man. and comm.	1.5	2.5
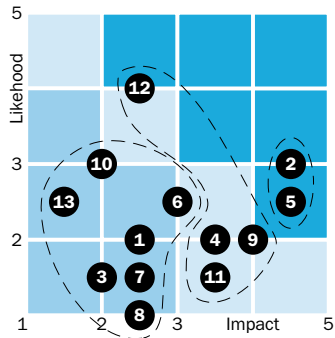
poses, for example, LL implementation in the project planning phase using a so-called 'lessons log,' which collects all the LLs relevant for the current project (Office of Government Commerce, 2009). A similar approach will be pursued in this case with the LL report, which summarises essential information from the extracted LLs and contains the classification in the relevant project phase, as well as recommendations for dealing with each LL (see

Table 6   Lessons Learned Report

#	Stage of project	Subject	IR	LR	Recommendation
1	Project conception & planning	Project scope (time, cost, capacity, . . .) is underestimated and not met	2.5	2.0	Business case, project plan and requirement catalog should be regularly confirmed by project committee and product owner. LL #2 and #10 should be closely reviewed.
2	Project conception & planning	Customer demand (offer, product range, . . .) and needs (services, . . .) are not met	4.5	2.5	Conduct a profound market research. The concept for the online shop should be confirmed by product owner and customer representatives. Key customers should be part of the steering committee. Close alignment with LL #9 is necessary.
3	Project execution: implementation and testing	System integration difficulties and disruptions	2.0	1.5	Plan more capacity for testing of system connectivity and implementation. LL #4 and #5 should be closely reviewed.
4	Project execution: system implementation	e-Procurement process inconsistencies and disruptions	3.5	2.0	Close collaboration with supplier and logistics service provider is necessary. Conduct a project start-up workshop together with suppliers and service providers. Connections to LL #12 should be reviewed.
5	Project execution: system development	Data security breaches	4.5	2.5	Consider extended security functions. External audit of data security aspects should be considered. Review connections to LL #8 and #11.
6	Project execution: system implementation	Problems in the business chain and logistic problems	3.0	2.5	Logistic solutions should be discussed and evaluated together with suppliers and logistics service provider. LL #12 should be taken into account.

Continued on the next page

Table 6). The LL #3 documentation, for example, describes its relevance in the project execution phase (implementation and testing), the defined assessment scales, as well as the recommendations for dealing with this LL (including consideration of the network of relationships).

Conclusions

'Learning [. . .] has to be managed together with the project and must be integrated into project management as standard practice. It has to become a natural experience with projects' (Ayas, 1996, p. 132). Following this recommendation of Ayas (1996), the goal of this article is to contribute to further developments in dealing with LLs in project-based organisations. For this

Table 6 *Continued from the previous page*

#	Stage of project	Subject	IR	LR	Recommendation
7	Project closing: change management	Customer relationship management (CRM) is inappropriate	2.5	1.5	Plan more capacity for customer service during roll-out of the online shop. Additional marketing campaigns. LL #2 and #10 should be closely reviewed.
8	Project conception & planning	Digitalization potential (e.g., cost savings) is not fully exploited	2.5	1.0	Business processes should be evaluated in terms of lean management principles (e.g., waste analysis). Lean project team should be implemented. LL #1 should be appropriately adapted.
9	Project conception & planning	e-Business strategy alignment is inappropriate	4.0	2.0	Carry out a strategy workshop with all necessary stakeholders, guided and moderated by the external consultants. LL #1 and #2 should be adapted accordingly.
10	Project execution: system development	Software and platform usability is inappropriate	2.0	3.0	Include employees and customers into the design phase. Continuous testing of the functionalities through customer representatives. LL #1 should be closely reviewed.
11	Project Execution: system implementation	Electronic payment is disrupted	3.5	1.5	Hire technical experts for designing and testing payment solutions. External audit of data security aspects is necessary. LL #8 and #5 should be closely reviewed.
12	Project planning & execution	Supplier collaboration is ineffective	2.5	4.0	Conduct a project start-up workshop together with suppliers and logistics service provider. A key supplier should be part of the steering committee. LL #4 and #6 are affected.
13	Project planning & execution	Stakeholder man. and communication is inappropriate	1.5	2.5	Stakeholder analysis should be conducted and an appropriate communication established. LL #2, #10 and #12 should be closely reviewed.

purpose, a LL process (including a tool set) is recommended for the semi-automatic extraction of LLs from large collections of project documentation and their formal assessment and implementation in the conception of new projects. Such formalised LL processes are necessary in project-based organisations so that, as expressed by Williams (2007), 'lessons observed' can become 'lessons learned.'

The proposed LL process provides a contribution to project knowledge management practice first by proposing a solution for the computer-assisted exploration of large textual document collections and for efficient extrac-

tion of LLs with the application of LDA. This solution provides the project manager with a tool for overcoming information overload in project-based organisations and the associated time-consuming research in text-based knowledge archives. Another contribution is made with the proposal of a systematic procedure for the assessment and implementation of those LLs that were previously extracted. In practice, this kind of formalised process can help reduce the individual discretion of the project manager and instead promote a standardised evaluation and consistent implementation of relevant LLs. It should be noted here that the individual sub-steps and the application of the individual tools are not sequences that must be strictly adhered to. Individual process steps can be varied as needed or omitted depending on the project or capacity. For example, assessment of the LLs could also be limited to scenario analysis and LL reporting.

The research is provided with development paths. Firstly, a text mining technique is demonstrated for handling extensive text-based collections of knowledge in project management. Computer-aided text analysis reveals generally interesting potentials for (project) knowledge management (see, e.g., Choudhary et al., 2009; King, 2009). Future research efforts should focus on the evaluation of these techniques in project management. Secondly, a further contribution is provided by transferring and applying the principles and methods of (project) risk management to the handling of LLs. The basic assumption here is that LLs represent positive experiences (opportunities) and negative experiences (risks), which also require formalised handling similar to that of project risks. The application of the broad range of risk management procedures and tools (see Raz & Michael, 2001) could drive consistent confrontation with LLs and their implementation and inspire the development of future LL processes.

The proposed approach is of course not without limitations. In particular, the methodology of computer-assisted extraction of LLs from inventories of text documents requires further in-depth evaluations. In this context, aspects of validity, objectivity and reliability must be examined. The following influencing factors to be examined should also be listed here. On the one hand, the influence of the nature and extent of the textual database, consisting of project documentation texts, should be evaluated. A different composition or amount of LL documentation could easily produce different results. On the other hand, the effect of subjective influences in the interpretation of the topics extracted by LDA is a limitation. Although the results were interpreted and discussed by two experts, a subjective bias in the definition of the LL cannot be ruled out, which could particularly affect the objectivity and reliability of the results. For text mining studies used for research purposes, there is a series of even deeper-reaching evaluation methods (see Debortoli et al., 2016). However, these are too comprehen-

sive for the practical purposes of efficient project management and would, therefore, not be used in the context of this practical case study.

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SME Business Models
and Competence Changes

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As a result of changes in the local or regional business environment, small and medium-sized enterprises (SMEs) in many industries are facing the need to change their business models radically and seize new business opportunities or fall out of business. Although the important impact of SMEs in economic growth and job creation is well known, current knowledge is rather limited on the effects of competences for changing the business models in SMEs. This paper focuses on the links between SME competence changes and business model innovations in industrial structural changes in the external environment. The findings of a comparative case study of Russian and Finnish SMEs identified the positive attitude to change and activeness in external networking and in seeking new opportunities as enabling competences for business model innovation. The practical implications highlight the competence transformation strategies enabling business model innovation and the effects of different institutional environments.

Keywords: business model, competence, SME, Finland, Russia

Introduction

The traditional cost-cutting and efficiency-improving strategies for achieving competitiveness are approaching their limits, and new requirements of including the environmental and social considerations have been placed on companies (Seifi, Zulkifli, Yusuff, & Sullaiman, 2012). Another force radically changing the business environment in recent years has been the external changes affecting the economy that have had far-reaching and partly unexpected effects on industry structures. This is resulting from the networked structure of the world economy, where companies and even whole industries are more tightly inter-connected to one another than before, and the changes in the business environment reflect to all parts of the network with varying effects (Leila, 2011).

As a result of these profound changes in the business environment, companies need to offer something completely new in terms of products and services, operating processes and whole business models (Chesbrough, 2010; Johnson, Cristensen, & Kagermann, 2008). This has led to the rise of innovation management issues on the top of the management agenda, as strategic changes in the business model leading to sustainable growth need to be tackled successfully to ensure business continuity and competitiveness.

Business model innovations and organizational renewal or strategic transformation of companies have been discussed both in academic and in practice-oriented business literature to some extent in recent years (Schneider & Spieth, 2013; Johnson, 2010). However, the literature on business model innovations concentrates mostly on defining, developing or innovating business models for large companies or for recently founded start-ups. The view of business model innovation in more established SMEs is scarcely presented, although an overview of the stages of SME growth and the resulting changes in business models is provided by e.g. Churchill and Lewis (1983). Micro, small- and medium-sized enterprises, defined to employ from 1 to 249 persons and having turnover under 49 million EUR or a balanced sheet under 43 million EUR (European Commission, 2017), are continuously challenged by renewal needs of their business for various reasons from either inside or outside the company. SMEs are not as well equipped as bigger companies to do so, due to their limited resources and available competences.

Thus, there is a gap both in the current theoretical and practical knowledge on how business model changes are implemented in SMEs, especially taking into account the needed competence transformation. To study the effects of competences and their transformation that are needed for changing, the business models in SMEs is thus important. Also, from the point of view of creating employment and new innovations, advancing societal development as well as public support actions, this seems to be a relevant issue.

SMEs, including micro enterprises, have been identified as an important contributor to both national economic output and employment, as key drivers of change in the economy, and as the source for business model innovations changing the operating rules of industries (The Edinburgh Group, 2013). The importance of strategic renewal of SMEs for regions and industries undergoing profound changes in business is remarkable in sustaining the economic activity, and sustainable growth in these areas can only be achieved by changes in SMEs and in their competences.

The paper aims to provide new knowledge and practical examples for improving the understanding of the following main research question:

- What is the impact of SME competence changes on business model innovations in external changes?

This phenomenon will be further examined with the following two sub-questions:

- What are the successful competence transformation strategies in responding to external changes?
- How do similarities and differences in institutional environment affect the process of business model innovation?

Discussing business model innovation, SME institutional environment, and competence transformation in SMEs as a background, the study aims at complementing the extant literature with a more detailed understanding of, firstly, the role and importance of existing SME competences for business model innovation and, secondly, of the competence change process in re-creating the SME business model. The research is carried out as a comparative case study, implemented by interviews in SMEs of two different countries, Finland and Russia. The study is limited to forest industry and forest-related industries, such as machinery. Empirical data from Russian and Finnish SMEs was collected based on the important impact of the forest industry for both countries, and because the economies met similar financial and industry related crises in 1998 and 2008–2009.

Related Literature

Business Models and Business Model Innovations

There is a growing need to transform the business in many traditional manufacturing industries such as forest, paper, metal and other related heavy industries because of the radical industrial structural changes in the operating environment (Lamberg, Näsi, Ojala, & Sajasalo, 2006). New environmental and social requirements from the customers and from the public are evident, leading to innovating new products, processes, business areas and business systems (Hovgaard & Hansen, 2004).

The research and definition of business models has been lacking of traditional economics literature (Teece, 2010). A general definition offered by Teece (2010) is: 'A business model articulates the logic, the data, and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value.' Thus a business model is concerned with the elements of value offering, value creation and value capture of the company. Business models have been studied from a variety of perspectives in recent years, including business design, organizational resources, narratives, innovation, transactions, opportunities and expectations, socio-technical transitions, and en-

trepreneurship (Schneider & Spieth, 2013; Zott, Amit, & Massa, 2011; George & Bock, 2011).

The concepts related to business model change or business model innovation are diverse and partly overlapping in terms of focus and objectives, because of the different scientific origins (Müller, 2014). There is a significant multidisciplinary area of research devoted to describing a business model and elements related to it, but the business model change process and factors affecting it in different contexts are still unclear. Attempts have been made to categorize the literature and basic concepts of business model innovation (see e.g. Spieth, Schneckenberg, & Ricart, 2014), but the complex phenomenon remains a subject for further clarification.

Identifying new business opportunities and creating business models based on them can be considered as an innovation process (Teece, 2010; Chesbrough, 2010). The identification of new opportunities and changing the business model effect all levels of the organization, and the business model should be integrated with all the planning levels (Casadesus-Masanell & Ricart, 2010). However, all changes in business models are not necessarily innovative by nature, but can rather be described as gradual or incremental changes with time.

Business model innovation processes can take several forms, either based on a company management's analytical thinking and strategic vision of the future, or a more discovery-driven approach based on experimentation, trial and error and learning (McGrath, 2010). According to Teece (2010), 'Designing a new business model requires creativity, insight, and a good deal of customer, competitor and supplier information and intelligence. There may be a significant tacit component . . . experimentation and learning is likely to be required.'

Although business models and different concepts related to changing them have been studied in recent years (Müller, 2014), the discussion of the relationship between company internal competences and business model innovation has been quite limited. Earlier works have studied the phenomenon in the framework of e.g. dynamic capabilities (Spieth & Schneider, 2014). Particularly in SMEs, due to high dependency on individual capabilities, the competences and personal experience of the managers become important for re-creating the business model.

SMEs and Regional Institutional Environment

Globally entrepreneurship and small firms are important determinants of economic growth (Audretsch & Keilbach, 2004; Audretsch, 2007). The OECD recognizes SMEs as engines of growth, and highlights SMEs' crucial position presented in a significant portion of export and tax revenues (see http://www.oecd.org/forum/). In the European Union SMEs are stated

as key drivers for economic growth, innovation, employment and social integration (European Commission, 2014).

Public institutions increasingly promote SMEs' operational circumstances, and interpret the institutional context (economic, political and cultural environment) in which the entrepreneur operates (Shane, 2003; Welter & Smallbone, 2011). One remarkable mission for any regional business environment force is to take care of the renewing, stimulating new industries and, at the same time, profiting from the capabilities and conditions created by established industries (Maskell, Eskelinen, Ingjaldur, Malmberg, & Vatne, 1998; Porter, 1990). The renewing process may meet challenges in declining regions dominated by struggling and traditional local industry (Arbuthnott, Eriksson, & Wincent, 2010). Small firms operate locally and therefore the local and regional institutional issues matter. According to critical regional innovation patterns and regional policy (e.g. Camagni and Capello, 2013), high-level innovation policies should propose for each regional mode of innovation. The well-meaning innovation policies and regional policies are not always fit for SMEs and, on the other hand, the role and contribution of small firms to regional economic development varies, so institutional demands are not necessary fulfilled.

The differences of growth and regional development in Britain in the 1990s resulted from the features of the regions themselves, such as competitiveness and mental spirit, influenced by historic and structural differences (Keeble, 1997). In the beginning of 2010s in German SMEs the general management competences, networking competences, entrepreneurial thinking and acting were identified as early indicators for sustainable regional development and cluster success (Gebhardt & Pohlmann, 2013). The firm-level innovation determinants impact strongly in European regions, so the local innovation policy should prefer the specific needs of SMEs in particular regions rather than improving regional conditions for innovation in general (Stenberg & Arndt, 2001). The literature examples above have been limited to European economies, which resemble the institutional and market environment of the studied case economies in the empirical part of the research. Similar regional or local business ecosystem changes have taken place also for example in the US, but the operating environment differs considerably from European context.

Although the studies in developed countries suggest a direct positive impact of SMEs and entrepreneurship on growth, converse results for developing countries have been found (Van Stel et al., 2005; Wennekers et al., 2005; Mueller, 2007). The institutions shape the entrepreneurial environment, 'rules of the game in a society' (North, 1994), including 'formal institutions;' constitutional, legal, and organizational framework, and 'informal institutions;' attitudes, values, and behavioral norms embedded in

a society. In developed countries the legislation, attitudes and value determination operate well, but in developing countries SMEs meet several obstacles, such as limited role of women due to negative attitude towards women entrepreneurship in former Soviet countries (Welter & Smallbone, 2011).

Based on OECD definitions, Russia is generally described as a developing country, and Finland, in turn, described as a developed country (see https://stats.oecd.org/glossary/). However, the research focuses on identifying links between competence changes and business model innovations. The OECD definitions 'developed' and 'developing' are intended for statistical convenience and do not necessary express the stage of a particular industry or area in the development process (see http://unstats.un.org/unsd/methods/m49/m49.htm).

Competence Transformation in SMEs

According to Cheetham and Chivers (2005), competence is the effective overall performance within an occupation, which may range from the basic level of proficiency through to the highest levels of excellence. Cheetham and Chivers (1998) present a model of professional competence in the work context and work environment to include meta-competencies/trans-competencies, knowledge/cognitive competence, functional competence, personal/behavioral competence, and values/ethical competence. In practice, on the other hand, competence can be understood as an influence on an individual's skills, knowledge, self-concept, traits and motives (Spencer & Spencer, 1993). In this study, the concept of competence includes all skills and knowledge of an individual, competences of companies, and competences needed in organizational networks. We define competence as comprehensive individual behaviors, knowledge, values and skills based on comprehensive competence approach, i.e. knowledge, functional competences and behavioral competences (LeDeist & Winterton, 2005).

The importance of organizational and individual competences in building competitiveness has been long recognized in the literature building on the resource-based and knowledge-based theories of the firm, which state roughly that organizational competitiveness is the result of combining the right kind of competences and knowledge to respond to the needs of the stakeholders and to the external environment in an optimal way (Barney, 1991; Grant, 1996). However, responding to these external needs has become more challenging than before with complex networked environment, and due to unexpected external changes. In general, SMEs have fewer resources and competences available for them than larger companies, so they need to be more creative and agile in combining their competences in a novel way, or in developing completely new competences, and also

be more proactive in anticipating and recognizing new potential business models in a rapidly changing situation.

Results of the study of Taipale-Erävala, Heilmann, and Lampela (2014a) concerning the survival competencies of Russian SMEs showed that both the firm's internal competences and its network competences are needed in order to survive in crisis situations. In addition to network competences, entrepreneurial competences and an open-minded attitude towards external partners will help in planning the acquisition and development of competences in focusing the scarce resources of SMEs. Related to competence transformation, Taipale-Erävala et al. (2014b) discovered that SMEs transform their competences in alignment with their business change management. In change situations, the attitude in firms was to embrace the future, rather than clinging to the past. Thus, positive attitudes towards change and systematic management of change process affect the success of SMEs, and leads to long-lasting effects.

Research Methodology

Research Design

The way in which people being studied understand and interpret their social reality and interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences are the central motifs of qualitative research (Merriam, 2009, 5; Bryman 1988, 8). Our research approach was qualitative, aiming at a deep understanding and analysis of the change situation in the case companies.

The case study copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2009). The case study is often associated with descriptive, explanatory or exploratory research, when the focus is on a current phenomenon in a real-life context (Ghauri & Gronhaug, 2005; Yin, 1994). In business studies, case study research is particularly useful when the phenomenon under investigation is difficult to study outside its natural setting and also when the concepts and variables under study are difficult to quantify.

An interview is a process in which a researcher and a participant engage in a conversation focused on questions related to a research study (DeMarrais, 2004, 55). An individual interview is probably the most widely used method for gathering information in qualitative research. Interviews provide an opportunity for detailed investigation of people's personal perspectives, for in-depth understanding of the personal context within which the research phenomena are located, and for very detailed subject cover-

age. Interview provides a tool for clarification and understanding (Ritchie, 2003, p. 36). A focused interview is one modification of the half-structured interview method.

Data Collection and Analysis

Data collection was executed with thematic, semi-structured focused interviews with individuals representing mainly the management level of the SMEs. The research questions concerned the basic business information (field of industry, establish year, etc.), and perceptions of changes in the external environment, for example 'How do the changes in society affect the company's life-cycle?' or 'Who monitors the external environment and how?' Additionally, with questions such as 'How do changes in the external environment affect the company's personnel know-how?' and 'What kind of new knowledge the company needs?' the changes of internal competencies in the firm were studied. The empirical research was carried out as a case study research with multiple SME case organizations. The companies represented industrial manufacturing or service companies related to the metal or forest industry. Interviews were conducted both in Finland and in Russia. Altogether the data consisted of 20 in-depth interviews conducted by one of the researchers of this article.

As research data we use two different samples in the metal and forest industries from two countries and business environments. Altogether 20 interviews from ten Finnish and ten Russian SMEs were conducted by semi-structured face-to-face interviews to ensure rich and focused information (Carson, Gilmore, Perry, & Gronhaug 2001; Willig, 2008). Qualitative samples are usually small in size (Ritchie, 2003). The selection of the firms ensure the validity of the findings, and basically suitable SMEs had to fulfill two basic criteria: firstly, drastic changes in their operational business environment had to have occurred, and, secondly, all firms needed to operate in the forest or metal industry, or other closely related industries. Suitable ten Finnish firms were found in a network of in the end of 2011 shut-down paper mill in South-East Finland.

The interviews were conducted between January 12 and May 29 2012. The suitable Russian SMEs had to meet at least one of the following changes: a polity change in 1991, the collapse of the ruble in 1998 and/or the financial crisis 2008–2009. Russian interviews were conducted between October 9 and December 5 2012. Table 1 summarizes the basic information of the firms and the interviews.

A qualitative analysis process was used to organize and classify the data (Miles & Huberman 1994; Silverman, 2005). The data was analyzed using an interpretative, qualitative content analysis method (Elo et al., 2014) resulting in a rich picture of the change situations in the organizations. First,

Table 1 Company and Interview Data

(1)	(2)	(3)	(4)	(5)
Finnish SMEs				
Metal, maintenance, steel construction	1989	Production Manager, Financial Manager	2	1h 15 min
Printing house	1991	Managing Director	1	1h 22 min
Transportation, earth moving	1944	Managing Director, Head of Office, Son of Managing Director	3	3h 16 min
Industrial piping, maintenance	1999	Managing Director	1	1h 31min
Business advertisement textiles	1988	Managing Director	1	1h 56min
Machine and facility assembling	1992	Managing Director	1	1h 29min
Metal structures and maintenance	1982	Managing Director	1	1h 38min
Underwater engineering and construction	1978	Managing Director	1	1h 35min
Wood manufacturing equipment	1996	Chairman of the Board, Managing Director	2	1h 47min
Industrial air conditioning	1998	Managing Director	1	1h 32min
Russian SMEs				
Engineering, non-standard technology	(1949) 1998	General Director, Production Manager	2	1h33min
Wood machinery, scientific industrial complex	1991	Vice-Chairman of the Board	1	1h20min
Commercial consortium of SMEs	2002	General Director	1	1h22min
Chemicals	1992	Marketing Manager	1	1h25min
Sheet metal	1992	Executive Director	1	1h39min
Information, research, data-mining services	1998	Chief Executive Officer	1	1h17min
Accounting and tax services	1997	Managing Director, Financial Director	2	1h18min
Paper industry equipment	1993	General Manager	1	1h38min
House building, agency	1996	Sales Manager	1	1h21min
House building, real estate development	1998	Chief Executive Officer	1	1h37min

Notes Column headings are as follows: (1) industrial sector, (2) year of establishing, (3) titles of interviewees, (4) number of interviewees, (5) duration of interview.

we organized the data and used categorizations in the process of classifying the data units. In this case a very central analyzing method was comparison. Comparison explores differences and similarities across incidents within the data currently collected, and provides guidelines for collecting additional data (Ghauri & Gronhaug 2005, 209). The analysis was done manually, following a deductive content analysis approach, which utilizes

prior understanding of the subject to create a categorization matrix and to code the data according to the categories.

The unit of analysis was phrases, a short collection of words to describe a meaning. These text fractions were selected and coded according to the themes of the interview. Next, the text fractions were copied into a table and organized by grouping similar answers together to form sub-categories. Through the interpretation of the meanings, the answers were first summarized, then labeled with a title that describes the whole group and the titles were translated into English.

Findings

Based on the interview results of our empirical study, the need for re-inventing the current business models has been emphasized especially in SME companies that face sudden external changes such as close-downs of their major customer. Some of them have successfully changed their operations based on their existing competences and strengths due to external situation changes like 'diversification and with client orientation policy' (Russian firm 1). There are differences in the strategic responses between countries, like 'I do not feel greatly to start bouncing around into different fields' (Finnish firm 4) as well as in the future orientation and networking orientation of the companies.

The key elements related to competence changes in SMEs on a strategic business model level were identified in this study as the positive attitude to change and activeness in external networking and in seeking new opportunities, highlighted in interviewee comments like 'the shut-down was a good thing, we had to go elsewhere [...] and in that we have succeeded pretty well' (Finnish firm 6) and 'In every crisis there is an opportunity. It depends how you perceive (it).' (Russian firm 7).

As an answer to sub-question one presented in this study, 'What are the successful competence transformation strategies in responding to external changes?,' we found that a successful strategy in transforming the competences and in creating a new business model is enabled either by utilizing the existing competences in a new, nearby area or customer segment, or actively seeking for new competences through hiring new people and finding new partners to adjust to the environmental change.

From the public actors, realizing these alternative strategies on a regional level requires firstly attracting new companies and employees from outside the geographical region and, secondly, supporting existing SMEs' growth and competence transformation through public training programs and activities specifically targeted to individual companies. Especially, the long-operated SMEs with limited customers and special industry sector require more specific public support. They have difficulties in business model
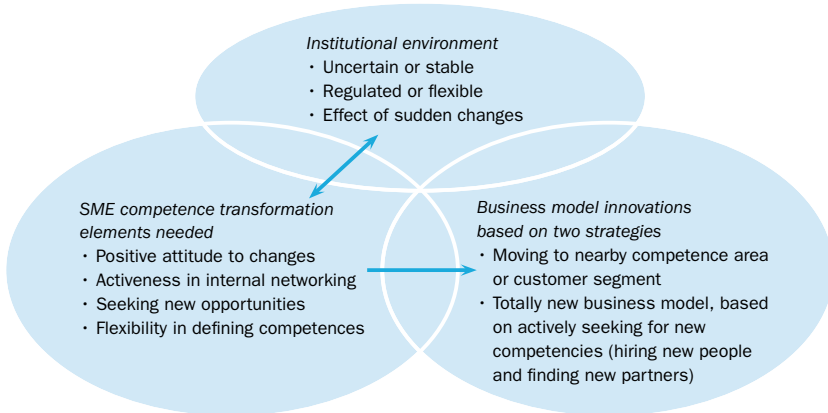
Figure 1 Competence Transformation, Institutional Environment
and Business Model Innovation

innovation, as it requires re-defining the basic elements of the business and in a way going back to the stages of early entrepreneurship process. These enterprises have already invested heavily in premises, equipment and staff; the entrepreneurial strategy has worked for decades, and therefore they prefer the familiar setting of the business.

As an answer to sub-question two in this study, 'How do similarities and differences in institutional environment affect the process of business model innovation?,' it can be said that the effects of the institutional environment for business model innovation in external change situations seem to be evident in our empirical study, and the importance of the entrepreneurs' own attitudes for transforming the competences and the business model were also highlighted. In comparison to the Finnish SMEs, the Russian SMEs had more extrovert competences, which may predict better entrepreneurial opportunity exploitation and sustainable business. Some of the interviewed Finnish SMEs found that they have very highly specialized competences, and they were not willing to redefine their business model or customer segments.

The ability of the SMEs to transform their competences and flexibility in re-defining their operations and business model in sudden change situations, as well as an open-minded attitude towards networking with partners, secures business continuity and sustainable growth also regionally. The supporting actions of public actors for managing sudden change situations from SME competence point of view and for enabling sustainable growth regionally seem to be inadequate or focusing on too general activities. Figure 1 brings together the main findings of the study.

The findings of our empirical research are well in line with SME litera-

ture on the two-sided effects of the SMEs and their regional institutional operating environment. On one hand, SMEs have an important impact on the regional growth and locally on the society they operate in, and on the other hand, the possibilities of SMEs transforming their competences and business models seems to depend on the local resources and support available, as well as on the mental atmosphere towards changes.

Discussion and Conclusions

Theoretical Contribution

Barney (1991) and Grant (1996) state that organizational competitiveness is the result of combining the right kind of competences and knowledge to respond to business changes in an optimal way. Taipale-Erävala et al. (2014a), in turn, detailed this general statement more specific for SMEs to include both internal competences (individual, entrepreneurial and organizational) and competences related to external environment – that is to say – network competences in order to survive in a crisis. The findings of this study, additionally, deepen more the previous studies. SMEs have limited human resources, and therefore competences. The attributes for SME survival seem to be positive attitude to change, and activeness in internal networking and in seeking new opportunities.

In addition to specific personal attributes, the type of business change management is crucial in business model innovation. Whichever direction the SMEs choose (either to stay close to existing business model or to focus onto a complete new one) the management strategy needs to embrace the future, rather than cling to the past (Taipale-Erävala et al., 2014b). To generate this forward-looking attitude may be a challenge for local and regional institutions. One remarkable mission for any public institution is to take care of stimulating new industries and, at the same time, improving the capabilities and conditions for established industries (Maskell et al., 1998; Porter, 1990). Public institutions need to be capable to influence attitudinal circumstances through, for example, entrepreneurial education and training. As found in the study, the Russian SMEs had more extrovert competences and were more prepared for radical business model changes compared to Finnish SMEs. The differences in mental business environment may cause challenges for public institutions when planning supporting actions.

The results of the research build novel insights into the role and importance of SME competence changes and SME business model innovation as an enabler of sustainable growth in a change situation. These insights can be useful for both researchers and practical actors in developing strategies for future change situations.

Within the theoretical background of business model innovation, competence transformation in SMEs and SME institutional environment, the study

aimed at complementing the current views with a competence focus. A discussion on the role of SMEs in business model innovations and in building sustainable growth especially from the competence point of view seems to be lacking from the literature. The contribution of the paper to the current research literature on innovation management is based on complementing the extant business model innovation literature with a more detailed understanding of, firstly, the role and importance of existing SME competences and, secondly, of the competence change process in re-creating the SME business model. Both the enablers of business model innovation and the process and elements of business model innovation have been recognized as important areas for further research in a recent literature study by Schneider and Spieth (2013).

The successful transformation of competences and company strategy, and generating new business model innovations is crucial for regional development and for achieving sustainable and inclusive growth in the long run. The paper describes SME competence change processes on a strategic level and offers reflections based on case studies in two culturally different neighbor countries, Finland and Russia, where the institutional environment for SME entrepreneurship also differs significantly. The findings can be used, for example, in analyzing similar change situations in other SMEs and identifying potential competence development needs as well as in identifying new business models based on existing competences.

Practical Implications

The findings of the study provide practical actors, both managers in SME companies and public authorities working with them, some examples of successful strategies for SME competence transformation in external change situations. The public actors planning SME support programs and actions are provided with new knowledge on the needed support for successful business model changes of SMEs from the competence point of view, as well as insights for facilitating new employment and growth through systematical emphasis in competence development in change situations. As practical implications for public business development actors guiding the regional industrial transformation programs, there is a need for improved support for the established SMEs that have difficulties in changing their competences and business model. Vocational and other training organizations should widen education and training programs to include also a practical working attitude alongside skills and other professional knowledge. Institutional barriers for SMEs need to be further demolished. SME owners and managers need an open-minded attitude for competence development and opportunity recognition in a changing environment.

These findings will be helpful for other SMEs or organizations facing sim-

ilar sudden changes in their environment in showing a potential roadmap ahead. The results can be utilized also in realizing the potential of creating new employment opportunities and sustainable growth through novel business models of SMEs, and in proactively changing SME operating environment structures to more supporting ones in sudden changes.

The potential of SMEs in creating sustainable growth in transformation situations could be increased with changing entrepreneurial attitudes and with more specialized support for business model innovation for established SMEs. This study has broadened our understanding on how to support business model innovation in SMEs from a competence perspective, and on how the regional institutional environment defines opportunities and barriers for the change process.

Limitations and Further Research

Despite the valuable empirical results achieved on SME competence transformation and business model innovation, this study has some limitations. As in most cases in a qualitative study, the number of 20 interviewed companies was rather small, which again enabled intensive interviews on the topic. As another limitation, all the interviewed Russian SMEs operated in international business or had international clients, and Russian SMEs operating only in internal markets are not included, which might reflect as a bias concerning the data on the institutional environment.

For further research the authors suggest: firstly, a broader qualitative research including SMEs operating in various markets, as according to common research practice, the results of the study should be validated in new contexts. Secondly, more studies on SME business model innovation and on the effects of existing and transforming competences in external change situations are needed. Also the institutional effects on the practical operational environment of SMEs require clarifications from the point of view of small enterprises, and based on entrepreneurs' demands.

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On Formal and Informal Factors: Enabling Learning for Safe Offshore Drilling Operations

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Traditional safety thinking has been concerned with investigating accident causations in order to learn from these. However, successful operations constitute the great majority of all the operations. It would thus be interesting to add a focus towards learning from operations that go well. The purpose of the current study is to identify factors that might contribute to successful operations in terms of safety. This purpose is approached by an empirical study consisting of 10 interviews with people who work on board a drilling rig currently operating in Norway. The informants who participated in the interviews hold different positions and come from different companies represented on board the rig. The findings in this study show that it can be difficult to characterize or define successful operations. The definition will be subjective; however, there are some common features of successful operations. Maintaining the life and health of people are the number one priority. A successful operation should also result in the intended product even though it might take some more time than planned. A successful operation is created by many factors and conditions. This study identified 27 factors that might contribute to successful operations in terms of safety. A lot of the theory explaining successful operations focuses on informal factors related to humans and their actions. However, the findings in this study implies that there must be both formal and informal factors present.

Keywords: communication, organizational learning, management, offshore drilling, formal structure, informal structure

Introduction

Accident investigations and the study of factors that lead to failure are widely used for learning and improvement (Kjellén, 2000; Sklet, 2004; Drupsteen and Guldenmund, 2014). Experience feedback is one of the key principles in safety management, in which systematic learning from incidents is the one main method (Kjellén, 2000). Things that go wrong and create

major accidents draw a lot of attention from the organization, authorities, media and the public. Such events are often very visible and, in combination with negative consequences, it is no wonder they have such a big focus in our everyday life. However, one can agree that accidents and failed operations make up a very small part of all the operations that are performed in an organization (Hollnagel, 2009). Most of the time operations tend to go well. If there is so much to learn from the small proportion resulting in accidents and unwanted events, then there must be a large potential for learning from the opposite side as well. This new way of thinking shifts the focus toward all the things that go right in order to understand normal operations and everyday performance. We use our knowledge about accident causations and contributing factors to accidents in order to prevent it from happening again. By gaining knowledge about the contributing factors leading to success, we can learn from successful operations as well. Few empirical studies have been published so far on learning from successful operations and from the factors that lead to success.

The purpose of this article is to present the results of an empirical study performed with the aim of identifying those factors that contribute to successful operations in terms of safety. The research question of the study is thus: *what factors contribute to successful operations in terms of safety?* This research question was answered by performing and analyzing interviews of people working at an oil and gas drilling rig operating at the Norwegian continental shelf.

Offshore drilling operations in the oil and gas industry are an interesting field of study when it comes to successful operations because of their complexity, association with high risk activities and the number of actors involved. Drilling operations have many stakeholders, all the way from the operator who will profit from the findings of oil and gas to the fishermen whose livelihood will suffer in the case of pollution. Accidents in the offshore oil and gas industry have the potential for severe consequences and it is in everyone's interest to ensure successful operations in terms of safety. Drilling of a well can be performed with several different techniques and by many different offshore installations or types of drilling rigs. However, the basic drilling system will overall be the same. Very simply explained, a hole is drilled in the ground at the seabed by a rotating drill bit. Torque is transferred from a power source through a drill string. The use of a drilling fluid that is pumped down the drill string helps transport the cuttings, which are the product of the drilling up to the surface. The drilling fluid will also function as lubricate and cool the bit. In order to control the pressure, one can adjust the weight of the drilling fluid. In addition, there is a blowout preventer (BOP), which can seal off the well if there is a 'well kick' that upsets the balance of the system (Jahn, Cook, & Graham 2008). Even though

it all sounds quite straightforward, there are a large number of things that have to be considered during the drilling of a well. We are referring to highly flammable substances under pressure. Not only is a hole being drilled in the ground, but the ground in question is placed up to several hundred meters under the ocean surface, which can cause challenges related to currents and weather conditions. There are several different actors involved in the drilling from different companies. One can define these operations as quite complex, with many different components affecting each other, and large amounts of energy involved.

Normal and Successful Operations

This view of success seems to be implied when Hollnagel (2013) argues that much more data will be available if we turn from looking at 'what goes wrong' to looking at 'what goes right.' This criterion does not necessarily distinguish between operations that are accident-free due to 'pure luck' and operations that are accident-free due to excellent safety work. An organization may experience a prolonged accident-free period even during the incubation period before a major accident (Turner & Pidgeon, 1997). The incubation period is characterized by danger signals that pass unnoticed or are misunderstood.

HRO (High Reliability Organisations) researchers argue that certain organizational properties and practices make an organization prone to success when it comes to safety. Early studies of HROs addressed complex systems that delivered remarkably reliable performance, such as aircraft carriers (Rochlin, LaPorte, & Roberts, 1987; LaPorte & Consolini, 1991), nuclear submarines (Bierly & Spender, 1995) and nuclear power plants (Schulman, 1993a). All these organizations can be termed as machine bureaucracy (Mintzberg, 1979) and as high risk organizations, according to Perrow (1984). Early accounts of successful performance include use of *redundancy* to derive highly reliable performance from imperfect human beings (LaPorte & Consolini, 1991), a capacity of the organization to *reconfigure spontaneously* during crises (LaPorte & Consolini, 1991); the emergence of a collective mind through *heedful interrelating* (Weick & Roberts, 1993), the successful *exploitation of slack,* including conceptual slack and the right to veto decisions (Schulman, 1993b), and *cultures of requisite variety,* facilitating information flow (Westrum, 1993).

Contributors to the emerging field of resilience engineering have insisted on the need to account more symmetrically for successful adaptations and accidents (Hollnagel, Woods & Leveson, 2006; Woods, 2006; Hollnagel, Pariés, Woods, & Wreathall, 2011). They have also argued that it is necessary to learn from normal operations in order to maintain and improve safety in systems that experience very few accidents. Normal operations

Table 1   Position of Informants

Mudlogger	Senior Cementer
Senior Toolpusher	Roughneck
Subsea Section Leader	Roughneck
Technical Section Leader	Rig Superintendent
Driller	Company Man

Table 2   Experience of Informants

Years of work experience	Number of informants
Less than 10 years	2
10–20 years	4
More than 20 years	4

will always involve variability, and the study of safety requires the study of normal variability.

Successful operations may encompass handling of serious disturbances. Studies of operations where situation control has been successfully regained and a dangerous sequence of events stopped are, therefore, also of relevance to the understanding of successful operations. Reason (2008) discussed cases of 'heroic recovery,' where human interventions have prevented disasters. Reason argued that Weick's notion of *collective mindfulness* needs to be complemented by a notion of *individual mindfulness.*

Method and Analytical Framework

Data Collection

This study is based on a case study design (Yin, 2009), based on drilling operations on a rig currently operating in the Norwegian sector. This rig has been operating internationally in several other places in the world. The rig was recently brought to Norway to drill in the Norwegian sector.

The case was conducted through qualitative research interviews. People in different positions have been interviewed to ensure as wide a range of perceptions as possible. People's point of view might vary depending on their position and type of work and responsibilities. Seven out of the ten interviewees came from the rig contractor company, one person was from the operator company (Company Man) and the senior cementer and mudlogger were employed by a third party service companies. The majority of the informants come from the rig contractor company because they represent the largest group on board the rig compared to the service companies. There are only a few people representing the operator company on board, so the operator company is very well covered.

The purpose of the interviews was to gather empirical data in order to answer the research questions. All the interviews were conducted over a

period of four weeks. The interviews lasted from 30–60 minutes. Some of the interviewees were at home while others were at work on the rig. Due to practical concerns, the interviews were conducted by telephone. Telephone interviewing can make it difficult to create the same relation and interaction between the interviewer and interviewee, as if they were face-to-face. It will also make it impossible to observe or use body language. That said there is no definite evidence that interviewees will answer differently in a telephone interview compared to a face-to-face interview (Bryman, 2012). The interviews were semi-structured. An interview guide with certain topics and questions was used. However, the interviewer was not very conservative with respect to this guide. A semi-structured interview allows the interviewee to talk about topics besides the questions in the interview guide and the interviewer will often ask new questions related to this. The topics and questions in the interview guide may not be asked in the exact order they were written, however most often all the topics will have been touched upon by the end of the interview (Bryman, 2012).

The interview guide was developed by the research team and consisted of 6 main topics with subsequent questions: background information about the interview object; the reasons why the rig had not experienced a major accident; assessment of success of operations; explaining success; and learning from success. The questions were developed on the basis of different theoretical perspectives addressed in two research workshops.

Nine out of ten interviews were recorded. Recording the interviews can be a great advantage, as it gives the opportunity to collect every bit of data provided by the interviewee. In the tenth interview the recorder was not operating. However, this was discovered immediately and the interviewer sat down with his notes and produced an extensive summary. Bryman (2012) point out that concentrating on taking notes in parallel while interviewing might distract the interviewer and make it difficult to catch important information given by the interviewee. Even though recording can be very useful, it is important to bear in mind that this could affect the interviewee's responses. People can be less open and more self-conscious when they know they are being recorded (Bryman, 2012). The recorded interviews were transcribed in full, word by word by one of the authors.

Data Analysis

Thematic analysis was adopted to study the interview material. This is a method for identifying, analyzing, and reporting patterns (themes) within data (Braun & Clarke, 2006). In contrast to other types of qualitative analysis, such as grounded theory, Interpretative Phenomenological Analysis (IPA) or discourse analysis, thematic analysis is not bound to a theoretical or epistemological framework (Braun & Clarke, 2006). Thematic analysis is

performed through several steps, and can be summarized in that the data is taken through the process of coding to establish meaningful themes. The actual analysis is not a linear process in the sense that the analyst goes back- and forwards between the data and the codes, as well as between the themes and the codes. Our analytical approach was driven by the researchers and theoretical interest in relation to the research question, and can therefore be classified as a deductive thematic analysis or a 'top down' way (Braun & Clarke, 2006). Both the coding and the theme development were thus driven by the research question. The codings were applied as was appropriate to describe, or capture, the essence of a segment in the data, like a sentence or a paragraph. This process involved a minimum of abstraction. A theme was defined according to Braun & Clarke (2006) as 'something important that relates to the research interest, and represents some level of patterned response or meaning within the data set' (p. 82). In this regard, constructs that embraced a number of initial codes, and in this way were mentioned by a number of interviewees, were identified as a theme. During the process of theme development, themes were continuously revised, meaning for example that some themes would be subdivided and others would be combined with the purpose of fitting the data. This step of the analysis involved therefore more interpretation. A digital mind map was applied to assist the analysis. On the last phase of the analysis, after finding the themes from the study, the themes were analyzed in accordance with Schiefloe's (2013) Pentagon model, which is a framework for analyzing organizations.

Theoretical Framework

A framework for analyzing organizational behavior was used to categorize and analyze the identified factors for successful operations. The framework is the so-called Pentagon model, developed by Schiefloe (2013) for analyzing organizations. Among other things, it has been used to perform a root cause analysis of the major gas leak on the drilling installation Snorre A in 2004 (Schiefloe et al. 2005), an incident that had been characterized as one of the more serious incidents at the Norwegian continental shelf in the recent years. The gas leakage did not cause any fatalities or cause a major environmental disaster, but could have been a disaster with only a few changes, as claimed by the Petroleum Safety Authority of Norway (Brattbakk, Østvold, Van der Zwaag, & Hiim, 2005). The Pentagon model can also be utilized to examine normal situations (Schiefloe, 2013).

The Pentagon model can be used on different organizational levels, from individuals to the general organizational structure. As the name implies, the Pentagon model involves five aspects that affects safety critical work in an organization (Schiefloe, 2013):

Formal qualities

Formal structure
· Organization chart
· Roles & responsibilities
· Rules & regulations
· Incentive structures

Technology
· Tools & machinery
· ICT systems
· Material infrastructure

Capabilities &
performance

Culture
· Language/concepts
· Symbols
· Knowledge
· Values/attitudes
· Norms
· 'Ways of working'

Interaction
· Cooperation
· Communication
· Coordination
· Leadership

Social relations & networks
· Network structure
· Social capital
· Trust
· Commitments
· Power & alliances
· Competition & conflicts

Informal qualities

Figure 1
The Pentagon Model
(adapted from
Schiefloe, 2013)

- *Formal structure* is often described as 'organization' or 'organizational factors.' This includes roles and responsibility, authority, procedures and regulations and staffing, among other things related to the formal structure of the organization.
- *Technology* includes all the tools, machinery, equipment, ICT-systems and material infrastructure that the employees use to do their work. Maintenance, operating routines and the equipment's condition are also relevant for the technology aspect. Technology has to been seen in relation to a formal structure, as different types of technology and equipment have different requirements regarding procedures and management, and the other way around.
- *Culture* includes factors as language, values and norms, attitudes and habits, competence/knowledge, symbols and expectations on how the work shall be done. The aspect of culture covers what people understand, know, think and believe.
- *Social relations and network* covers the information structure, network structure and social capital in the organization. It tells us something about the relationship between individuals, but also between groups or alliances. Keywords here are trust, friendship, sharing of knowledge and experience, alliances and power, competition and conflicts.
- *Interaction* is about how the people in the organization communicate,

cooperate and coordinate. People adapt, interact and influence each other. This aspect included leadership and information flow. Interaction is a precondition for social relations and network, and a foundation for organizational culture, learning and transfer of experiences.

It is important to consider all of the aspects as dependent on each other to a greater or less extent. Changes in one of the aspects can have impact on the others (Schiefloe, 2013). By considering all of these aspects when studying an organization or an event, such as an accident, one can get a better understanding of the 'bigger picture.' It can also be a great help for sorting and systemizing information.

As indicated in Figure 1, the five factors can be divided into two main groups: formal qualities (formal structure and technology) and informal qualities (culture, social networks and interaction). This divide reflects the dialectic between formal and informal perspectives of an organization that has been emphasized by others, e.g. theory-in-use vs. espoused theory (Argyris & Schön, 1996), and bounded rationality vs procedural rationality (March & Simon, 1958). Lately, the same mind-set has been applied for discussing compliance to safety rules or adaption to the situation by Hale and Borys (2013).

Results and Discussion

What Are Successful Operations?

One of the questions in the interview was: 'What are successful operations in terms of safety?' When asked about their interpretation of a successful operation, the answers from the interview objects vary a lot, this reflects the subjective nature of this question. However, there are some common features in most of the descriptions. One of these common features is the absence of accidents or injuries to people. Another one is no problems or damage to the equipment. Several do also describe a successful operation as when everything goes according to plans and one is able to do what was intended and to deliver the intended product. One says that it is a success when everything goes according to plans, even though it might take longer in order to do it safely. Two of the informants emphasize that a successful operation can consist of many smaller operations, and that one big operation can be successful in the end even though there might be troubles in some of the smaller operations.

One person mentioned that a successful operation should have some flow. This does not mean that it needs to go too fast, but at least it should have some flow. However, he also stated that there can be challenges related to such a flow. If you are in a 'flow zone' for too long, you risk losing some of your focus because you enter a sort of comfort zone. He believes that accidents often happen in this kind of situations when you have your

Table 3   Contributing Factors for Successful Operations

Taxonomy*	Findings in the case
Culture and working environment	· Everyone can provide input, make suggestions and ask questions. · Good culture among everyone with mutual respect, openness and dialogue. · Good working environment
Interaction, commu-nication, coordina-tion and leadership	· Give people meaningful responsibilities. · Good communication and co-operation. · Working as a team and working for a common goal
Social relations and networks – human factors and skills	· Good understanding and knowledge about the operation, work and rig. · Understanding the bigger picture. · Being practical and focus on solutions. · Everyone can provide input, make suggestions and ask questions. · Involve everyone, from the newest and youngest from the most experienced. · Experience, both from previous situations and from your colleagues. · Working as a team and working for a common goal. · Trust your colleagues and the quality of their work. · Working with the same crew and people you know help build good routines. · Meet on the free time
Formal structure and organizational fac-tors	· Having a plan B. · Thorough planning. · Plan and think ahead and anticipate what might happen. · Good procedures. · Good reporting. · Evaluation of the job, both before and after. · Little time pressure: focus on performing the operation properly and safely, even though it might take some more time. · Training and building competence. · Right people on the right place. · Support from the operator company. · Flat organizational structure
Technology factors	· Correct equipment. · Daily maintenance of equipment

Notes   * From Schiefloe's (2013) Pentagon model.

guards down. In order to prevent this from happening and still maintain the flow, they try to rotate among different work stations.

Factors Contributing to Successful Operations

When analyzing the interview transcriptions, 27 contributing factors to successful operations were identified. These are presented in Table 3. The informants were asked to mention some factors that they thought could contribute to successful operations. In addition, some of the factors were identified from the answers to other questions in the interview. The factors

were categorized according to Schiefloe's (2013) Pentagon model. This categorization reveals that the majority of these factors belonged to the group 'Social relations and networks' and 'formal structure.' In the following, the findings are sorted based on Schiefloe's (2013) taxonomy. Then the individual findings are elaborated and discussed.

Culture and Working Environment

In an environment where everyone can provide input, no matter how little, it might be easier to convert tacit knowledge into explicit knowledge. Good dialogue and involvement can help individuals share their tacit knowledge. Encouraging questions can also help reveal some of this knowledge. As described by Jacobsen & Thorsvik (2007), individuals do often lack awareness of the knowledge they utilize and questions from colleagues might make them reflect more on this and find the right words to describe it. An environment where everyone can provide input, resembles HRO, e.g. in the aviation industry, where a co-pilot can give suggestions to the captain and even correct his actions (LaPorte & Consolini, 1991).

Good Culture among Everyone with Mutual Respect, Openness and Dialogue

Respect for each other's field of expertise and work responsibilities is important to maintain a good dialogue and teamwork. It seems like the crew on board this rig has acknowledged that everyone has an equally important role and that everyone's work are equally important to achieve a successful operation, both in terms of safety and efficiency.

Good Working Environment

A couple of informants spoke of the shift scheme, where they work one week on a daytime shift and one week on a night shift. This scheme implies a very abrupt transition, which they thought had a negative effect on people. As one of the informants pointed out, most people's bodies need time to adjust to this transition. Little sleep and fatigue can be considered a performance shaping factor as described by Flin, Wilkinson, and Agnew (2014). One can argue that enough sleep and rest help people stay focused, increasing their level of attention and thereby decreasing the number of mistakes. Good working conditions might also make people more receptive to learning. Everyone should feel responsible for creating a good working environment both for themselves and for their colleagues.

Interactions, Communication, Cooperation and Leadership
Give People Meaningful Responsibilities

This factor is related to leadership. Allowing people to work with something they feel good at and to make full use of their skills can be a motivational

factor. This also goes for having meaningful responsibilities. One of the informants said that his supervisor was very good at giving him responsibilities and allowing him to try for himself. The supervisor was always there to support and guide him, but he did not 'take the work out of his hands,' as he described it. Meaningful responsibilities will make people feel appreciated and perhaps they will focus more on the safety aspects of their responsibilities as well.

Good Communication and Cooperation and Working as a Team and Working for a Common Goal

Working as a team is one type of cooperation, therefore (22) and (23) are discussed in the same paragraph. Both teamwork and cooperation are two of the CRM skills described studied by Flin et al. (2014). Well-functioning communication and cooperation seems to be crucial for successful operations. One of the informants emphasized that the communication should be clear and easily understood without any room for ambiguity. The fact that there is a relatively flat organzsational structure on board that facilitates close dialogue makes a good foundation for communication and good cooperation across disciplines. There are no A-team and B-team, and the focus is on involvement. Working for a common goal that is in everyone's best interest can make people feel stronger relations to their colleagues and this will perhaps further enhance communication and cooperation. As described by Schiefloe (2013), interaction is a pre-condition for social relations and network, and a foundation for organizational culture, learning and experience transfer.

Social Relations and Networks: Human Factors and Skills

Good Understanding and Knowledge about the Operation, Work and Rig

The understanding and knowledge about the operation, work and rig constitutes a foundation for several of the other factors. This is particularly important in order to see the bigger picture and when establishing plans. One of the informants mentioned that everyone should have an understanding of the upcoming operation, how it is planned and what challenges they might encounter. It will also be important that people are motivated and self-confident enough to use their knowledge and competence.

Understanding the Bigger Picture

Understanding the bigger picture is about mindfulness. According to Weick and Sutcliffe (2007), mindfulness can be explained as the ability to see the bigger picture. This ability could be central in the process of a successful operation. Today's complex systems consist of many activities, components and conditions that are dependent and interact with each other all the time.

In order for the operations to go well, good knowledge of these interactions is required and one must therefore always have the big picture in mind. Mindfulness also represents the concept of resilience in the way that resilience seeks to anticipate future situations and to monitor ongoing developments as a way to be always prepared for what comes next. On the other hand, it will probably be impossible to be aware of all the possible interactions and combinations all of the time. In situations where one has not been able to foresee certain interactions and unexpected situations occur, the ability to respond becomes important. Unforeseen interactions and unexpected developments do not necessary lead to an accident; it could just as well have no negative consequence at all. It is important to have the ability to determine if unexpected developments are a warning sign or not. This is all about knowing how and when to respond. The ability to understand the bigger picture might also be a motivational factor. One might be more motivated and feel a different ownership towards the job if you feel that what you do is an important contribution to a bigger product.

Being Practical and Focus on Solutions

'If you have a problem, do not create another problem. Solve the first problem before you go on.' These are some wise words from one of the informants. Being practical and focus on solutions are central features when facing challenges and especially new, and perhaps unknown, challenges. Dealing with one problem at a time, if possible, can prevent the situation from becoming more complex, thus it will be easier to foresee interactions and keep track of the bigger picture. Several of the informants emphasized that, if a challenge or problem occurred, the operation could be stopped and everyone involved met together and discussed possible solutions. This kind of collective brainstorming seems to be very helpful for the crew. Not only do they more easily solve the problem, they also facilitate the opportunity to learn from colleagues and their ideas. This can help increase the overall level of knowledge in the crew.

Everyone Can Provide Input, Make Suggestions and Ask Questions

This bears witness of the good and informal relations among the crew. Schiefloe (2013) has described sharing of knowledge and experience as a key word for Social relations and network.

Involve Everyone, Form the Newest and Youngest to the Most Experienced

One of the informants is particularly concerned with the involvement of the newest and the youngest. He says that they can often see things that the more experienced do not notice. This could be things that the more experienced do not reflect upon simply because they are used to it, even

though it might have a big potential for improvement. One informant did also mention the dangers related to very frequent routine operations and the flow that comes with such operations. If one has done the operation a hundred times, one might become a bit 'blind' and a new pair of eyes can therefore be most helpful. To involve the newest and the least experienced on board are also important for learning and for building competence. This is an example of exploitation March (1991), in the sense that knowledge is transferred from the more experienced to the less experienced.

Experience, Both from Previous Situations and From Your Colleagues

In several of the interviews, experienced and skilled people came up as a prerequisite for success. Experience from previous operations and with the equipment will probably increase the ability to catch early warning signals and to find solutions, cf. the ability to respond and monitor in resilience (Hollnagel et al., 2011). Andresen, Rosness, and Sætre (2008) do also argue that a high level of competence and experience may increase the operator's ability to detect unwanted and unforeseen developments at an early stage. The informants described a core of very experienced leaders on board. These leaders can be a very good resource for experience transfer and learning for the people with less experience. It was described by the informants that everyone's opinion was equally respected regardless of experience. All the knowledge, both silent and explicit, and experience of the crew on board can be considered one large experience database. It is important to have mutual respect for each other's competence, to see the value of your colleagues' experience and to use this as a resource in planning, decision-making and problem-solving.

Trust Your Colleagues and the Quality of Their Work

One of the informants described a situation where the driller would choose to stop the operation because he did not feel that everything was ok. Even though there was no indication of anything wrong the company man and the senior toolpusher would respect and support the driller's decision. The operation would be stopped and they would check for problems. Even though sometimes it turned out that everything was in fact fine, the others would never criticize the driller's decision. This does again illustrate the 'better safe than sorry' policy on board.

Working with the Same Crew and People you Know Help Build Good Routines/Meet on the Free Time

Several of the informants said that working with the same crew and people you know was a great enrichment for the operations and work itself. Working in a fixed crew helps build good working routines and create an effective

team. It is also directly linked to a good working environment, where people trust each other and feel confident in their roles. One of the informants expressed a wish for more social events on the free time on shore. He felt that such events or team building would further facilitate good and efficient working routines. Team building can also help develop social relations that might contribute to a greater sense of responsibility for your colleagues. People caring about each other and looking out for each other might improve the level of safety. Skjerve (2008) has described robust work practice as the following: e.g. when a person notifies a colleague who is about to do something wrong that can lead to negative consequences for him or others. It requires good, well-established relations and trust to be able to tell a colleague that he or she has made, or is about to make, a safety critical error. One must be able to trust each other and do not take offense when someone points out an error or mistake. The finding is in accordance with HRO thinking (Rochlin, LaPorte, & Roberts, 1987; LaPorte & Consolini, 1991).

Formal Structure and Organisational Factors

Having a Plan B/Thorough Planning/Plan and Think Ahead and Anticipate What Might Happen

Thinking ahead and anticipate what might happen is one of the four pillars of a resilient system, the potential (Hollnagel et al., 2011). This could also be recognized from Schiefloe's five prerequisites for safe operation, which describes a reliable organization as one that makes use of good planning and risk assessment (personal communication with P. M. Schiefloe, as cited in Albrechtsen, 2012). Størseth, Albrechtsen, and Eitrheim (2010) have described risk awareness as one of the Contributing Success Factors (CSF's). This includes the adaption process in resilience engineering: Anticipation-Attention-Response (A-A-R). Planning and anticipation of future events have a central role in this process.

It is reasonable to believe that the range and variety of the potential events one will be able to anticipate are related to previous experience and knowledge and so will the sensemaking, should such an event occur. Clegg, Kornberger, and Tyrone (2008) have described seven characteristics of the sense-making processes; one of these characteristics tells us that the processes are retrospective in the way that people make sense of things by interpreting present situations in the light of the past. However, it is important to 'look outside of the box,' and not to rely solely on own experience. A broad specter of knowledge and experienced people will help improve planning and anticipation. A plan B will be a result of some kind of risk assessment, job evaluation or anticipation process. This would be a way of ensuring that the crew knows how to respond if irregularities occur, cf. the four pillars of Resilience (Hollnagel et al., 2011). A plan B can be prepared

on different levels. It could be specified as part of the original plans, but it can also be less specific actions that are based more on the ability to be flexible, adapt and improvise. Some of the informants talk about thorough planning as an important factor for success. Here one can draw parallels to the Efficiency-Thoroughness trade-off (ETTO) as described by Hollnagel (2013). According to the ETTO principle, there must be a minimum level of both efficiency and thoroughness in order to succeed with an operation. However, it will be impossible to maximize both at the same time (Hollnagel, 2013). It seems like the organization on board this rig has found a well-functioning balance between efficiency and thoroughness as reported in this study. They continuously work to improve efficiency, but never at the expense of safety. One might get the sensation that this is an organization that favors thoroughness above efficiency pressure.

Good Procedures

Procedures are important not only as a means of fulfilling laws and regulations, but also as a fundament creating a certain common standard in all the operations. A well-functioning structural fundament can be important to have success. One of the informants pointed out that not all the procedures are as easy to follow in practice. He believed these procedures were often written by people on shore who did not have the adequate knowledge about how the work should be actually done. A good procedure should have a professional foundation, serve the purpose and be pedagogically good. It is essential that the user can understand the value of the procedure and why procedures are needed. One way to obtain this can be to make people feel ownership towards the procedures. On this rig, the culture is characterized by openness and involvement, where everyone can make suggestions. This might help facilitate people's involvement in the writing and editing of procedures. Even though it might be crucial with a structural fundament of procedures, one must keep in mind that too rigid procedures might leave little room for adaption and flexibility.

Good Reporting

Reporting of not only unwanted, but also wanted incidents can contribute to learning from things that go well. In order for people to appreciate the opportunity of reporting, it is important to give response and to discuss the reported incidents. Good reporting is not only about having a high number of reports, but also about having good quality (Kjellén, 2000).

Evaluation of the Job, Both before and after

Evaluation before the job starts would be a part of planning and risk assessment. Pre-job meetings and pre-job evaluations are rather common

and often embodied in procedures. Debrief or evaluation after the job is perhaps more uncommon. One of the informants stated that they do have debrief meetings on board the rig, but this does rarely involve everyone that contributed to the job. Another informant mentioned that debriefs are most common after operations where something did not go according to plan. More focus on debriefs also after successful operations might contribute to learning from things that go well. Resilience tells us to make use of learning not only from previous accidents and failures, but also to draw knowledge from success and normal operations (Hollnagel et al., 2011).

Little Time Pressure: Focus on Performing the Operation Properly and Safely Even Though It Might Take Some More Time

The overall impression is that there is little time pressure or pressure related to increasing efficiency on this rig. According to the informants, this also applies for the rest of the Norwegian sector. This does not mean that they do not focus on improving efficiency: they do always have this in mind and are continuously working on finding new and more efficient ways to perform the operations and avoid down time. However, the main focus seems to be on performing efficient, high quality operations without compromising the level of safety. Several of the informants did also emphasize that this trade-off was supported by both the land organization and the operator company. According to Rasmussen's model of drift, both management efficiency pressure and the effort to avoid unacceptable workload can steer the operation towards the boundary of acceptable risk (Rasmussen, 1997). Being able to minimize this pressure to an acceptable level can therefore be essential for safe work. What the acceptable level of pressure is will most likely vary between different operations. It will probably be more acceptable to try optimizing the efficiency in routine operations than in more challenging and less frequent operations or critical phases. Flin et al. (2014) have described stress as one of the performance shaping factors: the low time pressure on board contributes to a low stress level and can therefore increase the level of high quality work performances.

Training and Building Competence

Training and building competence are directly linked to experience. One of the informants pointed out that it is important that everyone learn how things are done and how the procedures are to be followed, and that everyone get the same prerequisites for learning. He emphasized that 1:1 training can impair the quality of the competence. If number one teaches number two, number two teaches number three and so on, you risk that number nine in the row might be 'lazy' and only pass on the shortcuts to number ten. Several of the informants mentioned that Norwegian offshore employees represent an overall high standard in competence. The profes-

sional status is raised through formalized education and training of good quality. A high level of competence, skills and knowledge will make the operator more prepared to handle unwanted and unforeseen situations. Competence and experience might help compensate in situations where there is no procedure or clearly defined prescription on how to act (Andresen et al., 2008).

Right People on the Right Place and Right Time

To have the right people working on the right place could be just as important as using the correct equipment. Allowing people to work with something they feel good at and to make full use of their skills can be a motivational factor. This is also an aspect of planning and resource management.

Support from the Operator Company

As a contractor company, the operator will be your client. The operator company makes the drilling program and will often be on top of the decision-making. It is therefore very important for the contractor and the crew on board that they have support from the operator, especially the company man who is the operator company's main representative on board. The informants say that the operator company support the favoring of little time pressure and high focus on performing safe operations above efficiency pressure. One of the informants emphasized that the company man was part of the great team and there was no 'them' and 'we.'

Flat Organizational Structure

A flat organizational structure implies that decisions are made on the lowest possible level of the organization, as near the sharp end as possible. Proximity to the operation will be an advantage. As pointed out by one of the informants, procedures and work routines are often written by people on shore who do not have a full understanding of the operation in question. This can make it difficult to follow the procedures. Flat organizational structure does also imply short communication routes and it is therefore less likely that messages are misunderstood. It seems like the leaders are good at delegate decision-making without pulverizing of the responsibility. Such an organizational structure will make it easier to build relations across different levels and it could thus be easier to give a heads up or to make new suggestions.

Technological Factors

Correct Equipment/Daily Maintenance of Equipment

The use of correct equipment can be linked to the planning phase of an operation. One of the informants pointed out that they always tried to prepare
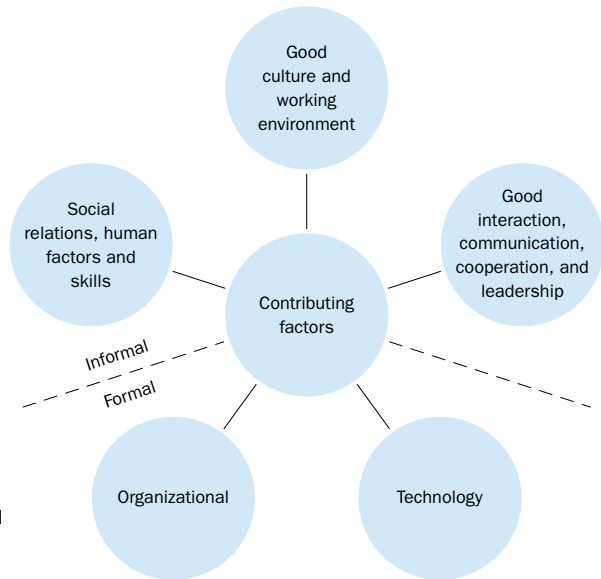
Figure 2
Factors That Might Contribute to Successful Operations in Terms of Safety

all the equipment they needed before the operation started and it was important that they knew exactly where to find the equipment needed. Maintenance of equipment can be seen as an act of proactivity. Maintenance and testing of e.g. the BOP are performed to prepare for potential unwanted events. The bigger picture does also play a role in maintenance of equipment: 'It's important to keep the details in mind as well, but we often see that it's the basics that's lacking. Like basic maintenance and such,' an informant stated. Technical aspects did not come up as a very significant topic in the interviews. However, it was briefly spoken of in relation to some of the other topics.

Conclusion

Due to the complexity of drilling operations, it might be difficult to explain exactly what is causing it to go so well. It can be hard to pinpoint because people might not know the exact reasons. Things that go well have not been the focus of traditional safety thinking, and people and organizations are not used to reflect upon the causes behind success. Just like accidents are rarely caused by only one reason alone, successful operations are the result of multiple conditions and factors. The factors are also clearly interrelated.

Figure 2 illustrates how the factors contributing to successful operations are divided into five groups. There is not necessarily always a clear distinction between formal and informal factors: some might belong in both categories. Formal factors might also be a prerequisite for informal factors

and the other way around. Some of the groups in the figure are bigger than others to illustrate the distribution of factors among the five groups. The group of 'technology' is the smallest one. However, this does not necessarily imply that technological factors are less important than others. It seems like the informants had a greater focus towards the other four groups.

When explaining successful operations in terms of safety, the literature mainly focuses on informal factors related to humans and their actions (e.g., LaPorte & Consolini, 1991; Weick & Roberts, 1993; Westrum, 1993; Hollnagel, 2009; Hollnagel et al., 2011). Despite this, the empirical findings in this study do clearly indicate that both formal qualities and informal qualities must be present in order to create successful operations. It can seem like the informants are more oriented towards compliance to rules than informal qualities like adaption to situations. Some of the informants say that good procedures, reporting and following routines are important to avoid major accidents. At the same time, the informants describe a flat organizational structure and a type of leadership that is not consistent with compliance and a top-down approach. This might imply that both compliance and resilience are equally important for successful operations and that a certain degree of both are required.

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Early Involvement and Integration in Construction Projects: The Benefits of DfX in Elimination of Wastes

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Typical construction processes provide waste: material waste but especially process-related waste. The majority of this waste can be avoided with efficient planning in the front end of projects. The main aim is to describe how the concept of Design for Excellence (DfX) can reduce the most severe waste in construction projects. Based on a literature review of waste and requirements that aid early involvement and integration, we created a survey for analyzing and prioritizing types of waste in the construction industry. We describe how DFX reduces this waste, especially through the use of early involvement and integration. When applied, DfX creates incentives for project stakeholders to eliminate waste automatically through early involvement and integration.

Keywords: design for excellence, lean, waste, early involvement, integration

Introduction

The construction industry has been criticized for very low productivity development compared with other industries (Pekuri, Haapasalo, & Herrala, 2011). Typical construction processes provide waste – material waste but especially process-related waste (Merikallio & Haapasalo, 2009). Process-related waste occurs from activities in the process that do not add value (Womack & Jones, 1996). The majority of this waste can be avoided with efficient planning in the front end of projects.

Construction projects have traditionally been organized in sequential phases in which project tasks follow each other with minimum interaction with other tasks. Project stakeholders participate in other phases only on an as-needed basis resulting in minimal and weak communication. Weak com-

munication leads partially to sub-optimization where work is done mainly to optimize the impact and contribution for the best for one particular participating organization, not for the best for the whole project (Lohikoski & Haapasalo, 2013; Matthews & Howell, 2005).

Early stakeholder involvement and integration have been highlighted as one of the most promising solutions for resolving these waste problems (Aapaoja, Haapasalo, & Söderström, 2013a; Baiden, Price, & Dainty, 2006; Lahdenperä, 2012). This solution has also been mentioned as an essential part of improving productivity in the construction industry in the long run. Integrated project deliveries (IPDs) and relational project delivery agreements (RPDAs) are operating models based specifically on early stakeholder involvement and integration. Contractors, customers, and other stakeholders work together as an integrated, collaborative team in an IPD and RPDA (Ballard, 2008).

Key stakeholders can be addressed in the early phase of a project through the Design for Excellence (DfX) approach. DfX has been applied in the electronics industry in complex product development projects. In DfX, the X stands for an aspect, life-cycle phase, or stakeholder under consideration, such as manufacturing, environment, maintenance, supply chain, and cost (Bralla, 1996; Lehto et al., 2011; Möttönen, Härkönen, Belt, Haapasalo, & Similä, 2009). In DfX, it is important to identify the critical stakeholders (X's) to integrate them early. DfX helps functional integration, creates capability, and acquires the best competence for the project (Ulrich & Eppinger, 2008).

As a more extensive development avenue, the automotive industry has successfully utilized Lean principles for decades, resulting in higher productivity by 15–40% (Bhasin & Burcher, 2006). One of the main avenues of improvement in Lean is to eliminate waste and focus on value creation, early or before waste occurs. Lean thinking has also been applied in the construction industry since the 1990s resulting in a similar type of improvements (Alarcón, Diethelm, Rojo, & Calderón, 2005; Bertelsen, 2004; Sacks, Koskela, Dave, & Owen, 2010).

In this study, based on very versatile and partially miscellaneous background concepts and discussions from different industries (waste, early stakeholder involvement and integration, DfX and Lean), we aim to combine logical reasoning to eliminate waste and then improve productivity in construction. To put it succinctly, *we present the DfX concept as a solution for eliminating the most severe waste in the construction industry.*

The original setup for this research comes from the fragmented and poor productivity construction projects resulting in process waste. From the early stakeholder identification and involvement and eventually integration, we review means for avoiding fragmentation. For these discussions, we aim to

present that when applied, DfX automatically forces stakeholders to concentrate on critical issues and prevent waste from occurring. For identifying the most important stakeholders (X), we need to apply discussions from stakeholder management, that is, stakeholder salience. We generated the following research questions:

RQ1 *What are the fundamental requirements for early involvement and integration?*

RQ2 *What are the typical types of waste in construction projects?*

RQ3 *How does DfX respond to these types of waste?*

Literature Review

Waste in the Literature

Lean thinking involves eliminating all waste and focusing on creating value. The automotive industry has successfully utilized Lean principles for years. Lean manufacturing has resulted in increasing productivity in the manufacturing industry by 15–40% (Bhasin & Burcher, 2006). Lean principles have also been successfully applied in the construction industry since the 1990s resulting in similar improvements (Alarcón et al., 2005; Bertelsen, 2004).

Waste was defined by Womack and Jones (1996) as all possible inefficiency resulting from tools, materials, labor, or capital use. Waste includes material loss and cost from unnecessary work resulting in extra cost but no value. Polat and Ballard (2004) observed that waste is everything that does not increase customer value. For customers, this is important because they do not want to pay for activities that do not add value (Liker & Morgan, 2006). Finally, the customer defines what value is and what waste is (Hines, Holweg, & Rich, 2004). Monden (1983) classified process activities into three types: value-adding activities (VAs), non-value-adding but necessary activities (NNVs), and non-value-adding activities (NVAs).

The literature recognizes several waste classifications originating from Ohno's (1988) seven initial types of waste: overproduction, waiting, unnecessary transportation, unnecessary movements, over-processing, inventory, and defects. Formoso, Isatto, and Hirota (1999) revised these classifications to fit the construction industry and added weather conditions, theft, and vandalism. Subsequently, Koskela (2004) added making do and poor constructability (Koskela, 1992), making the wrong product or service (Womack & Jones, 2003), and behavioral waste (Emiliani, 1998). Liker (2004) added people's unused potential, overloading, and unevenness. Cain (2004) proposed other types of waste, such as poor quality of work, poor material management, material waste, non-productive time, suboptimal conditions, and lack of safety. A complete list is compiled in Table 1, where similar types of waste are combined.

Table 1   Types of Waste in the Construction Industry According to the Literature

Type of waste	Authors in the literature	Content in construction
Overproduction	Formoso et al. (1999), Garas, Anis, and El Gammal (2001), Hines and Rich (1997), Liker (2004)	Producing materials, products, or services beyond what is needed or too early, e.g., manufacturing products for inventory
Waiting	Formoso et al. (1999), Garas et al. (2001), Hines and Rich (1997), Liker (2004)	Products or workers have to wait for the next processing step, tool, parts, etc., e.g., because of a machine malfunction
Unnecessary transportation	Formoso et al. (1999), Hines and Rich (1997), Liker (2004)	Transporting materials, parts, tools, or information indirectly to the next working step; e.g., products or materials are moved in and out of inventory between process phases
Inadequate processing	Formoso et al. (1999), Garas et al. (2001), Hines and Rich (1997), Liker (2004)	Ineffective processing caused by unnecessary activities, defective working methods, or poor planning; producing over quality and underutilized capacity
Inventory	Formoso et al. (1999), Garas et al. (2001), Hines and Rich (1997), Liker (2004)	Unnecessary storage of products, materials, or work-in-progress
Unnecessary movements	Formoso et al. (1999), Hines and Rich (1997), Liker (2004)	Unnecessary or inefficient movements made by workers during their job
Defects	Formoso et al. (1999), Garas et al. (2001), Hines and Rich (1997), Liker (2004)	Quality defects, wrong working methods, and needing rework
Making do	Koskela (2004)	Initiating a task without ensuring that all needed prerequisites (materials, workers, information, etc.) are available
Making wrong products or services	Womack and Jones (1996)	A customer's need is not understood, and the wrong product or service is produced for the customer

Continued on the next page

Integration

Integration can be seen as a contrast to fragmentation and then an essential part of improving productivity in a project-based industry (Aapaoja et al., 2013a). Organizations, and especially temporary organizations, are open social systems that deal with uncertainty from several sources, where parts of the organization must handle and coordinate problems associated with different tasks and their interdependencies (Tushman & Nadler, 1978). Coordination is an important part of the integration and can be implemented

Table 1   *Continued from the previous page*

People's unused potential	Liker (2004), Macomber and Howell (2004)	Underutilizing people's creativity or skills; workers' ideas and perspectives are not considered
Overloading	Liker (2004)	The workload is too heavy for the worker or machine; it can cause defects and a decrease in safety and quality
Poor constructability	Cain (2004), Lee, Diekmann, Songer, and Brown (1999)	Designing constructs that are difficult or inefficient to build
Inadequate communication and documentation	Alwi (2002), Josephson and Saukkoriipi (2005)	Defective and poor communication, information, or documentation
Safety	Josephson and Saukkoriipi (2005)	Working accidents, poor safety conditions, and dangerous working methods
Other (weather conditions, theft, vandalism)	Formoso et al. (1999), Garas et al. (2001), Josephson and Saukkoriipi (2005)	Waste of any other nature, such as theft, vandalism, or inclement weather

through information systems (Morris, 2013; Thompson, 1967). Then organizations, including temporary organizations, must develop information-processing mechanisms that can be considered integration mechanisms, to deal with external and internal sources of uncertainty.

Uncertainty can exist in the organizational environment, as well as in tasks and task complexity, not to mention time (Mitropoulos & Tatum, 2000; Tushman & Nadler, 1978). According to Turkulainen, Kujala, Artto, and Levitt (2013), organizational task uncertainty can be divided into dimensions: uniqueness, ambiguity, complexity, and dispersion. Several tools and methods can decrease uncertainty, but they must be integrated in the project organizations. Information and communication technology (ICT) systems cannot solve the problems either but can help share explicit knowledge across organizations (Dave & Koskela, 2009).

Integration mechanisms link different parts of an organization to accomplish a collective set of tasks (Van de Ven, Delbecq, & Koenig, 1976). According to Okhuysen and Bechky (2009) and Mintzberg (1989), coordination mechanisms, similar to integration mechanisms, are 'the most essential elements of structure' in organizations, including formal and emergent elements. Information processing systems are part of management systems that aid organizational decision-making by gathering, interpreting, and synthesizing information (Laudon & Laudon, 2010; Tushman & Nadler, 1978). Van de Ven et al. (1976) classified information processing into three distinct modes: impersonal, personal, and group. ICT systems were found for these

classes (Laudon & Laudon, 2010). However, integration of these systems is essential. Thompson (1967) identified that coordination mechanisms address various interdependencies (pooled, sequential, and reciprocal) in organizations and vary according to the number of interdependencies (Morris, 2013).

In a classification of integration mechanisms, Mitropoulos and Tatum (2000) presented three types: contractual, organizational, and technological. Contractual mechanisms are typically impersonal plans and formalized rules, policies, and procedures: a blueprint or process for action that project management should commonly specify. Organizational mechanisms, in turn, are organizational charts and written policies and procedures; they may also include personal integration mechanisms. Technological mechanisms frequently contain standardized information and communication systems (Turkulainen et al., 2015; Van de Ven et al., 1976). These mechanisms are most likely dynamic and have a higher level of interdependency in complex projects (Morris, 2013).

Early Involvement

The current method of involving different stakeholders in the construction process varies, typically on an as-needed basis. Similarly, the over-the-wall principle prevails where contribution for the project will be in a unidirectional mode, which leads to a sub-optimization in which the stakeholders aim to optimize their performance (Matthews & Howell, 2005) without properly understanding the effect on others. A concurrent discussion about early involvement typically concerns an IPD or RPDA (Ballard, 2008). This type of relational multi – party contracting challenges the traditional system by contrasting the customer needs and requirements against means and constraints (Figure 1) – alternative methods for accomplishing their needs beyond those they have previously considered and to help clients understand the consequences of their desires (Ballard, 2008). An IPD or RPDA is a procurement model for delivering major projects, where the customer and non-owner stakeholders work together as an integrated, collaborative team. The objective is to work in good faith, acting with integrity and making unanimous, best-for-the-project decisions, by jointly managing all risks of delivering the project delivery, and sharing the outcome of the project (Cohen, 2010; Department of Treasury and Finance, 2006; Lahdenperä, 2012; Thomsen, Darrington, Dunne, & Lichtig, 2009), generating together win-win or lose-lose situations.

'IPD integrates people, systems, business structures and practices into a process that collaboratively harnesses the knowledge and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction' (American Institute of Architects, 2008). Early
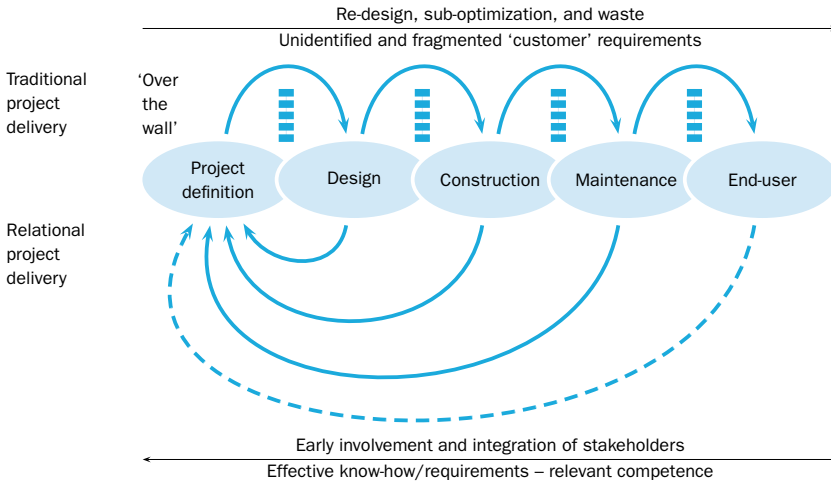
Figure 1 The Ideological Difference between the Traditional As-Needed Basis and Early Integration (Adapted from Aapaoja, Kinnunen, & Haapasalo, 2013b)

stakeholder involvement and integration have been highlighted as one of the most important aims of IPDs (Aapaoja et al., 2013a; Baiden et al., 2006; Lahdenperä, 2012). Handfield, Ragatz, Petersen, & Monczka (1999) emphasized that the more complex the project, the earlier the stakeholders should be involved. Early involvement yields, at least, the following benefits (Dowlatshahi, 1998; van Valkenburg, Lenferink, Nijsten, & Arts, 2008):

- Early knowledge about the end-users leads to greater client satisfaction regarding the product's function and usage.
- Leads to the lower likelihood of developing poor designs, and a higher probability of improved construction operations and less scrap.
- Enables creation of innovative solutions and intensive exchange of ideas.
- Leads to procedures that are synchronized and run in phases.
- The more the stakeholders know about:
  1. the client's or end-users' actual usage of products, the more efficient the stakeholders' operations are regarding meeting the buyer's needs and purposes;
  2. the exact objectives of design specifications, the more the stakeholders can meet or revise those specifications by adjusting its capabilities.

DfX and Stakeholder Management

In the electronics industry, DfX has been applied in complex product development projects (Bralla, 1996; Lehto et al., 2011; Möttönen et al., 2009).

Table 2 Business Benefits Supported in DfX Realization

DfX characteristic	Potential benefit
Cost	Profit in price competitive markets
Quality	Consistent and low defect rates; optimal product performance; reliable products
Services	Effective after-sales service; effective product support and maintenance; customization of products and services; availability of products
Delivery	Fast delivery; on-time delivery; time-to-market
Flexibility	Design changes; rapid volume changes and introduction of new products
Manufacturing	Selection of appropriate processes and materials; appropriate modular design; use of standard components
Supply chain	Optimal lead-time and product diversity
Assembly	Economical assembly; effective parts handling and insertion
Testability	Optimal test coverage; faults revealed and reliability improved; controllability; observability
Environment	Sustainable development; overall environmental impact minimized

Notes Modified from Lehto et al. (2011).

Early involvement and integration can be seen as a necessity from the project success point of view (Aapaoja et al. 2013b; Distanont, Haapasalo, Väänänen, & Lehto, 2012). However, all possible stakeholders cannot be involved early because the number of stakeholders would be too large. DfX is a structured approach to systematically addressing key stakeholders in the early phase of product development, functional integration, and capability creation.

At the permanent organization level, there are few examples of how these X's have been defined and balanced for collective knowledge and contribution in the early phase of product development (Kinnunen, Aapaoja, & Haapasalo, 2014). A comparative study (Aapaoja et al., 2013a) revealed that the construction industry has not utilized collective capabilities, or involved stakeholders, optimally. In principle, comparative X's exist in the construction industry, but the names are different. It then only requires stakeholder analysis for each type of project.

Theoretically, these X's are the most important stakeholders. Bourne (2005) defined a stakeholder as an 'individual or group who have an interest or some aspect of rights or ownership in the project.' Stakeholders can also 'contribute in the form of knowledge or support, or can impact or be affected by the project.' Briefly, they have a stake in the project or the results. Management, or more accurately, 'orchestration,' of these stakeholders involves identifying, analyzing, and planning actions systematically in order to communicate with and impact the process of these stakeholders to aid decision-making in projects (Aaltonen, Kujala, & Oijala, 2004; Don-

aldson & Preston, 1995; Project Management Institute, 2004). However, it is easy, even in smaller projects, to end up defining tens or even hundreds of stakeholders, and decision-making becomes impossible. Aapaoja and Haapasalo (2014) created a framework for identifying and classifying stakeholders in construction projects. This framework adapted Mitchell, Agle, and Wood's (1997) stakeholder salience (consisting of the attributes legitimacy, urgency, and power) and Olander's (2007) impact and probability matrix to identify the key stakeholders.

DfX includes features of concurrent engineering (CE), such as manufacturing, quality, logistics, assembly, packaging, reliability, service, and so on (Bralla, 1996). Life-cycle considerations are important, because project management commits as much as 70% of the total life-cycle costs of products in the early design stages. One of the main aims of DfX is to reduce costs, but it also provides cost and other information to designers (Anderson, 2006; Asiedu, 1998; Rabino & Wright, 2003). DfX has been seen as a potential means for improving communication and creating capabilities for addressing competitive goals (Lehto et al., 2011; see Table 2).

Requirements for Early Involvement and Integration

IPD, typically applied in complex projects, can be considered an extreme form of inter-organizational integration. The most attractive forms of relational contracting are reducing fragmentation and improving efficiency and performance in complex construction projects (Chen, Zhang, Xie, & Jin, 2012; Davis & Love, 2011). Fragmentation in the construction industry has resulted in adversarial relationships between stakeholders, in the disintegration of the construction process in general, and in deteriorating performance on demanding projects (Jefferies, Brewer, & Gajendran, 2014; Noble, 2007). Some researchers (Chen et al., 2012; Lahdenperä, 2012; Rutten, Dorée, & Halman, 2009) have developed several collaborative project arrangements to improve integration through the early involvement of stakeholders, transparent financials, shared risks and rewards, joint decision making, and agreement. The literature identifies at least three forms of collaborative arrangement: project alliancing (originally in Australia), integrated project delivery (the Integrated Form of Agreement in the United States), and partnering (Lahdenperä, 2012; Walker & Lloyd-Walker, 2015).

Inter-organizational integration is vital for organizations to promote a collaborative culture and improve project performance (Aapaoja & Haapasalo, 2014). Ibrahim, Costello, and Wilkinson (2013) characterized seven key practices for alliance team integration: team leadership, trust, respect, single team focus on project objectives, collective understanding, commitment from the alliance management team, the creation of a unique and co-located alliance team, and the free flow of communication. These prac-

tices are very similar those that Aapaoja et al. (2013a) identified as the cornerstones for creating an integrated team.

DfX is a management approach for coordinating design requirements of internal functions and external supply chain partners – stakeholders. Aside from the requirements coordination role, one of the main benefits of DfX is getting requirements on equal terms for the project and its outcome – especially in the beginning of the project. DfX works also as a communication tool to achieve functional (stakeholder) integration and as a compilation to manage requirements (e.g., Lehto et al., 2011). Through DfX a project can discuss on contradictory requirements and avoid mistakes and overlapping in its later phases.

Waste in the Finnish Construction Industry

Research Methodology

This study follows mainly a conceptual research, when it focuses on the concept or theory that explains or describes the phenomenon of DfX and wastes being studied. It, however, has features of an explorative study forming avenues for further research e.g. in the area of stakeholder management related to DfX utilization in construction processes. The role of empirical data is to explain and verify the major wastes to be eliminated with DfX concept.

Our research aims at answering to the research questions presented in the introduction (Figure 2). We first analyzed the literature on waste, especially wastes in the construction industry, to provide specific waste definitions for this industry. Then we reviewed the literature on integration, early involvement, DfX, and stakeholder management to provide insight into the fundamental requirements for early involvement and integration (RQ1). The literature is based on earlier systematic literature reviews in our earlier studies. We have used an integrative approach to combine the aforementioned areas for this study. We have used only the most relevant references to avoid unnecessary extension in the list of references, because the aforementioned areas are somewhat based on different types of literature.

We present the results from a survey carried out to identify and describe the types of waste in construction. On the survey, practitioners were asked to define the most severe types of waste and to rank them by importance. We created a waste priority number (WPN) based on a failure mode effects analysis (FMEA) in order to rank the types of waste, and then applied an analytical hierarchy process (AHP) for pairwise comparison. FMEA relies on identifying potential failures, analyzing root causes, and examining failure impacts so that these effects can be reduced (Abdelgawad & Fayek, 2010). Because of the divergent nature of the different types of waste (e.g., intangible and immeasurable), the types of waste were also ranked with the AHP
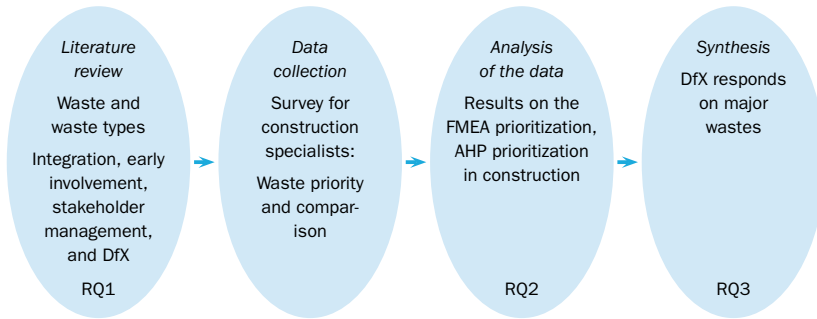
Figure 2   Our Research Process

method (RQ2) to validate the priority and weight of different wastes. The AHP aims to aid in the decision making for problems that involve multiple criteria, entailing a hierarchical formatting of the problem by establishing a pairwise comparison matrix (Saaty, 1980). Finally, we analyze the most severe waste with the benefits of DfX (RQ3).

Data Collection

We deployed a survey among Finnish construction specialists (Table 3) to rank types of waste in the construction industry (Table 1). We applied FMEA for the waste priority number and an analytical hierarchy process (a pairwise comparison). The interviewees' provided data for prioritizing the wastes and answered on pairwise comparison on different waste pairs. We selected the interviewed specialist from the Finnish construction companies representing different roles in the construction process (Table 3). The selected companies were participating in the same development entity and had a good understanding on productivity development in the construction industry. Therefore we had good access to information and a reliable relationship with these specialists.

Data Analysis Method

Traditional FMEA determines a risk priority number (RPN) for the failure modes as a multiplication of severity, occurrence, and detection (Abdelgawad & Fayek, 2010). Instead of the RPN, we created the WPN with the same logic; for simplicity, all three attributes are equally weighted from 1 to 10. Severity means the effect of the waste on the project: the higher the number, the more severe the type of waste in question. Occurrence refers to how often the waste occurs: a value of 10 means continuous occurrence while 1 means a very rare occurrence. The detection means how easily we can identify waste: 10 means that waste is tough to determine, and its root

Table 3   Interviewees' Demographics

Title	Trade	Size of bus. unit	Work experience
Project Engineer	Contractor	4	2
Executive Director	Design	4	3
Executive Director	Project Management	4	5
Account Manager	Design and Maintain	3	3
Consultant	Construction Consultant	1	4
Executive Director	Developer	1	5
Project Manager	Contractor	4	2

Notes   Size of business unit (employees): 1 = 0–10, 2 = 10–50, 3 = 50–200, 4 = 200+. Work experience (years): 1 = 0–5, 2 = 6–10, 3 = 10–15, 4 = 15–20, 5 = 20+.

Table 4   Pairwise Comparison Scale Applied in the Interview

Weight	Definition
1	Equal importance
3	Weak importance of one over another
5	Essential or strong importance
7	Substantially higher importance
9	Absolutely higher importance
2, 4, 6, 8	Intermediate values
Reciprocals of above	Reciprocals (1/2 to 1/9) of the above weights can be used when necessary

Notes   Adapted from Saaty (1980).

causes and consequences are hard to control within the current system. The WPN increases as the occurrence of this type of waste may have unpredictable and uncontrollable outcomes. A value of 1 means that the waste can be easily identified by individuals or by the existing control system. We collected the data through interviews (Table 3), and every informant gave values for each type of waste and each attribute. During the interviews, informants were able to ask additional specific questions if needed.

In the pairwise comparison, the respondents compared and prioritized two alternatives. This method identifies the extent or ranking of the compared factors. A pairwise comparison included several steps, starting with the construction of the matrix (size $n \times n$, where n is the number of waste). Then the respondents compared two factors in the interview using the relative scale measurement shown in Table 4. Finally, the informants compared each type of waste against the others. The system assigned reciprocals automatically in each pairwise comparison (Al-Subhi Al-Harbi, 2001; Saaty, 1980).

After all the comparisons had been made, the priority vectors (eigenvectors) were calculated: Each element of the matrix was divided by its column

Table 5 Random Index (RI) Values

(a)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(b)	0	0	0.52	0.88	1.11	1.25	1.34	1.41	1.45	1.49	1.51	1.54	1.56	1.57	1.58

Notes (a) size of matrix (*n*), (b) random consistency. Adapted from Alonso & Lamata (2004).

total, and then the priority vector was obtained by finding the row averages. Then, the consistency of the comparison was determined by using the eigenvalue (λmax) to calculate the consistency index (CI), CI = $(\lambda max - n)/(n - 1)$. After that, the consistency ratio (CR) was calculated by dividing the CR with the appropriate value of the random index (RI; Table 5). If the CR does not exceed 0.10, it is acceptable but, if it is higher than that, the judgment matrix is inconsistent and should be reviewed and improved (Al-Subhi Al-Harbi, 2001; Saaty, 1980).

Waste Priority Number in the Finnish Construction Industry

The final WPN can vary from 1 to 1000 per type of waste. A higher WPN means a more important type of waste; a smaller WPN means that particular waste is less important. The types of waste are presented in the order of the WPNs in Table 6. According to the FMEA prioritization and WPN analysis, the most severe types of waste are inadequate communication and documentation, people's unused potential, defects, making the wrong product or service, and unnecessary movements.

If we think about eliminating waste, detecting it is a major factor. In the WPN, detection has a significant role, and the use of detection in the formula changed the order of some types of waste. Communication and documentation remained number one, while the role of defects, overproduction, making do, and overloading increased. The interviewees saw the importance of different types of waste differently, so there was no direct correlation between the answers. Different roles and responsibilities in projects also revealed slightly different types of waste.

Pairwise Comparison of Types of Waste

In the pairwise comparison, types of waste were compared with each other. There was no clear correlation between different interviewers' answers, and the correlation between the pairwise comparison and the WPN analysis was weak. There was more correlation between the impact factor of the WPN analyses and the pairwise comparison. Inadequate communication and documentation, making the wrong product or service, and defects all were the most severe in both methods.

In Figure 3, there is a pairwise head-to-head comparison of the types of waste. The analysis indicated that poor communication and documentation

Table 6   List of Types of Waste According to the Waste Priority Number

Type of waste	WPN	Severity	Occurrence	Detection
Communication and documentation	328	8.0	7.0	5.9
People's unused potential	251	6.9	5.6	6.6
Defects	238	7.0	7.0	4.9
Making wrong products or services	207	6.9	5.3	5.7
Unnecessary movements	201	4.8	7.3	5.7
Inadequate processing	187	6.0	5.5	5.7
Making do	186	6.4	7.0	4.1
Overloading	176	6.7	6.6	4.0
Poor constructability	152	6.7	5.3	4.3
Overproduction	148	7.1	6.6	3.1
Waiting	146	6.0	5.9	4.1
Unnecessary transportation	144	4.9	7.1	4.1
Safety	51	6.5	2.3	3.3
Inventory	45	4.3	6.2	1.7
Other (weather conditions, theft . . .)	30	4.7	4.8	1.3

Notes   WPN = severity × occurrence × detection.
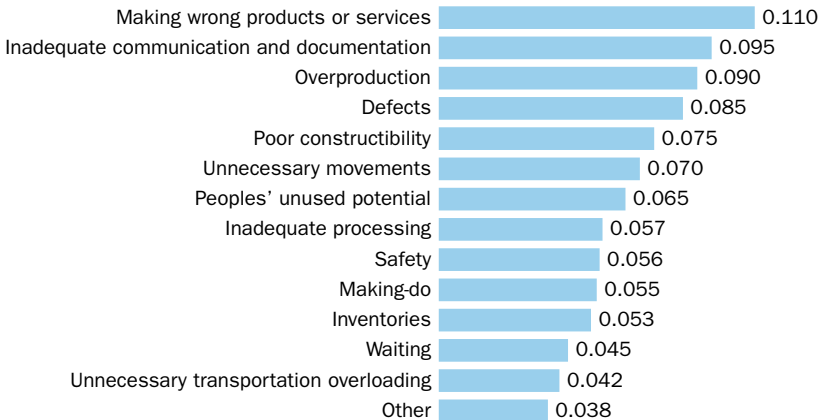
Figure 3   Head-to-Head Pairwise Comparison of Types of Waste

is the most severe type of waste in the construction industry. The main reason is the fragmented nature of the construction industry, and non-material waste should receive more attention.

The two estimation methods led to different rankings of types of waste. Table 6 and Figure 3 show that inadequate communication and documentation, defects, and making the wrong products or services have the best correlation. Both estimation methods ranked these types of waste as among the four most severe types of waste. Likewise, unnecessary transportation,

another type of waste, was less essential according to both approaches.

The two estimation methods ranked some types of waste very differently. People's unused potential was the second severe type of waste according to the waste priority number but the seventh in the pairwise comparison. Overproduction was the third most severe using the pairwise comparison but tenth in the waste priority number ranking.

We combined the results of the two methods by adding together the two estimation methods' rankings and arranging the sum numbers from smaller to bigger. The five most severe types of waste are: (1) inadequate communication and documentation; (2) making the wrong products or services; (3) defects; (4) people's unused potential and (5) unnecessary transportation. It is evident that all major types of waste except defects result in waste.

The Use of DfX to Reduce Waste in Construction Projects

Design for X contributes to the early involvement process. Early involvement provides benefits, such as a more efficient design and improved construction operations. When stakeholder needs can be defined early enough, it is easier to plan and design the project and to share the overall objective, scope, and limitations, as well as the features it provides. The project's mission statement can then serve as common understanding for stakeholders. If stakeholders contribute to this document, they are also more committed to it.

Lean principles focus on eliminating all waste and creating value. In the literature review, we listed types of waste and then, in the study, we estimated the importance of each type of waste. As a result of two different analyses, we found the five most severe types of waste: inadequate communication and documentation, making wrong products or services, defects, people's unused potential, and unnecessary transportation. DfX is a tool for managing (originally) design requirements that come from all project stakeholders. With these needs and requirements, and especially early involvement, stakeholders' knowledge and competence can be utilized in the early phase. DfX has a requirements coordination role, but it also receives requirements equally for the project and its outcomes.

In this logic we have not yet specified what are the specific X's – stakeholders. As it is evident that key stakeholders – X's – have to be involved in the beginning, it is yet more important to recognize these stakeholders project specifically. The possibilities of influencing the project success and value creation are perceived as the best during the early phases of the project. Stakeholder involvement is generally project-specific, that is, what works in one situation may not be appropriate in another. Therefore we cannot, yet, propose all relevant stakeholders. It is one of the main tasks of project management to identify, classify and prioritize the stakeholders who

are the most salient, and to be able to contribute to the project's success by eliminating wastes.

Inadequate communication and documentation means defective and poor communication, information, or documentation. It was the most severe type of waste according to the waste priority number and the second important one in the pairwise comparison. DfX focuses on documentation in the early involvement process. According to Lehto et al. (2011), there are document systems involved with DfX. Requirements from various stakeholders are collected and documented and then communicated to designers, but also for other stakeholders in the project. Then excuses about 'not knowing' vanish. The proper use of DfX requires better communication between interested parties and an appropriate documentation system of requirements (see e.g. Lehto et al. 2011). The more the stakeholders know about the objectives of the design specifications, the more the stakeholders can work together and adjust specifications (see e.g. Van de Ven et al., 1976; Aapaoja et al., 2013a). Early involvement also allows creative solutions and innovative exchange of ideas. The more the stakeholders know about the customers' or end-users' actual use of the products, the more efficient the stakeholders' operations are regarding meeting the buyers' needs and purposes.

Making wrong products or services occurs when the customers,' or other stakeholders,' needs are not understood, and the customer gets a bad product or service. Project management can use DfX for different purposes. DfX forces or allows designers to contact all the chosen stakeholders during the design phase. In construction projects, project management can collect requirements from all interested parties and balance them using stakeholder salience (see e.g. Aapaoja et al., 2013a; Aapaoja et al., 2013b). 'Requirement' has a negative connotation in the construction industry, but in the information and communication industry, requirement has a positive connotation: If someone sets requirements, he should know what to develop.

Defects typically include quality defects and wrong working methods, which cause rework. DfX gives project managers tools for documenting the required qualities or features of the product for designers and then provides documented guidelines for production to avoid defects. It is possible to discover the defects before the production phase and, thus, the process is scrutinized from the stakeholders' point of view and balanced with stakeholder salience (see e.g. Halttula, Aapaoja & Haapasalo, 2015). Project managers can minimize construction defects if contractors can influence the design work and if they require efficient tools to be used in the design so as to minimize the number of mistakes and rework during the construction phase. Improved communication and documentation decrease defects, and thus prevent poor quality from snowballing further.

People's unused potential takes place when the project underutilizes people's creativity or skills because the project managers do not consider workers' ideas and perspectives. DfX pays attention to all stakeholders' needs, which makes it possible to listen to opinions of larger crowds within the project but does not guarantee that all people participating in the project are using their full capacity nor that they are in a position to give information to the project managers.

Unnecessary transportation means transporting materials, parts, tools, or information indirectly to the next working step. For example, products or materials are moved in and out of the inventory between the process phases. DfX collects the requirements from the stakeholders that the project managers have chosen. It enables planning to consider production requirements so that the production phases and work methods do not generate unnecessary transportation. In the design phase, it is important to include requirements from maintenance operations – a stakeholder. For instance, there has to be enough space for maintenance machines to operate optimally and to care for temporary inventory space for snow in winter maintenance.

Conclusions

In the literature, DfX has been seen as a philosophy that balances all stakeholder needs for 'the best for the project.' It is natural that people should work for the best for the project and think holistically. However, this works optimally only in theory. So where can DfX provide benefit? In practice, limited scope and amount of information cause bias. Cost, quality, and time in the current construction business do not allow automatically 'best for the project' thinking – traditional commercial models drive for sub-optimization (see e.g. Merikallio & Haapasalo, 2009). If we use and further develop DfX as a tool that is part of formal protocols, it is evident that it automatically hits on the most severe types of waste and then improves the project success. Therefore, DfX can eliminate the most severe types of waste in the construction industry.

This study does not specify, what are the specific X's – stakeholders, because stakeholder involvement is project-specific. It is actually one of the main tasks of project management to identify, classify and prioritize the stakeholders in the very beginning of project planning that can be most salient and able to contribute on the project success by eliminating wastes.

DfX is a practical approach that helps project managers include early involvement and integration in the process. According to this study, DfX reduces some of the most severe types of waste in construction projects. The important thing is to make sure that there are incentives for the project to collect the relevant requirements from later phases of the project. If

a construction company collects more money from change orders due to design mistakes instead of trying to avoid them, there is something wrong, in the sense of sustainable long-term business.

Relational project delivery agreements include incentives for balanced gain and pain. It is also possible in a traditional design-bid-build project to provide incentives that support the proper use of Design for X in construction projects. DfX supports early involvement and integration, because it forces stakeholders to communicate but also documents when things become more explicit. Project managers can study the stakeholder salience and balance the requirements in DfX so that the best work is performed for the project.

However, the construction industry is still in the early phase of genuinely applying integration. We have only slightly opened up the possibilities of DfX in early involvement; clearly, more development is required, and additional practical applications of DfX must be defined. It is the responsibility of the following studies to outline who really these most salient stakeholders are – not only those generic ones that have been typically defined in national norms and standards.

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Higher Education Offshoring as an Innovative Response to Global Learning Challenges

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The wide implementation of service offshoring strategies worldwide has been visible and studied mainly in such business domains as information technology, accounting, human resource management and customer care centres. Nonetheless, transferring processes to offshore locations has also been implemented in the higher education sector. Responding to demographic, social and globalization challenges, renowned universities seek for innovative solutions that shall enhance quality and attractiveness of their operations, while strengthening their competitive advantage. The paper examines the case of an American university that conducts degree programmes in European offshore locations, in the light of differences between higher education and standard business offshoring.

Keywords: offshoring, innovation, quality, globalization, education

Introduction

The rapidly growing globalization impacts almost every domain of human life (Potrafke, 2014) and transforms educational services by overcoming former accessibility constraints and enhancing knowledge exchange (Carter, 2005). It is claimed to bring positive impact not only on income, employment, trade balances and inflows of capital, but also on the advancement of skillset or innovation (Balestrini, 2012). Population declines, demanding competition, and funding reductions are forcing higher education institutions (HEIs) to constantly go for assessments in numerous rankings, despite their primary mission and focus (Shin, Toutkoushian, & Teichler 2011, p. 2). Such changes impact communities and states involved (Kedziora,

Karri, Kraslawski, & Halasa, 2017), and require insights into relations between higher education, global society and the economy (Allais, 2017). In this situation, the key challenge every organization needs to address is how to make use of the best managerial practices to develop optimised operational models that would allow for further functional improvements and expansion opportunities. One possible option can be international sourcing and considering some foreign locations where operations can be transferred in order to be delivered by an external partner. In the past few years, business process offshoring has widely been implemented in such business sectors as accounting, information technology (IT), human resource management (HRM) and customer contact centres (CCC) (The Shared Services and Outsourcing Network, 2017). Such transformations may bring multiple benefits not only to both parties (investor and service vendor) involved, but also to local communities and to the global economic turnover.

The study conducted in this paper describes the case of an American university that runs degree programmes in Poland, in the light of a globalised learning environment. The results aid in understanding the nature and conditions of such ventures, and in identifying the differences among offshore investments in higher education, compared to the widely implemented offshoring of IT, HRM and CCC. The core aim of this paper is to briefly present the operational model and key aspects governing higher education offshoring ventures, enhancing innovative and qualitative features of international knowledge exchange. The following research questions shall be addressed:

1. How can the operational model of remote education services be designed?
2. What are the key motivators and challenges in the higher education offshoring?
3. What are similarities and differences behind higher education and standard business offshoring ventures?

Theoretical Background

Transnational education refers to the situation where students are based in a different country than the awarding institution, which has mainly been observed in the past decade due to the formation of international branch campuses (Wilkins & Huisman, 2012). An international branch campus (IBC) can be defined as an offshore unit of a HEI that is managed by the mother institution or through a joint venture in which this institution acts as a partner, and awards the degree upon the successful completion of a programme in an offshore location (Becker, 2009, p. 2). The HEI often engages in some face-to-face teaching and provides its offshore students access to the entire

academic virtual resources (Cross-Border Education Research Team 2014). There is already more than 200 IBCs in the world (Lawton & Katsomitros, 2012) and most of such investments happen from more developed to less developed countries (Naidoo, 2009). It has recently been one of the most noticeable developments in globalised higher education (Healey, 2015), as research universities have increasingly been encouraged by federal and state governments to focus on their economic roles at the policy level (Warshaw, 2014). The targeted allocation of research funding and global need for growing science and technology professionals has been perceived as a key trigger of the so-called 'academic capitalism' (Slaughter & Rhoades, 2004; Cantwell & Kauppinen, 2014). In some countries, such as the UK, US and Australia, the state funding has increasingly failed to satisfy the operational and investment needs of HEIs, which forced many of them to search for alternative revenue sources (Welch, 2011).

HEIs assume multiple strategies to the coexisting demands of society and industry's institutional logics (Upton & Warshaw, 2017), but they tend to evolve rather slowly and most often by means of a piecemeal engineering (Meyer, Ramirez, Frank, & Schofer, 2007). Piecemeal social engineering refers to challenging the status quo in small steps, to avoid violent social changes (as opposed to the utopian engineering, aiming at the revolutionary changes that shall lead to the achievement of a predetermined ideal status) (Popper, 2011).

The way public HEIs have been transforming themselves into market-focused, industry-like organisations has been questioned by many researchers (Bozeman & Boardman, 2013) and, in many aspects, European academics have been remaining resistant, or at least critical, to the new directions in which research policies are heading (Matos, 2013). Publication productivity remains a key focus of many researchers stipulated by motivational, demographic and institutional characteristics (Bentley, 2015). In the 21st century, modern universities have been subject to such an internationalization that has triggered significant changes and has introduced a new education paradigm (Taylor, 2004; Gacel-Avila, 2005). Such internationalisation, embracing various domains of higher education (Haigh, 2002), forces many universities to tackle multiple challenges in the areas of knowledge society demands, information and communication technology (ICT) developments, and globalization (de Jong & Teekens, 2003). The internationalisation of HEIs and the observed growth in transnational provisions may be seen as an institutional response to globalisation (Marginson and Van der Wende, 2007; Maringe & Gibbs, 2009).

Offshoring can be understood as shifting part of business to some foreign country and it originates from David Ricardo's theory of comparative advantage (Butler & Soontiens, 2014). The word outsourcing is created

from the words 'outside,' 'use' and 'resources,' and it refers to the passing of some business functions to an external company (Allweyer, Besthorn, & Schaaf, 2004). It has mostly been stipulated by such factors as cost reduction and access to broad workforce capabilities in some other location (Fielding, 2006). Even though labour expense differences between countries may become smaller as time passes (Rost, 2006, p. 35), there are other aspects that impact such changes in the short-term and mid-term, such as productivity and quality enhancement, building core capabilities and learning new competencies (King & Malhotra, 2000). The stable growth of service offshoring can be observed globally and the range of processes transferred to remote locations becomes wider over time (Thelen, Honeycutt, & Murphy, 2010). Organisational project management can be defined as a sphere of management where dynamic structures in the firm are articulated as means to implement organizational objectives through projects in order to maximize value (Aubry, Hobbs, & Thuillier, 2007). A business transition project is a process of transferring knowledge, systems and operating capabilities to some other unit (Charter BPO Solutions, 2006) that builds and deploys new or somehow modified services (ITIL, 2011). Managers involved in the implementation of transition projects constantly need to struggle with various challenges (Kedziora, Karri, & Kraslawski, 2016), as managing complex transitions requires specialised and efficient resources from both the service buyer and vendor's side (Karimi, Somers, & Bhattacherjee, 2007).

The ability to use the information from different sources in order to create some unique solutions to problems is called innovation, and it can be divided into two basic types: evolutionary and disruptive (Proctor 2005, p. 18). Open innovation is to be understood as the use of outflows and inflows of knowledge to enhance internal innovation and expand for its external usage (Chesbrough, 2003). One of the key characteristics of open innovation is the involvement of external partners in the process (Cheng & Huizingh, 2014) and in the last few years, we can observe the intensive shift from the traditional 'closed' model to the open innovation, with a focus on internal operations and resources (Gassmann, 2006; Lichtenthaler, 2011). It often leads to an increase in the company's profitability and performance quality (Chiang & Hung, 2010). Qualitative content analysis is a text analysis approach used to quantify research content in terms of predefined categories, in a replicable and systematic manner (Eriksson & Kovalainen, 2008).

The emergence of computer-assisted qualitative data analysis software (CAQDAS) is perceived as one of the most remarkable developments in qualitative research in the past few decades (Bryman & Bell, 2007, p. 291). There are multiple programmes that can be used for coding empirical data

available on the market. Fundamentally, the process of a multiple case analysis differs from a single one, as it is not necessary to define all the features of the cases in detail (Yin, 2003). CAQDAS packages enable the incorporation of quantitative data for assuming quantitative approaches to qualitative analysis (Lewins & Silver, 2009). The empiric data can be coded based on the concepts from various sources, but the analyst may also be taking into account new concepts emerging from the data during the analysis, as the data shall be coded, retrieved and interpreted by the analyst (Creswell, 2013).

Offshored services can nowadays correspond to multiple business lines and forms, such as captive (in-house) offshoring, Information Technology Outsourcing (ITO), Business Process Outsourcing (BPO). Alsudairi and Dwivedi (2010) have defined its 42 variations, but the broadest expression, covering such operations, commonly referred to in many reports (Association of Business Service Leaders, 2016) is 'modern business services.'

Educational Services in a Global Context

Nowadays, university students are constantly reminded about the need to prepare themselves for global market competition (Durbin, 2006). It has a direct impact on the branding of higher education institutions, which has become an important subject observed globally in the past few years (Stensaker, 2007). In branding studies, the core of a brand forms its identity, conceptualised as its culture and vision (Suomi, 2014), and HEIs normally conform to standard values, such as 'commitment,' 'quality,' 'critical attitude,' 'diversity,' and 'openness/transparency' (Sataøen, 2015). As students still tend to choose higher education institutions based on their reputation rather than on teaching quality or tuition costs (*The Guardian,* 2012), many HEIs engage in numerous global rankings that have been widely affecting the behaviours of prospective students (Marginson, 2014). Nonetheless, university rankings may deliver misleading information that can result in negative consequences in terms of fruitless and unrewarding efforts by governments, university administrators, and students (Goglio, 2016). Thus, ranking providers should regularly review and modify their services to enhance and refine their judgements (Soh, 2015). The prestige is often associated with the cost, as presented in the cost comparison of selected universities below.

Whereas the public universities in Poland are free of charge for all EU citizens, the tuition fee in the private institutions is still lower than in the top American and British schools. Thus, only those students able to cover funding and living costs can apply to these schools. Let us present the estimated monthly costs in the selected countries in Table 2.

From the universities' perspective, the commonly observed demographic

Table 1 Costs of Studying in Selected Countries (in thousands PLN)

Country	Higher education institutions	Annual fee
The United Kingdom	University of Cambridge	45.4
	University of Oxford	45.4
	University College London	45.4
The United States of America	Harvard University	179.7
	Stanford University	183
	Massachusetts Institute of Technology	184.9
Poland (private universities)	University of Social Sciences in Lodz	4.0–7.5
	Kozminski University in Warsaw	10.4–22
	SWPS University of Social Sciences and Humanities in Warsaw	7.6–18.5
	Polish-Japanese Academy Of Information Technology in Warsaw	7–14.3

Notes Authors' own work based on data from AEGON (www.aegon.pl).

Table 2 Estimated Monthly Costs of Studying Abroad (in thousands PLN)

Country	Study-related costs	Costs of living	Total
The United Kingdom	5	4.2–6	9.2–11.4
The United States	16.2–21.6	8.9–10.7	25.1–32.3
Germany	0.1–0.3	3.6–3.9	3.7–4.2

Notes Authors' own work based on data from AEGON (www.aegon.pl).
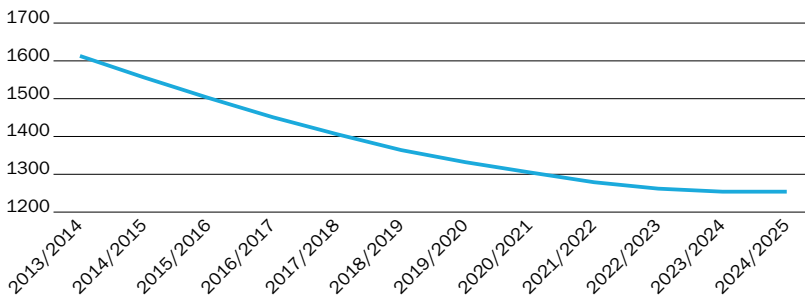
Figure 1 Forecasted Number of Students in 2013–2025 (in thousands, based on Klamut, 2016)

decline in Poland (*Financial Times,* 2015) shall impact the number of students in the country, which has been systematically decreasing for the past years and shall continue in the future, as presented in Figure 1.

What is interesting is the number of foreign students in Poland has been steadily growing in the past few years, and in 2014/2015 it has reached 46,100 persons, compared to 4,300 in 1990/1991 (Central Statistical Office of Poland, 2015). The majority of those originate from Ukraine, as well as from other European countries, as presented in Figure 2.

There are twelve international branch campuses in Poland, among which

Belarus	4118
Czech Republic	795
Spain	1188
Germany	857
Lithuania	932
Norway	1538
Russia	966
Sweden	1290
Turkey	1040
Ukraine	23392
Other European countries	2375
China	785
Taiwan	410
India	545
Kazakhstan	560
Saudi Arabia	804
Other Asian countries	2498
Canada	398
United States	696
African countries	709
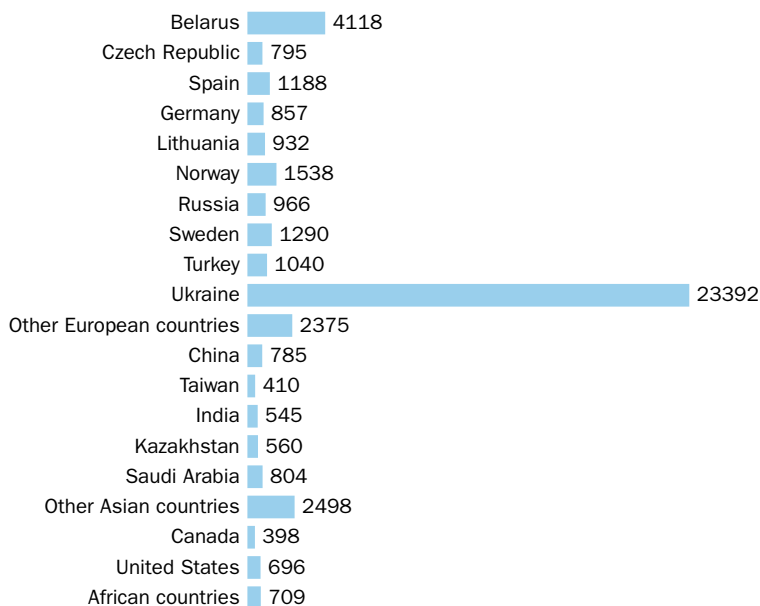
Figure 2   Origin of Foreign Students in Poland in 2014/2015 (based on Klamut, 2016)

the widest activity is conducted by the WSB University. While most of the Polish IBCs are offered by private schools, there are three public universities offering MBA programmes. The below list presented in Figure 3 reflects their geographical location.

1. MBA + Master programme of Clark University in Worchester, USA offered by the Cracow School of Business at Cracow University of Economics (CSB CUE)
2. MBA + Master programme of Clark University in Worchester, USA offered by the University of Social Sciences in Lodz
3. Executive MBA programme of National Louis University in Chicago, USA offered by the Higher School of Business – National Louis University in Nowy Sacz
4. Canadian Executive MBA ESG University of Quebec at Montreal UQAM, Canada offered by the Warsaw School of Economics SGH
5. Poznan-Atlanta MBA programme Of Georgia State University in Atlanta, Canada offered by the Poznan University of Economics
6. MBA programme of Franklin University in Columbus, USA offered by the WSB University in Wroclaw
7. MBA programme of Franklin University in Columbus, USA offered by the WSB University in Bydgoszcz

Figure 3
Locations of Selected
International Branch
Campuses in Poland

8. MBA programme of Franklin University in Columbus, USA offered by the WSB University in Chorzow

9. MBA programme of Franklin University in Columbus, USA offered by the WSB University in Opole

10. MBA programme of Franklin University in Columbus, USA offered by the WSB University in Torun

11. MBA programme of Northampton University, USA offered by the WSB University in Gdansk

12. Aalto Executive MBA of Aalto University (former Helsinki School of Economics) offered by the WSB University in Poznan

The presence of the Finnish IBC in Poznan indicates the growing interest of Scandinavian organisations in exploring offshore markets in order to access wider student pools. In fact, there are already examples of Scandinavian activity in the area of international branch campuses, like the Estonian Business School in Helsinki, Stockholm School of Economics Russia and ESMOD Oslo, Moteskolen AS.

The Offshored Education Operational Model
of an American University in Poland

American universities seek to assume global perspective in education and emphasise the study-abroad programs growth (Parey & Waldinger, 2010). The American university addressed in this study has taken advantage from the offshore outsourcing model where the external partner (Polish university) conducts American Master studies. As of 2004/2005, according to the agreement concluded between the two partner universities, degree programs include a Master of Science to Master of Business Administration
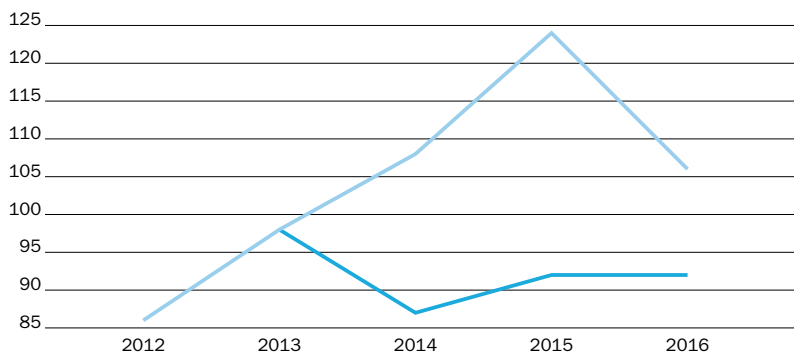
Figure 4   Number of Students Starting Studies and Graduating in 2012–2016
(based on data from the American University)

with English as a language of instruction, mainly in the areas of Business, Management, Information Technology (IT), Marketing and Communications, and Human Resources Management (HRM). Since then, over 800 students have graduated with American diplomas. Detailed data from the last 5 years are presented in Figure 4.

In order to successfully manage the IBC's operations, managers need to clearly define the roles of all the parties involved. Different stakeholders may have different expectations, as well as perception of the success or failure of outsourcing arrangements (Alborz et. al, 2003). In Table 3, the key roles and responsibilities in the project shall be depicted with a clearly defined division between service buyer and vendor, where the vendor company's site is divided into two units (the American Unit at the Polish University is further supervised and supported by the Core Authorities of the Polish University responsible for the overall management of the institution).

Qualitative Analysis of Interviews

The interviews with both parties involved in the offshore operations of the American University in Poland were conducted in the beginning of 2017, by means of personal interviews, web-conference calls and email communication. Data was collected from 6 managers leading the programmes and was transcribed and thematically analysed with the use of the software NVIVO v. 11, designed to explore and code qualitative material. The interviewees were inquired regarding the aspects below related to the presence of the Polish IBC:

- factors impacting the decision of transferring operations abroad and reasons for considering such initiative,
- important factors for the organisations while choosing target partner and location,

Table 3   Key Stakeholders of University Partnerships

Stakeholder	Role	Description
American University	Dean of Graduate Studies, Associate Provost	Key decision maker in the cooperation committee, member of the American University Board of Trustees responsible for negotiating contracts and overall cooperation governance. Acting as a final escalation point, resolving conflicts and issues, providing sign offs & approvals. Strategic level partner of cooperation.
	Associate Dean of Professional Studies	Part of the cooperation committee who reports directly to the American University Board of Trustees. Planning of new educational services to be on-boarded and transferred to partners. Participating in reviews and audits together with the partner's Executive Team. Tactical level partner of cooperation.
	Dean of International Programs	Leading the overall operations and coordination for international programs at the American University. Ensuring execution, timely escalations to the Board of Trustees, regular monthly status reporting to the Executive Team. Monitoring, tracking and controlling budgets. Operational level partner of cooperation.
Polish University	Rector of the University	Key decision maker in the cooperation committee, member of the Polish University authorities responsible for negotiating contracts and overall cooperation governance. Acting as a final escalation point, resolving conflicts and issues, providing sign offs & approvals. Strategic level partner of cooperation.
	Dean of the Faculty, Associate Provost	Part of the cooperation committee that reports directly to the Polish University authorities. Planning and managing of new educational services to be on-boarded at the Polish University. Participating in reviews and audits together with the partner's Executive Team. Tactical level partner of cooperation.
	Department of International Cooperation	Overall coordination of international programs at the Polish University. Plays an important role in the initial phase of the project as cooperation orchestrator and as responsible for project paperwork and overall coordination. Operational level partner of cooperation.

Continued on the next page

- key challenges during the execution of transition project that set up the investment abroad,
- the most important features of offshore services in the location and ways the organisation ensures such important factors are being properly addressed and delivered,
- key challenges for remote operations and ways of responding to such (initiatives that have been undertaken),
- future steps and plans for this offshore investment.

The replies were abstracted and labelled with codes, while the categories

Table 3 *Continued from the previous page*

Stakeholder	Role	Description
Unit of the American University at the Polish University	Program Director	The Program Director has a leading role in the program at the Polish University. He is a key decision maker in the cooperation committee and represents the Polish University at the American University Board of Trustees. He is responsible for negotiating contracts and facilitating relations with the American University. The Program Director acts as a final escalation point, resolving conflicts and issues, providing sign offs & approvals.
	Program Manager	The Program Manager has an operational role in the program at the Polish University. He is responsible for the overall operation of the American University Branch in Poland, which includes preparing plans and documentation, ensuring smooth transition execution and timely escalations to the Executive team (e.g. to the Program Director and/or to Dean of International Programs at the American University). The Program Manager places special emphasis on maintaining high quality of educational standards, as expected by the American University.
	Lecturers	Lecturers are responsible for the educational service execution and delivery to end users (students). They must meet high quality standards required by the American University. Lecturers play a key role in the success of a project as they are 'faces' of the American University on local market.
	Administration Staff	Business as usual: administration activities including, but not limited to, daily coordination, support for students, support for lecturers and faculty, courses registration, courses planning, quality and key performance indicator (KPI) reporting.

reliability, logical structure and in-depth text grounding were constantly rearranged and refined (Patton, 2002). The relationships between the main concepts were semantically examined with the use of data-mining software. The qualitative content analysis followed the Graneheim and Lundman (2004) approach, based on open-ended questions, addressed with latent content analysis. The relationships between nodes were examined with the semantic analysis, structured in several steps, following a comprehensive reading and understanding of the text subdivided into few meaningful units, each of them containing more than one concise sentence. The dataset composed from single words represented separate summary points rather than continued text.

Findings and Discussion

The analysis conducted with the use of NVIVO revealed that the substance was composed from four dominant nodes, covering nearly 60% of the material. The core concepts identified were: 'quality,' 'partnership,' 'innovation'

and 'expansion.' Based on that, the concept map was developed with the use of data mining software. The overall results confirmed that the perception behind the partnership settlement was slightly different on both sides, as briefly summarised below.

The American organisation already had many relationships with organisations abroad, but Poland was interesting because it was a new market, mostly untapped by US universities. For the Polish organisation, the idea to start a partnership with the American university and to offer master programmes had one primary reason: to offer an innovative product, something that no other Polish university had, both in terms of content and teaching style. It was very beneficial in marketing/advertising activities and it has significantly strengthened this organisation's competitive advantage. Regarding the important factors while choosing a target location, the American side was claiming that securing the appropriate partner was very important to them and it needed to be an organisation that they could trust and work closely with. The Polish side was also claiming that reliability is key to a successful offshore presence and it resulted from some personal contacts within the faculty. Moreover, it was one of the few American universities to have overseas campuses. Participants from the American side reported that the key challenges during the execution of transition project that set up the investment abroad was dealing with the cultural and regulatory differences. Moreover, it took considerable time and travel to negotiate the terms of the contract. This could be quite expensive and needed to be included in the budgeting process. Similarly, the Polish university mentioned the financial issues during the contract negotiations, as well as the time needed to build an atmosphere of trust between the partners.

As far as the most important features of the offshore operations are concerned, the American side emphasised that the quality of the programme delivered overseas and the preservation of a close and collegial relationship with the partner is extremely important. The same for the Polish side: keeping the quality of service at the appropriate level is a critical factor. Satisfied students become satisfied graduates, keeping their Alma Mater in mind and recommending it to their colleagues/collaborators in their future careers. To check the level of satisfaction, evaluation surveys are regularly conducted regarding the content of the courses or the delivery of the classes. Moreover, having a good working contact with the foreign partner was important, and various communication tools were being used for that purpose (email, calls, web-conferences, travels).

As for the key challenges for the offshore operations, the American side again mentioned maintaining the programme quality, mostly due to staff turnover on site. Having the right staff on the ground is critical to ensuring that the business is run the way it should be and that the organisation's best interests are being represented. Visits to Poland are organised at least

twice a year and constant communication with the staff is kept, which has already proved to be key in the current success. For the Polish side, the key challenge was to attract enough students so that the programs earn profit for the University. It was difficult in a competitive market, especially in times of demographic decline. To respond to this challenge, the University tried to adjust its study offer in order to become more up-to-date and to meet market requirements, in cooperation with agents to attract students from other parts of the world.

The final statements from the Polish side, regarding future steps and plans for this cooperation, concerned the new programmes to be offered next academic year. Moreover, new campuses of the American university will be opened in other European countries, for which the Polish campus would act as a coordination hub. The American side has confirmed the consideration of expanding to different markets. The Polish partner is strong and offers opportunities to expand in other Eastern European countries, but it is important to do extensive research to determine which markets are most suited for the American university and offer the best promises for future financial and reputational gains. The researchers advised the interviewees that further consideration of such initiatives could be linked to the current trend of developing an 'ideopolis,' understood as 'a sustainable knowledge intensive city that drives growth in the wider city-region' (Jones, Williams, Lee, Coats, & Cowling, 2006, p. 5), acting as a democratic 'agora,' where teachers and students would gather to talk and exchange ideas (Badley, 2009). The managers from both the Polish and American side reacted positively to such idea, and assured that such opportunities would be assessed in the future.

The nodes and keywords from this text were used to generate a concept map to enable visual representation of how the concepts semantically relate to one another, and in order to identify the most frequently occurring concepts in relation to the four main NVIVO nodes. The larger dots on the map indicate more prominent concepts, with the most prominent being 'quality,' 'partnership,' 'innovation' and 'expansion.' The concept usage statistics vary in the size of the dots based on frequency across all main nodes. These findings indicate that prominent concepts such as 'quality,' 'partnership,' 'innovation' and 'expansion' are considered by the involved parties to be central to conducting offshore services.

Based on Figure 5, we can infer that higher education offshoring is being triggered by slightly different factors than other widely implemented offshoring of business domains, such as information technology, accounting, human resource management and customer care centres. The standard business offshoring is mainly focused on reducing operational expenses, by taking advantage of more cost-efficient locations (Karpaty & Tingvall, 2014). Moreover, standard business services offshoring aims for the opti-
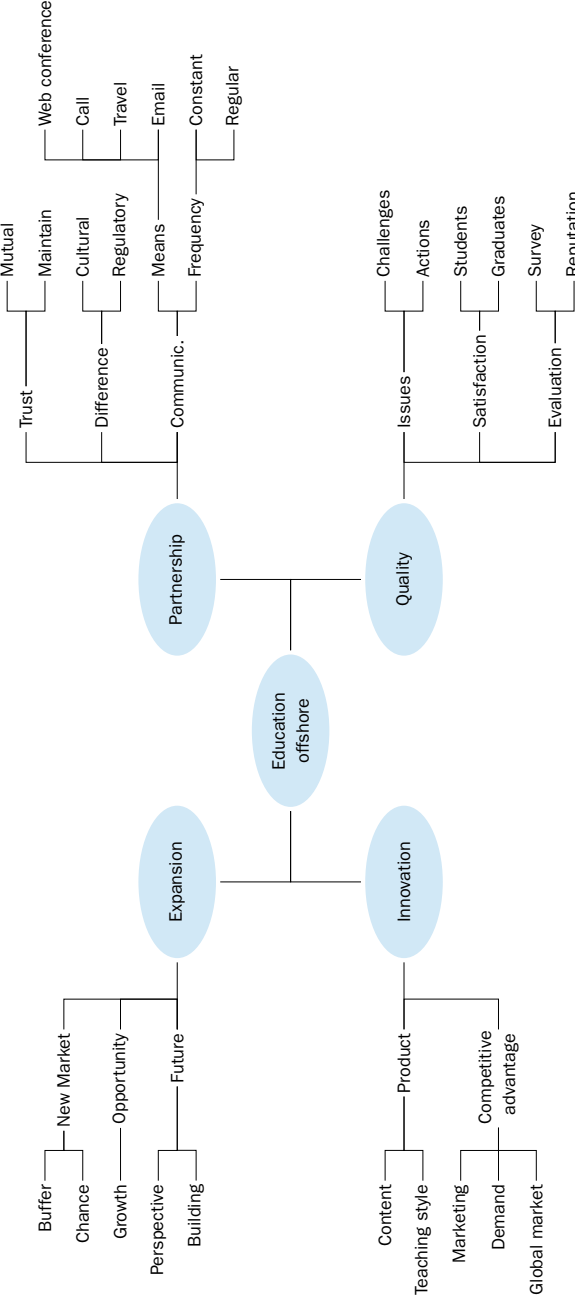
Figure 5 Semantic Representation of the Key Concepts in Higher Education Offshoring

Table 4 Key Features of Standard Business Offshoring and Higher Education Offshoring

Standard business offshoring	Higher education offshoring
• Cost reduction	• New markets expansion
• Process improvement and optimization	• Partnership with responsible HEI
• Productivity enhancement	• Service quality maintenance
• Taking advantage of external talent resources	• Innovative product
	• Strenghtening competitive advantage
• Taking advantage of partner's expetise	• Enhancing student satisfaction

Notes Based on Karpaty and Tingvall (2014), Mihalache et al. (2012), Cha et al. (2008), Kedia and Mukherjee (2009), Aksin and Masini (2008), and Di Gregorio et al. (2009).

misation of business processes, associated with business process reengineering and innovative performance improvement (Mihalache, Jansen, Van Den Bosch, & Volberda, 2012), resulting many times from the access to the provide's expertise (Cha, Pingry, & Thatcher, 2008). Another factor is associated with taking advantage of the large talent pools in offshore locations, overcoming at the same time retirement challenges in the incumbent location (Kedia & Mukherjee, 2009). Moreover, it enables companies to build on their core activities, by locating non-core processes abroad (Aksin & Masini, 2008), and it allows for a quicker response to the rapid demand changes (Di Gregorio, Musteen, & Thomas, 2009). In case of HEIs offshoring, we can speak of product innovativeness associated with the expansion to a new destination as the key unique motivator. Wilkins and Huisman (2012) divided factors facilitating IBCs ventures onto 4 pillars: regulative (public funding, regulatory forces and constrains), normative (quality and internationalisation), cultural-cognitive (culture and language) and institutional (distance and uncertainty), and indicated that the decision-makers are sometimes simultaneously influenced by different mechanisms that pull them into isomorphic, opposite directions. Setting up an IBC should not merely be treated as a product strategy, as the programmes offered are often hard to replicate in a different country, in terms of degree curriculum, physical surroundings, human resources, equipment, recreational and social offerings (Wilkins & Huisman, 2012). Such investments need to be treated as an innovative response to the challenges higher institutions face in the globalised educational environment, and HEIs can minimise the risks associated with entering into the host country, which may involve funding provision or academic freedom and operational autonomy assurances (Sidhu, Ho, & Yeoh, 2011). Let us summarize the comparison of key features of standard business offshoring and higher education offshoring in Table 4.

Conclusions

In the paper, the concept of higher education offshoring has been addressed, in the context of establishing international branch campus (IBC) in

a different country. Despite its wide implementation and research in other business sectors, the authors identified the need for addressing the international transfers of higher education functions, which are increasingly being considered by universities worldwide. The dynamic changes in the globalised education environment forced many schools to look for expansion opportunities abroad. The case described in this study addresses the presence of an American university in Poland that takes advantage of a Polish private university to deliver offshore operations, by running American degree programmes in Poland. The researchers studied the global environment of educational services in order to find that the key causes of higher education offshoring is the constant decrease in the number of students, significant differences in the values of annual university fees in different countries, and students' strive for prestige associated with top quality education. The operational model of the American university running educational services in Poland has been presented, with its key features and roles of stakeholders. Moreover, the interviews with American and Polish managers involved in the offshore venture have been conducted and investigated with a qualitative research method, using the NVIVO software.

It has been found that the statements of the interviewees mainly concentrated around four concepts: 'quality,' 'partnership,' 'innovation' and 'expansion.' Although the understanding and approach towards the universities' cooperation was slightly different on both sides, it overlapped in the most important aspects. From the Polish side, the core reason for establishing such cooperation was to offer an innovative product, by means of teaching style and content. The American university wanted to expand and gain global reputation in offering top-quality programmes. For both organisations, trust and open communication was critical in daily cooperation, being the most challenging part the cultural and regulatory differences, as well as the financial negotiations. Another feature emphasised by both sides was the quality of operations, which is the most important part impacting reputation and future success of the investment. Moreover, based on the success of the current operations, further expansions are planned that shall use the Polish unit as a regional coordination hub. In general, it was discovered that higher education offshoring is triggered and governed by slightly different factors than those in standard business process offshoring in such sectors as accounting, IT, HRM, or CCC. Whereas standard business offshoring focuses on cost reduction, access to broad talent pools, taking advantage of partner's expertise, process optimization and focusing on core capabilities, higher education offshoring aims at developing innovative programmes that can strengthen the competitive advantage of the HEI investor and that can allow its expansion to new markets, achieved through open communication and close cooperation with an offshore partner. Among the several shared

aspects, we can list the common strive for operations enhancement and organisational structure improvement, by ensuring top quality of services that shall translate into high customer/student satisfaction.

As for the limitations, the authors studied only one example of the higher education activities offshoring that concerned American-Polish cooperation of these two universities. Moreover, not all of the internal materials and documents could be accessed, due to their confidentiality. Nonetheless, the researchers believe that the future growth of IBCs across the world shall become an increasing important topic of scientific research, and that the need for similar analyses will probably grow. The observed interest of Scandinavian universities in the wide student pools of Central and Eastern Europe may result in consecutive investments in the forthcoming years, which could become an interesting topic for further studies that the authors would like to address.

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Use of ICT/WEB in Higher Education in Croatia: The Case of Economics and Management Studies

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The paper presents results of research on the acceptance and use of ICT and advanced web technology among teachers in the higher education process of Economics and Management in Croatia. Acceptance and use of ICT and advanced web technology is estimated by the number and type of digitized materials created by teachers as well as through individual use of different types and frequency of ICT and advanced web technology. Acceptance and use of ICT are assumed to be the result of lessons learned in previous use of technologies, perceived ease of use, perceived usefulness of technology and some 'external' variables. The model used to evaluate the acceptance of the technology is a modified Technology Acceptance Model (TAM). In our model we assumed that the actual use of technology results from a previously acquired intention to use technology and from a previously acquired perceived ease of use and perceived usefulness of technology. That is why the application of the TAM model represents an interpolation of the model on acquired experience. Data were obtained through a stratified online questionnaire, which consisted of 42 questions answered by 98 respondents. The results showed that dependences have lower coefficients of correlation between the constructs related to those obtained in the 'focused' TAM model. The study also showed that, among teachers in higher education institutions in the field of economics and management in Croatia, there is untapped potential for the acceptance and use of ICT and web technologies and that their future use is likely to be more intense if more attention would be paid to training.

Keywords: higher education, Croatia, modified technology acceptance model

Introduction

Formal, informal and non-formal educational processes nowadays deeply rely on ICT and especially on Internet technologies. These technologies are

becoming prevalent in all kind and levels of education, and especially in higher education. It is widely accepted that these technologies bring enormous benefits in availability of data, information and knowledge as well as in efficiency of their usage, information exchange and communication. The use of ICT in education assumes different forms and shapes and that is why learning with the support of ICT is referred to with different terms: digital learning, e-learning, web-learning etc. ICT and web technologies in the context of this paper include different technological solutions that are nowadays mostly accepted in educational processes:

- technology for preparation, creation and presentation of digitized educational materials;
- technology for searching, finding and analysing digitalized educational materials;
- technology for creating and exchanging new knowledge;
- technology that enables communication and cooperation;
- integrated solutions that enable all forms of communication and presentation of different digitized materials, including all forms of social networks;
- technological systems that enable knowledge management by creating, sharing, communicating and evaluating educational materials (LMS).

Despite the fact that these technologies bring advances in educational process (both on teachers' and students' side), the question remains to what extent are they actually used in terms of number, type and frequency of use in particular educational institutions. This needs to be explored for each particular context, as well as for each particular technology and type of user. The research focus of this paper is the use of ICT and web technologies in higher education institutions in the field of economy and management in the Republic of Croatia. Most of the colleges, polytechnics and universities in the Republic of Croatia already introduced most of the mentioned technologies in their educational process. Still the largest and most widely used solutions are standardized digital materials in the form of presentations and digital texts combined with simpler graphics and image documents. The potential of modern technological solutions that enable the creation of richer forms of digital educational content, communication and cooperation among the participants of educational processes (collaboration tools, LMS, databases, specific software solutions, knowledge base, e-learning systems . . .) are used far less often. Despite strong support from the State, there was no formal obligation for the institutions to adopt and implement the mentioned technologies in the educational process. Therefore, diversity

in the scope and use of ICT exists and consequently a perception that there is room for improvement and more intensive use of ICT and web technology in higher education process.

Another research question remains which variables or which groups affect the acceptance of ICT and web technologies in the context of current or improved models that explain the acceptance of technology by certain users.

Aims and Objectives

The primary goal of this research was to determine which ICT and web technology, for what purpose and to what extent and frequency, teachers use it in educational process at higher education institutions of economics and management in Croatia. In addition to that, another aim was to identify and to group variables that affect the acceptance and use of ICT and web technologies by the teachers and to determine dependences among certain groups of variables and to make better predictability of future behaviours, as well as proposing measures for better exploitation of researched technologies in the education process.

For the research of the acceptance of different technological solutions, different models and methods were suggested, among which the most commonly used is TAM model proposed by Davis (1989). Throughout the years, this model has been expanded and modified by both the author and other researchers. According to the revised proposed TAM model (Venkatesh & Davis, 2000), the user's attitude to a technology and its intention to use it will be determined by the user's perceived utility of that technology and the perceived ease of its use. These perceptions can be affected by some environmental variables. The attitude will affect the intent to use, which in turn affects the actual use of technology.

In our research, the actual use of technology will be explored based on experiential attitudes about technology gained through the acquired perceived ease of use, through the perceived usefulness and, finally, through several factors from the environment that may have an impact on technology and the intensity of its use. For this purpose, the revised TAM model will be modified and its usability evaluated in order to better assess the future use of advanced web-IC technology by teachers in the educational process.

Hypotheses

In accordance with the problems identified, aims and objectives of the research as well as its accepted theoretical framework, the following hypotheses are set:

1. There is a (significant) portion of unused ICT and web technology in

the educational process in the studies of Economics and Management in Croatia.

2. Actual use (quantity, type and intensity of use) of ICT and web among teachers in higher education process is affected by:

- acquired perceived usefulness,
- acquired perceived ease of use,
- socio-demographic characteristics of users,
- quality of ICT infrastructure in organizations,
- actual daily use of ICT and web.

We will also check if:

1. there is a statistically significant difference in the production of educational materials (type and amount) among:

- type of institutions,
- gender,
- age group of respondents;

2. perceived ICT and web skills and literacy is in conformance with actual use (quantity, type and intensity of use) of ICT and web in education.

An Overview of Previous Research

Studies conducted on the acceptance of ICT in higher education in Croatia are mostly related to the acceptance by students (Hutinski & Aurer, 2009; Dukić, Dukić, & Kozina, 2012; Gligora-Marković, 2012; Lisek, Brkljačić, 2012) and only one to teachers (Kovačević-Prelas, Vrhovski, & Britvić, 2014). The aforementioned research gives a description of the frequency of use of certain ICT by students and does not investigate cause-effect relations among variables nor does it use any adopted models of technology acceptance.

Other relevant research conducted in Croatia included the acceptance of DSS in small and medium enterprises in Croatia (Dulčić, Pavlić, & Silić, 2012), while Renko and Popović (2015) explored the consumers' acceptance of electronic retailing using a technology acceptance model and confirmed that the variables perceived usefulness and perceived ease of use strongly affect attitudes towards e-tailing and intentions to use it.

There were attempts to explain attitudes towards technology, intention to use it, actual use and user acceptance of technology through different psychosocial theoretical models. Among the first appeared, there was the expectancy-value (EV) (Mazis, Atola, & Kippel, 1975) model and the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975). 'The expectancy value theory was developed to understand motivations underlying the behaviour
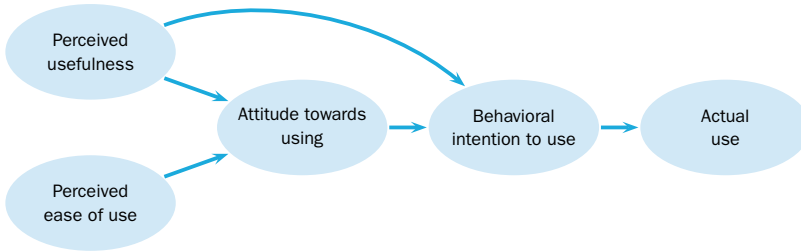
Figure 1 Technology Acceptance Model (adapted from Davis et al., 1989, p. 985)

of individuals. Behavioural intent is posited as the immediate precursor of a particular behaviour. If we understand the elements that influence intention, we can better predict the likelihood of an individual engaging in a behaviour' (Bradley, 2009). According to TRA, 'a person's beliefs and evaluations lead to their attitude (A) toward the behaviour, which in turn leads to behavioural intention (BI). Normative beliefs and motivation affect the subjective norm (SN) which also influences BI.' TRA improved explanatory strengths and predictivity of the E-V model.

The most influential model that has evolved from the previous two mentioned models (theories) is the Technology Acceptance Model, originally proposed by Davis et al. (1989). The model is shown in Figure 1, which shows that Perceived Utility and Perceived Ease of Use are two key variables that will determine the Attitudes towards technology and the Intention to use technology. From the intention and attitude stem actual attainment and use of technology. The basic idea of the model was to demonstrate through the experiment on the user (homogeneous users group) that some relatively homogeneous technology will produce an attitude toward using and an intention to use and consequently to be actively used if users have the feeling and knowledge about the usefulness of the technology and if it is easy to use. Lately, Davis and other authors slightly differentiated the original idea introducing some external variables that may affect the Perceived Ease of Use and Perceived Usefulness of technology (Venkatesh & Davis, 2000).

The model was used in the analysis of numerous individual technologies, where it showed explanatory and predictive powers but also some weakness and shortcomings (Lee, Kozar, & Larsen, 2003; Legris, Ingham, & Collerette, 2003; Chuttur, 2009). Numerous authors introduced other variables or constructs for PU, PEU, AU or BI (Chuttur, 2009).

Some constructs (group variables) are explained and updated in the light of new theoretical approaches, like The Theory of Planned Behavior (Ajzen & Fishbein, 1991) and the decomposed theory of planned behaviour (DTPB). Venkatesh, Morris, Davis and Davis (2003) examine eight competing models of technology acceptance and formulate a unified theory of acceptance

and a use of technology (UTAUT) that integrates elements of these models. The eight models are: TRA, TAM, motivational model, TPA, TAM/TPB combined, a model of PC utilization, innovation diffusion theory and social cognitive theory. UTAUT includes four variables (performance expectancy, effort expectancy, social influence and facilitating conditions) and up to four moderators of key behaviours, gender, age, experience and voluntariness. Goodhue and Thompson (1995) introduced the task-technology fit and individual performance model. Bhattacherjee and Sanford (2006) proposed an elaboration likelihood model. They examined how 'external influences shape information technology acceptance among potential users, how such influence effects vary across a user population, and whether these effects are persistent over time.'

In some recent study on LMS usage by teachers in education, results 'generally supported the proposed model with minor revisions and confirmed the significant influence of perceived self-efficacy (PSE), systems quality (SQ) and facilitating conditions (FC) on the use of LMS by faculty members in higher educational institutions' (Nafsaniath & Ross, 2015).

Models also showed some shortcomings that researches should have in mind when trying to explain acceptance of technology among different kind of users. The main shortcomings of this different version of TAM are (Lee et al. 2003):

- Instead of measuring actual usage, the 36 studies relied mainly on self-reported use, assuming that self-reported usage successfully reflects actual usage.
- The tendency to examine only one information system with a homogeneous group of subjects on a single task at a single point of time, thus raising the generalization problem of any single study.
- The dominance of a cross-sectional study is also an important limitation. Since the user's perception and intention can change over time, it is important to measure these quantities at several points of time.
- Low explanations of variance were referred to as a major problem of TAM studies. In general, 30–40% of the variance of the causal relationship was explained but, in some cases, only 25% was explained by the independent variables.
- Other suggested limitations of TAM studies included single measurement scales, relatively short exposure to the technology before testing, and self-selection biases of the subjects

In addition, Bagozi (2007) warned to other drawbacks:

- the absence of a sound theory and method for identifying the determinants of PU and PEU, as well as other bases for decision making,

- the neglect of group, social, and cultural aspects of decision making,
- the reliance on naive and over-simplified notions of affect or emotions, and finally
- the over dependence on a purely deterministic framework without consideration of self-regulation processes.

Model and Methods

This paper is not intended to carry out an 'experiment' in user-technology relations from which, based on a certain set of questions, the perceived usefulness, perceived ease of use, attitudes towards technology and the intentions for its future use are obtained. In the study of actual use, the current perception of users own abilities to use ICT, the current perception of the usefulness and ease of use (which are actually acquired perceptions from previous experiences), we actually tried to 'interpolate' the model on previously acquired intentions, acquired perception of the usefulness and ease of use, as well as to evaluate some other influential factors that might determine the actual use of ICT and web technology in the educational process.

When used as an 'experimental' model, the TAM generally offers a high degree of consistency in constructs (ease of use and the actual use as well as perceived usefulness and actual use of the technology) measured by the Cronbach test. The question is whether the current users behaviour can be explained equally well by users' obtained perceptions for which we have no evidence on how they were obtained.

Given the advantages and disadvantages of the TAM model, as well as the objectives and hypotheses of this paper work, the researching dependence between the variables will be performed based on the model shown in Figure 2.

The model differs from the original TAM model in that it does not contain variables that describe attitudes towards technology and intents of using technologies. It uses five groups of variables (constructs):

- external variables (socio-demographic – age, gender, type of institution),
- variables of perceived usefulness,
- variables of perceived ease-of-use,
- variables of actual use,
- perceived user's own ICT and web capability and private ICT usage can tentatively be taken as an external variable, which is largely formed out of the studied system.

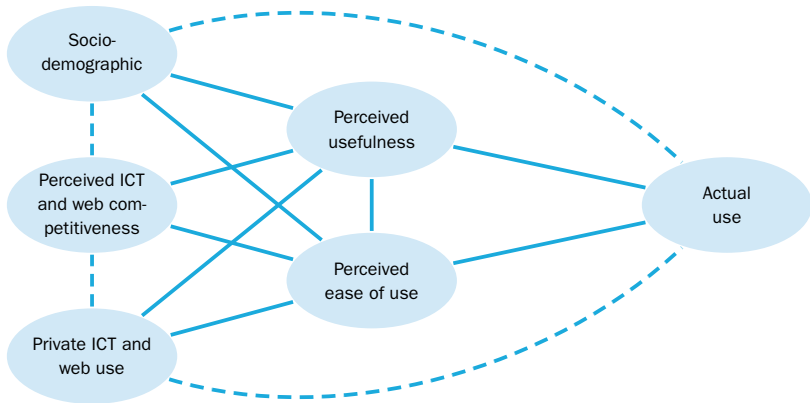The variables were categorized to form the constructs and optionally

Figure 2 Modified TAM Model for Actual ICT Use in Higher Education
with Three Groups of External Variables

(depending on the type of question) recoded, then for each construct the Cronbach-alpha test was calculated. Relations between the constructs were studied through:

- the Pearson product-moment correlation coefficient;
- the Spearman rank correlation coefficient;
- the *T*-test;
- the non-parametric methods (χ^2, Kruskal-Wallis and Man-Whitney test).

For the descriptive statistics, the most appropriate measures of dispersion (variance, mode, median) were used.

Data was gathered through a survey for teachers in higher education institutions (polytechnics and colleges) of economics and management in Croatia during May 2014. In Croatia there are 15 private and state-owned colleges, 12 polytechnics and 9 state universities in which economics and management studies are offered.

The request for filling out online questionnaire was sent to 250 teachers' mail addresses. In a month, answers from 98 respondents from 14 institutions were gathered (a response rate of The questionnaire consisted of the next groups of questions:

- The first group of questions aimed at finding out some socio-demographic characteristics of respondents (type of institution, gender, age);
- The second group of questions revealed to what extent and frequency some of ICT and web technology are used in educational process;

Table 1   Types of Institutions and Socio-Demographic Characteristics of Respondents

Category	Group	(1)	(2)	(3)
Type of HE institution	College	28	28.6	28.6
	Polytechnic	33	33.7	33.7
	University	37	37.8	37.8
Gender	Male	46	46.9	46.9
	Female	52	53.1	53.1
Age	≤30	34	34.7	34.7
	31–50	50	51.0	51.0
	>50	14	14.3	14.3

Notes   Column headings are as follows: (1) frequency, (2) percentage, (3) valid percent.

- The third group of questions indicated perceived usefulness of technologies;
- The fourth group intended to find perceived ease of use of technologies;
- The fifth group revealed the perception of respondents' own ICT and web skills, as well as intensity of use of ICT and web in daily life.

The questions were of the next types:

- closed question, with a choice of only one response,
- closed questions, with a choice of more than one response,
- half-closed questions, with a choice of more than one answer and editing personal response,
- Likert scale questions.

Types of institutions and socio-demographic characteristics of respondents are given in Table 1.

Results and Discussion

For the purpose of proving the first hypothesis, the research encompassed:

- intensity of the use of certain types of digitalized materials in the educational process,
- frequency of use of certain technologies in the education process,
- frequency of use of LMS,
- frequency of use of social networks.

Distribution of types of teaching materials used by respondents is shown in Table 2. Frequency of use of particular web technologies (blogs, wikies, podcasts, webcasts, on-line lectures, social networks, text messages, collaboration tools and document-management systems) in educational pro-

Table 2   Distribution of Types of Teaching Materials Used by Respondents

Type of digital educational material	No.
Normal documents (.doc, .pdf, .ppt . . .)	96
Html documents	34
Pictures, drawings, diagrams, graphics	72
Animations, simulations	25
Audio and video recordings	43
Webinar	5
Online questionnaires, evaluation tests	38

Table 3   Frequency of Use of Certain Web Technologies

Type of technology	*N* Valid	Missing	Median	Mode	Percentiles		
					25	50	75
Blogs	94	4	1.00	1	1.00	1.00	2.00
Wikies	93	5	1.00	1	1.00	1.00	3.00
Podcast	94	4	1.00	1	1.00	1.00	2.00
Webcast	94	4	1.00	1	1.00	1.00	2.00
Online lectures	95	3	2.00	1	1.00	2.00	3.00
Social networking	94	4	1.00	1	1.00	1.00	2.25
Textual massages	96	2	4.00	4	3.00	4.00	4.00
Collaboration tools	93	5	2.00	1	1.00	2.00	3.00
Document management	95	3	3.00	3	2.00	3.00	4.00

Notes   Variables have values: 1 – never, 2 – very rarely, 3 – sometimes, 4 – often, 5 – very often. Mode 1 indicates that certain types of web technologies are never used in educational purposes. For most technologies except for exchange of text messages or simpler DMS systems mode = 1.

Table 4   Use of LMS in Educational Process among Respondents

Use of LMS	Frequency	Percentage	Valid Percent	Cumulative Percent
Do not use LMS	44	44.9	44.9	44.9
Use LMS	54	55.1	55.1	100.0
Total	98	100.0	100.0	

cess is shown in Table 3. Learning management systems like Moodle and its Croatian versions Loomen and Merlin enable good organization of digitalized educational materials, communication and cooperation with students, creating tests and questionnaires. However, their use is still not entirely accepted by teachers (Table 4). How Internet is used for a certain educational-research activities is shown in Table 5. Use of social networks among participants is shown in Table 6.

Results shown in Tables 2–6 illustrate that there is a (significant) portion

Table 5 Frequency of Internet Usage for Certain Educational-Research Activities

Category		(1)	(2)	(3)	(4)	(5)
N	Valid	96	95	96	95	95
	Missing	2	3	2	3	3
Median		4.00	3.00	2.00	2.00	4.00
Mode		4	5	1	1	5
Percentiles	25	4.00	2.00	1.00	1.00	4.00
	50	4.00	3.00	2.00	2.00	4.00
	75	5.00	5.00	3.00	3.00	5.00

Notes Column headings are as follows: (1) creating materials for lectures using social network, (2) books and scripts publishing, (3) participate in web conferences, (4) scientific research.

Table 6 Use of Social Networks: Have a Profile on Any Social Network

Category		Frequency	Percentage	Valid percentage	Cumulative percent
Valid	Yes	61	62.2	63.5	63.5
	No	35	35.7	36.5	100.0
	Total	96	98.0	100.0	
Missing	System	2	2.0		
Total		98	100.0		

of unused ICT and web technology in the educational process of Economics and Management studies in Croatia, which strongly supports the first hypothesis. It is not a firm proof of the hypothesis but a good indicator, which otherwise would require accurate data and the calculation of what is adequate use of technology by individual users.

Relations and Dependences among Variables

According to our model and hypothesis we found out that sociodemographic variables (type of institution, age and gender of respondent and type of institution) mainly do not affect the actual use of web and ICT in educational process, which means that hypothesis 2c and 2d are rejected. Some exceptions occur in:

- Age group/frequency of use of the Internet in different educational purposes (age_new/s_v24–s_v28) $\chi^2 = 53.414$, $df = 32$, $p = 0.010$), where it is shown that *younger groups use the Internet more often than older age groups.*
- Age group/having a profile on social networks ($\chi^2 = 9.866$, $df = 2$, $p < 0.001$), where it is shown that *younger age groups have profiles on social networks more often than older age groups.*

Table 7   Cronbach Alpha for the Constructs

Construct	Variables	α
Perceived ICT and web competences	p_v1–p_v2	0.787
ICT and web usage in private purposes	s_v30–s_v45	0.772
Perceived usefulness of internet to improve educational process (PU_1) PU of ICT in educational process improvement (PU_2)	PU_1 (p_v4–p_v8)	0.771
	PU_2 (p_v19–p_v26)	0.858
	PU (p_v4–p_v8–p_v19–p_v26)	0.824
Perceived ease to use web and ICT PEU	p_v3, pv_9–p_v15 (without pv_14)	0.606
	p_v9,p_v12_pv13 (usage of int.)	0.729
Actual use: AU_1 no. of digit. mat. produced by teacher, AU_2 – freq. of use of different tech., AU_3 – internet usage freq. in edu. proc.	AU_1 (s_v1–s_v7)	–
	AU_2 (s_v10–s_v18)	0.777
	AU_3 (s_v24–s_v28)	0.411

- Research of dependencies of gender and other variables has shown that *there is no statistically significant connection between any of the external variables, the variables of perceived usefulness, perceived ease-of-use and the variables of actual use of ICT, and the web technologies and gender variable.*
- Research for dependencies of types of higher education institutions has shown that there is a statistically significant difference between types of higher education institutions only in the use of LMS systems (type_VU/use_LMS) (χ^2 = 14.653, *df* = 2, *p* = 0.001). *In universities LMS is used more than in colleges and polytechnics.*

For variables that represent constructs, an analysis of consistency (reliability) through a Cronbach alpha test was performed. The results are shown in Table 7. Poor Cronbah alpha test for PEU is probably the result of insufficiently precise questions, i.e. combinations and ways of grading the responses (from positive to negative and vice versa). Although variables were recoded in the calculations, some information content was lost due to inconsistent unidimensionality. All constructs except the sub constructs AU (AU_3, 'Actual use – using internet for educational purpose') have lower level satisfactory value (Cronbach alpha > 0.70).

Dependencies between variables were examined based on the model shown at Figure 2. Results are given in Table 8.

The results show that:

- Actual use (AU_3) has weak connection with perceived usefulness (PU_2), which partly confirmed hypothesis 2a.
- There is weak connection between actual use (AU_1) and perceived easy to use (PEU), which partly confirmed our hypothesis 2b.
- Actual use (AU) (frequency, number and type of digitized material and

Table 8 Correlations among Constructs

Constructs		PU_1	PU_2	PEU	AU_1	AU_2	AU_3	PIS	PDU
PU_1	p_v4–p_v8av	0							
PU_2	p_v19–p_v26av		0						
PEU	p_v3_p_v9–pv_15av		0.226	0					
AU_1	s_v1–s_v7av			0.252	0				
AU_2	s_v10–s_v18av				0.521	0			
AU_3	s_v24–s_v28av	0.281					0		
PIS	p_v1–p_v2av		0.280		0.521	0.388		0	
PDU	s_v30–s_v45_av				0.367	0.470	0.567	0.426	0

frequency of web technology usage) is in the highest dependency (near to and moderate) with the frequency and number and type of use of web and ICT in private life (PDU). Thus hypothesis 2e is confirmed.

Research confirmed weak connection between Perceived easy to use (PEU) and perceived usefulness (PU_2).

Perceived ICT competence (PIC) can also be considered as an attitude towards ICT. In the research based on the original TAM model, the attitude towards technology affected the intention to use and the actual use of technology. This paper has partially confirmed this statement (PIC is in weak connection with AU_1 and AU_2).

Conclusions, Limitations and Recommendations

ICT and advanced web technologies (web 2.0), which were shown good in education, nowadays are in their mature phase and the question is not whether to use them or not, the question is to what extent to use them and when to use them.

The research has shown that teachers of higher education institutions in the fields of economics and management mostly prepare digital educational materials using standardized technologies (simple and/or extended tools for office use). Other 'richer' ICT and web technologies are used to a far lesser extent, which, from this aspect, has confirmed the assumption that ICT and web technologies are not used sufficiently in educational processes. That was confirmed by mode of the number of used educational materials.

Research on the frequency of use of particular ICT and web technology has shown that newer technological solutions (web 2.0) are used rarely or never and that field is abundant with unused opportunities. This is especially important because of the fact that the respondents usually belonged to younger age groups.

LMS systems that are used nowadays in educational process are integrative, documental, communicative, collaborative tools, which open numerous opportunities in digital education but are also not used enough as well. The same situation relates to the use of social networks. Reasons for that probably emerge from the fact that the use of different ICT and web technologies is a matter of the individual orientation of teachers and not organizational or task-based orientation. This is corroborated by the fact that teachers pointed out as critical elements the need for organized training for the use of ICT and web 2.0 technologies, the price of the training and the support of the management.

Research has shown that respondents who use ICT and web technologies for personal needs outside of the educational process, at the same time use these technologies more in the educational process. On the other hand, teachers who use ICT and web technologies to a lesser extent often think that students do not have enough ICT and web knowledge. Also they often think that their low production of digitalized educational materials is partly caused by the quality of ICT and network equipment in the institution they work. However, some additional analysis confirmed that the equipment is not an obstacle.

In most researches in which TAM was used (Legris et al., 2003; Chuttur, 2009; Li, 2015) it was shown that there are weak dependencies between the actual use of technology and perceived usefulness. This was also confirmed in this research. The research also confirmed (weak) dependency between intensity of use of ICT and web technologies and perceived ease-of-use. In future research, for this construct a more homogenous group of question has to be defined. In addition, weak dependency between perceived ease-of-use and perceived usefulness of ICT and web technologies was confirmed.

When it comes to perceptions of future use of educational technologies, the biggest importance for teachers will be in software solutions that will enable support of dynamic and individual pace of studying as well as LMS systems with already existent abilities as well as new collaboration possibilities.

From the results we can cautiously conclude that the ease of use will be a key factor in the future use of technology. However, in order to create the perception of ease of use of the technology, it is necessary to present it adequately to the prospective user, which proved to be an important requirement by most of the respondents. It will also be an important requirement to set up continuous institutional teacher training in new technologies.

The conducted research has some limitations that have to be taken into consideration when interpreting the results. The first limitation emerges from the size or the representativeness of samples. As it was stated in the

introduction, respondents were teachers of higher education institutions (colleges, polytechnics and universities) who teach in economics and management studies. In that way, the sample represents only one segment of teachers of higher education institutions. The sample is not consistent with the number of representatives of certain types of higher education institutions as well as age or gender structure of certain institutions. Secondly, limitation emerges from the measuring scales of certain variables and constructs. This was indicated in the cases of variables with three values of the measured attribute. Also, using heterogeneous measuring scales for variables in certain constructs decreased the value of the Cronbach alpha test and made it questionable. For variables that have alternative values that are not mutually excluded (Measures and their importance for ICT usage in HE; Perceived importance of ICT for future), more valuable answers could have been obtained if certain options were ranked by significance not if only one option was chosen as the most important one.

The TAM model has proven to be good in analysis of relatively simple specific technologies with constructs that had 5–10 variables and same measuring scales. The homogeneity of variables in a construct was usually relatively high. Correlation coefficients between constructs were also relatively high.

The model used in this research is a modification of TAM model and it has shown usability in analysing technology that is not a simple technological solution but a group of more complex technological solutions. Aforementioned technologies are not particular technological solutions but can be integrated into complex technological solutions that offer more options in creating digital materials and use of those materials in educational purposes. That is why some constructs had lower values of Cronbach alpha (from 0.7 to 0.8) so even alpha = 0.606 was used in analyses. Also, because of the same reason, dependencies between constructs have shown relatively low correlation coefficients which in that context can be considered acceptable and the suggested modified TAM model can be considered as a usable model for similar analyses.

The model, as mentioned above, has its limitations, which are primarily derived from its linear structure in the study of the dependence among constructs. Creating a perception of usefulness, creating the perception of ease to use and the actual use has in the longer period of time a circular psychological effect. This means that the ease of use will encourage action and use of technology. Using technology (even in such a broad sense as the work presented) will open new prospects and expand the perceived usefulness. Using technology brings ease of use to a higher level of complexity of the technology, which can expand the perceived usefulness.

In future research, propensity to use new ICT and web technologies have

to be explored using larger user groups and with combinations of variables other than those contained in perceived ease of use and perceived usefulness. Special attention will have to be paid to the so-called external variables, for which there is almost no consensus on the choice and the grouping of these variables. Non-linear relationships between variables will be necessary to be researched using sophisticated methods such as decision trees, neural networks, machine learning algorithms and other classification algorithms.

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The Development Needs of Newly Appointed Senior School Leaders in the Western Cape South Africa: A Case Study

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The essential role that senior school leaders play in school leadership teams to ensure effective strategic leadership in schools has been the subject of intense discussion for many years. Crucial to this debate is the establishment of professional learning and leadership approaches for newly appointed senior school leaders. Recommendations for policy and practice highlight the importance of appropriate, multifaceted, developmental support initiatives for newly appointed school leaders. In many countries, including South Africa, a teaching qualification and, in most cases, extensive teaching experience is the only requirement for being appointed as a senior school leader in a school. This tends to suggest that no further professional development is required for newly appointed school leaders, the problem addressed in this paper. This paper reports on the main findings of the perceived development needs of newly appointed senior school leaders in the Western Cape, South Africa, and suggests that school leaders occupy a unique and specialist role in education, which requires relevant and specific preparation to support effective leadership. The respondents of this study report a lack of contextualised training and support before and after their appointment in their new roles creating unique development needs. This paper, therefore, employs a mixed-method approach to gather data to understand the perceived needs of twenty newly appointed senior school leaders in the Western Cape, South Africa.

Keywords: newly appointed senior school leaders, school leadership and management, professional development programmes, school leadership development needs

Introduction

The current state of education in South Africa has been described as largely dysfunctional. This observation suggests that South African scholars, compared to their peers around the world, lack basic skills and knowledge, are ill-prepared for higher education, and that the education standards in the country are generally low. Challenges facing mainstream schools include developing leadership skills among senior school leaders to guide school

employees and staff educators to better engage with pupils, and manage institutions effectively in a time of great change.

In writing this article, I have borrowed pertinent concepts from human resource management to refer to the establishment of professional learning and leadership approaches for newly appointed senior school leaders. Similarly, retaining talented personnel demands putting dedicated programs in place, to empower school leaders to drive consistent high performance and meet challenges, such as structured learning opportunities that promote quality education in South African schools. This objective is achieved by way of developing the competency of education leaders who apply critical understanding, values, knowledge and skills to school leadership and management, within the vision of democratic transformation that contributes to improving the delivery of education across the school system.

This article attempts to address the assessment that South Africa's current state of education is deemed inadequate and in need of a major uplift through educational leadership. Effective senior school leadership is arguably crucial for school and system effectiveness and, in particular, also for school learner success (Renihan, 2012). The role of the senior school leader is undeniably demanding, diversified, complex, forever changing, and encompasses high levels of responsibility (Clifford, 2010; Leithwood & Riehl, 2003). In this regard, Leithwood and Jantzi (2005) summarise the important role of senior school leaders in the following way:

> In many ways, the senior school leader is the most important and influential individual in any school. He/she is responsible for all of the activities that occur in and around the school building. It is this leadership that sets the tone of the school, the climate for learning, the level of professionalism and morale of teachers, and the degree of concern for what students may or may not become.

This article, drawing on data from twenty newly appointed senior school leaders in the Western Cape, engages with the perceptions of novice school leaders regarding their professional development needs after been appointed into their new roles. The study established the professional development needs of senior school leaders in the Western Cape, in lieu of designing contextualised training platforms that support novice school leaders in developing and managing their schools. This research study builds on the research project reported on by Piggot-Irvine, Howse, and Richard (2013), which investigated the role, workload and leadership needs of South African senior school leaders in the Gauteng Province. While the focus of their study was solely on the senior school leaders' development needs, this study focuses specifically on the development needs of newly appointed school leaders in the Western Cape. The purpose in writing this article was to

make available data gathered from interviewing 20 novice school leaders from different school contexts in the Western Cape, to expand on the progressive development of future training and mentoring platforms for new school leaders.

Firstly, this article provides the background and rationale for the study, followed by a discussion on current international and national literature about the development needs of novice school leaders. Thirdly, it describes the methodology and research design that shaped the research. In the main discussion section, the article presents the findings of the study, based on five main leadership functions used to assess school leaders. These leadership functions were adapted from leadership development frameworks by Cranston, Ehrich, and Kimber (2003), Hess and Kelly (2007) and Piggot-Irvine et al. (2013), as well as the norms and standards for school leaders from the Department of Education (2011a, 2011b). The article presents the findings of the completed surveys and discusses the outcomes, in combination with data obtained from interviews. The article concludes with a discussion of the findings alongside relevant literature, and offers recommendations for the continued development of leadership skills and knowledge platforms for newly appointed senior school leaders in the Western Cape, South Africa.

Professional Development for New Senior School Leaders

Although much has been written on the vocational expertise of established senior school leaders, relevant literature on the professional development needs of newly appointed senior school leaders employed within the South African school context has not been well documented. We live in a time of great change in South Africa, in particular bringing forward the nation's vision for the future of education. The top priorities for developing leadership skills for novice school leaders involve setting clear goals, managing a curriculum that collates practical and vocational learning in conjunction with theoretical study, monitoring lesson plans, allocating resources and evaluating teachers on a regular basis to promote student learning and knowledge. Quality of instruction and overall management of the education system are the top priorities for developing leadership skills. This need for radical change is imperative, simply because the world of work has changed significantly and in order to improve our education system that has not changed fast enough. The conventional top-down, one-size-fits-all education system does not enable all children to thrive in their own way. It is important that the revised education system recognize that young people are individuals with diverse talents and aspirations. Consequently, pupils do not learn in the same way. While it is acceptable that pupils are exposed to a strong common core of essential skills and knowledge, education leaders need

to explore different variables of a subject so that pupils may develop their own particular talents and aspirations. Young people need to be informed about the unpredictability of the economic climate and how this affects the recruitment market when the time comes to leave full-time education. The formal sector requires employees with passion, know how, initiative, creativity, resilience and self-knowledge; people who can take initiative, get on with others and who know when to listen and when to lead. These skills and abilities cannot be gained in the classroom alone: they come from practical experience, learning by doing things in real time, working with experts, and applying theory that reflects the demands of the modern workplace.

That South Africa needs a new education paradigm becomes very apparent when we compare ourselves with other countries around the world. The Social Progress Index (see https://www.socialprogressindex.com) states that a score is allocated to represent a country's level of access to basic knowledge. As such the twenty best-performing countries, relative to access to the best education system are (1) South Korea, (2) Japan, (3) Singapore, (4) Hong Kong, (5) Finland, (6) United Kingdom, (7) Canada, (8) Netherlands, (9) Ireland, (10) Poland, (11) Denmark, (12) Germany, (13) Russia, (14) United States of America, (15) Australia, (16) New Zealand, (17) Israel, (18) Belgium, (19) Czech Republic, and (20) Switzerland.

Hess and Kelly (2007) observe that the lack of scholarly inquiry into the development needs of novice school leaders in an international context is the main reason for the shortcomings of existing development programmes in America. The same may be true within the South African context. Professional development of newly appointed school leaders often takes the form of on-the-job training, but can also include on-going professional development opportunities that can range from carefully planned training and induction programmes to formal workshops, courses, job shadowing, school leader meetings, and peer coaching or mentoring (Normore, 2004; Hart, 1993; Cranston et al., 2003; Piggot Irvine et al., 2013; Fullan & Langworthy 2014).

The author of this article acknowledges that the best school leaders are visionaries, capable of shaping education requisites to constantly adapt, to stay abreast of change, to meet future standards. The qualities needed to be a successful school leader are vision, courage, passion, emotional intelligence, judgement, resilience, and curiosity (Sutcliffe, 2013). He further states that successful school leaders show great determination and are steadfast in challenging scholars' under-performance or poor behaviour by taking an active interest in their work and that of their staff. They are team-builders, involving the whole school community and taking people forward together. School leaders are also great motivators in getting people to go that extra mile to achieve objectives.

School leadership can be defined as the symbiotic interaction between the strategic leadership functions and the organisational functions in a school (Fullan & Langworthy, 2014). Strategic leadership involves functions such as planning, budgeting, organising and staffing issues, while dealing with the day-to-day operational running of the school is considered an organisational or managerial function (Kotter, 1990; Leithwood & Riehl, 2003; Roza, 2003). Leithwood and Riehl (2003) and Roza (2003) suggest that a challenge for the new school leader is the ability to manage the balance between the strategic and organisational functions of their roles. These roles cannot be separated because the functions often run concurrently; for example, decisions relating to the vision and mission of the school affect long-term activity as part of strategic leadership. Since daily operational decisions have a direct impact on the 'here-and-now,' strategic leadership constitutes the organisational function of school leaders and both need to run concurrently in order for effective leadership to take place. These authors further suggest that it is normal for new senior school leaders to tend to respond to the more urgent day-to-day matters when leading the organisational function of a school, and that this can result in them neglecting the 'leading strategically' function of their new roles (Leithwood & Riehl, 2003; Roza, 2003; Fullan & Langworthy, 2014).

Within the South African context, the ability of new senior school leaders to lead their schools strategically is consistently mentioned in the literature published by the Western Cape Education Department (WCED) as being one of the most important functions of the role of the senior school leader (see http://wced.pgwc.gov.za/home/home.html). In line with the Norms and Standards for Educators (Department of Education, 2011a, 2011b), 8 key areas are identified as the roles of the senior school leader. These are:

1. Leading teaching and learning in the school
2. Shaping the direction and development of the school
3. Managing the quality of teaching and learning, and securing accountability
4. Developing and empowering self and others
5. Managing the school as an organisation
6. Working with and for the community
7. Managing human resources (staff) in the school
8. Managing and advocating extramural activities

The National Education Policy Act 27 of 1996 in South Africa (Department of Education, 2011a) interprets the role of the senior school leader as the person that has the overall responsibility for leading and managing

the school and who is accountable to the employer (Provincial Head of Department) and, through the school governing body (SGB), to the school community. This implies that the leaders of the school should be well-appointed and trained both broadly – to respond to the Department of Education requirements – in order to respond to the contextual challenges within the school context, to perform their duties optimally.

Important attributes and skills for effective newly-appointed school leaders are:

- Maintain continuity to instil trust and support by regularly re-evaluating and adapting accepted traditions;
- Implement change to advance student learning, based on proven personally achieved experience and involvement;
- Promote constructive involvement of parents, the community and stakeholders to advance the development of the school;
- Provide instructional leadership based on a focused mission for the school, creating a culture for learning, setting goals for learning, making sure instruction is consistently of a high quality, and measuring student outcomes;
- Be accessible to students, staff, and parents, to formulate problem-solving strategies;
- Maintain a positive school culture that provides a safe, healthy, and orderly environment for learning;
- Establish and maintain a cooperative school climate that encourages positive student behaviour;
- Maintain staff balance, taking gender equality and ethnicity into consideration;
- Encourage high student expectations;
- Ensure that all lines of communication are operative to keep everyone within the school community informed about what is happening in the school;
- Effective interpersonal skills to galvanise people to work productively with one another;
- Ability to acquire and utilize relevant resources from the school system and other sources;
- Exercise participatory leadership to optimize human capital and organisational capacity by collaborating with others;
- Promote professional growth by helping teachers and staff members recognise their individual strengths and weaknesses in performing their duties;
- Forward thinking by keeping abreast of global trends in education de-

velopment and by utilizing this knowledge to advance learning, and by establishing a learning environment reflective of available technological innovations to prepare staff and students for the 21st century.

Heystek (2014) notes that the role definition and expectations of senior school leaders in each school may vary and therefore these different contextual roles determine the extent to which the school leader needs to be able to move between strategic (leadership) activities and organisational (managerial) activities during a normal school day. This movement between the two different roles requires the senior school leader to focus on both the setting of the strategic direction of the school, while simultaneously developing the people and the organisation. Thus, senior school leaders need to find ways to engage in both the strategic function of leading and the operational day-to-day function of their roles, in order to successfully manage their school. It is therefore critical to the development of any newly appointed senior school leader that they are well-trained and prepared for both the operational and strategic leadership functions (Heystek, 2014).

The roles of the senior school leaders further require them to engage with the broader school community to provide guidance on educational matters to parents. The function of leading the community – while not necessarily a core leadership function – is an important role that school leaders must play to enable them to harness the support and involvement of the community. This dual function is essential for both the strategic and the organisational running of any school (Leithwood & Riehl, 2003).

South Africa's education system in general is in need of an overhaul. Smaller schools in rural areas have to close not only due to a lack of financial support but also because sufficiently educated and motivated teachers are in short supply. Large numbers of pupils living in rural areas or townships adjacent to major cities are denied access to basic education, which in the long run will impact negatively on the national economy, increasing unemployment and poverty. Consequently, the current state of education in South Africa places the country at the second last position on the international league table. The burning question is 'How to drastically improve South Africa's education system?' Jansen (2016) states that Government should invest in early childhood development so that children are better prepared for formal education. He argues that every senior school leader and teacher would benefit from regular coaching and mentoring; these coaches and mentors must have a track record of running successful schools or achieving high results in the subjects for which they are responsible. Every pupil must have the required textbooks, parents must be informed of the pupil's achievement scores, and teachers must be encouraged to further their studies to at least a Master's Degree qualification.

Research Methodology

The data for this paper was constructed using a mixed-method approach. Themed and structured questionnaire surveys were used, followed by individual interviews that discuss the perceived needs of twenty newly appointed senior school leaders from schools in diverse socio-economic communities in the Western Cape. The structured questionnaire survey, which was adapted from a variety of leadership development frameworks (Cranston et al., 2003; Hess & Kelly, 2007; Piggot-Irvine et al., 2013) as well as from the Norms and Standards for Educators of the Department of Education (2011a, 2011b), sought, among other things, to ascertain the novice school leaders' views about their development needs shortly after their appointment to a senior leadership position. Using the data from the surveys, individual interviews were conducted to clarify the survey responses and enrich the data. The responses were transcribed and coded to reveal patterns. This paper reports on the perceived professional development needs of the twenty selected newly appointed senior school leaders from the Western Cape, South Africa.

Drawing from leadership development frameworks, the five main leadership functions identified for this study that these newly appointed school leaders perceived to be their most required development needs were:

- Leading strategic initiatives
- Leading teaching and learning
- Leading the organisation
- Leading people (staff)
- Leading the community

The structured questionnaire survey used a five-point Likert scale (a Likert scale is one where the format in which responses are scored is done along a range, I opted to use the Likert Scale as it allowed me to assign a numerical value to otherwise subjective opinions) to structure the data regarding which leadership needs were perceived by the new leaders as requiring the most on-going support and development.

The next section reports on findings of the study and details the perceived development needs of newly appointed school leaders using the five leadership functions noted above.

The Findings of the Study

Leading Strategically as a Development Need for Newly Appointed WCED Senior School Leaders

It is argued by Boal and Hooijberg (2001) that the essence of strategic leadership involves the capacity to learn, the capacity to change, as well as

managerial wisdom to lead one organisation. Strategic leadership involves functions such as planning, budgeting, organising and staffing issues, while dealing with the day-to-day operational running of the school is considered an organisational or managerial function (Kotter, 1990; Leithwood & Riehl, 2003; Roza, 2003).

Newly appointed senior school leaders in WCED schools are expected to have the ability to exercise strategic leadership decisions within their schools. To this end, the respondents identified four sub-areas in which they perceived a need for on-going development and support. These four areas are:

1. Strategic goal setting
2. Turning strategic goals into action
3. Change management research
4. Staff management

According to the survey data, strategic goal setting and the management of change processes in schools are recognised as the two areas in which the newly appointed senior school leaders perceived they needed the most professional development. This resonates with the research done by Piggot-Irvine et al. (2013) and Cranston et al. (2003), where they found that senior school leaders reported a greater need for development in strategic goal setting, with 26% requesting development in problem-solving skills, which included the management of human resources. Their respondents also suggested a greater need for further development in human resources management. In a further international study in the Pacific Island States, Robinson, Lloyd, and Rowe (2008) found that their established school leaders perceived strategic vision setting and leadership as key areas of professional development needs for school leaders.

The interview data reported in this paper from the newly appointed WCED senior school leaders highlighted the fact that, in order to lead strategically, the respondents indicated that they needed professional development in analysing and interpreting student results and whole school data. One respondent in the WCED, who has been mentored by local business leaders to develop strategic leadership skills, made the following statement during his interview:

> You need practical examples about how to run the school as a business by using data. I have introduced what I have learnt in the corporate world in my curriculum. I am pulling it apart to make it relevant, so I can set strategic goals for the staff.

The respondents further suggested that they perceived change management research as an area for development. Change management research

can be defined as the process, tools and techniques to manage the people-side of change to achieve the required business outcome in an organisation (Kotter, 2010). While the data from this study revealed that the newly appointed senior school leaders perceived further knowledge and development in all aspects of strategic leadership, they highlighted 'change management research' as being the area in which they felt that they required specific, contextualised professional development.

Leading Teaching and Learning

An important and necessary aspect of the role of senior school leaders involves the improvement of student performance by focusing on improving teaching and learning in schools. The literature defines this area as instructional leadership (Fullan & Langworthy, 2014). Within the South African context, the Department of Education defines the role of the senior school leader as the person who is responsible for leading, managing and evaluating the curriculum. The newly appointed WCED senior school leaders suggested that they require developmental support in the following five sub-areas of teaching and learning:

1. Greater understanding of current approaches to teaching and learning
2. Using valid and reliable assessment practices
3. Creating a learning culture of positive staff attendance
4. Creating, analysing and interpreting student and whole-school data
5. Managing classroom instruction

The respondents suggest that in order to improve in all of the mentioned five areas, an integrated approach, which involves working towards improving all these areas, is required. Thus the new senior school leaders suggested that they require training in both analysing data from teaching and learning assessments, as well as support in using the data results to develop practical strategic plans to maintain a high level of student learning. One of the respondents made the following statement during her interview:

> We are expected to analyse and interpret student results to assist with short- and long-term planning. The data helps us with strategic goal setting. Without this knowledge, we will be making decisions without knowing why.

This comment is echoed in the study from Piggot-Irvine et al. (2013), which suggests that school leaders who rely on data to support their decisions show far greater success in their strategic planning than those who do not. This concurs with the arguments made by Bush et al. (2006) and Hoadley and Kopanong (2007), who support the importance of instructional

leadership, i.e. leading teaching and learning as a means to improve student results.

Fullan and Langworthy (2014) suggest that successful teaching and learning in schools has traditionally been associated with senior school leadership adopting a direct hands-on approach to teaching and learning by strategically managing classroom instruction. However, the surveyed group of new WCED senior school leaders perceived this need as a lesser need. This is not surprising since the data suggests that the mandated teaching load and regulated approach by the WCED pays particular attention to this area, resulting in the new senior school leaders knowing that they are well supported by the WCED in this area. The results from a South African study by Hoadley, Christie, and Ward (2009) reveal that the teaching and learning function of senior school leaders is perceived as less important than other roles, which they relate to the fact that the school leaders in their study were also actively involved in teaching and learning. In contrast, two international studies by Robinson et al. (2008) and Cardno and Howse (2005) concluded that their respondents reported a need for development in the teaching and learning function as their respondents were not actively involved in daily classroom teaching. It may be concluded, then, that a more active teaching load may result in being perceived as a lower development need in the 'teaching and learning' function of leadership.

Within the South African school context, the data from this paper suggests that many WCED new senior school leaders are expected to not only lead the school, but also to take on teaching roles. This may place unnecessary pressure on the new senior school leaders who have already taken on fairly onerous organisational and strategic roles. As a result of the roles taken on by new senior school leaders, this study reveals that the new senior school leaders may be inclined to neglect the teaching and learning function of their roles as they are under pressure to acquire operational knowledge in their new leadership positions. This theory is supported by the work of Chikoko, Naicker, and Mthiyane (2011), who report that classroom teaching places additional pressure on the senior school leaders, reiterating the consensus of the WCED respondents that combining classroom teaching with the roles of a school leadership position, places considerable pressure on new senior school leaders.

Leading the Organisation Development

This paper reports that the respondents of this research study perceive a medium to high need for leadership development in most areas of the 'leading the organisation' aspect as part of their role as school leader. The importance of 'leading the organisation' is echoed by Hess and Kelly (2007), who report that internationally professional development training for

school leaders is not aligned with the contextualised development needs of senior school leaders. Within the South African context, Bush and Heystek (2006) state that the focus of newly appointed school leaders tends to be on managing the administrative, financial and human resource aspects of their role, as well as that of policy implementation.

Based on the surveys, the following areas of 'leading the organisation' were identified as the most important developmental needs by the respondents:

1. Leading and managing change
2. Leading organisational self-evaluation strategies
3. Coaching and mentoring on instructional leadership

These results suggest that the newly appointed senior school leaders believe they are required to integrate the organisational role functions with the strategic role functions of their new positions, and therefore need support in developing the leadership skills that span across both leadership areas. This understanding is supported by Mintzberg (1996) and Heystek (2014), who suggest that new school leaders' roles must be integrated, as leaders need to be able to move seamlessly between their managerial (leading the organisation) and leadership (leading strategically) role functions.

The data from this study suggests that the requirements for the organisational and strategic roles of the new school leader differ depending on different school contexts, the needs within the organisation, and the approach adopted within each school to teaching and learning. Thus, the development needs of the new senior leaders are particular to their school context and, since developmental programmes take a more generalised approach to developing school leaders, it might not be helpful in supporting the new school leaders to develop leadership skills that respond to the challenges of their specific school contexts.

The respondents in the study, who were offered the opportunity to develop leadership skills despite not being formally appointed into a leadership role, found the transition to being the leader of the organisation much easier. One respondent noted:

> I find no problem with leading the organisation, but I found it to be a real challenge dealing with the staff . . . The deputies before me didn't have the same role I have; I have many more roles and duties to perform, because my senior school leader is training me for his position . . . I actually thought I could do it. I was very fortunate to have senior school leaders that allowed me to do things in the school that post-level one teachers never do. So I had a management role in the school for a long time.

Another respondent explains:

> Yes, I was well prepared because the former senior school leader let me do a lot of his work, and I went on two courses and a Head of Department course.

Not all respondents, however, were coached and mentored to strengthen their leadership capacity before being appointed. One respondent, a new school leader, noted when asked whether she felt prepared for her new role:

> I would say no, I did not have any training; I wasn't coached or mentored into the role; it was a case of having to assess what was going on and learn as you go on. In terms of preparation, I do not think so.

Another respondent stated that he was very unhappy that he did not receive any induction training at his school:

> I do not think anyone can be fully prepared for such a job. We attended a course but I was very confused after the course. According to all the paperwork, all the regulations you have to adhere to are specified, although the old school leaders tell you to go with the flow and to satisfy everyone in the department.

The statements indicate that the experiences of newly appointed school leaders are very different. Most new senior school leaders are not subjected to formal training before taking up their new leadership roles, and generally need to acquire essential skills as quickly as possible. In addition, they are expected to find time to attend short courses offered by the WCED to support their developmental needs as new senior school leaders.

Leading People Development

According to the South African Department of Education, new senior school leaders are expected to provide professional guidance and development to their staff (Department of Education, 2013). This commitment reflects the point made by Otunga, Serem, and Kindiki (2008), who state that the role of senior school leaders is to improve material and professional prospects for staff.

Based on the surveys, the following areas of 'leading people' were identified by the respondents as their most important developmental needs:

1. Developing strategic direction for staff
2. Building capacity within the teams
3. Designing and delivering broad scope professional development

The study revealed that the area of 'leading people' was the area in which respondents experienced the most frustration, following their appointment as new senior school leaders. This concurs with the findings from studies of school leaders in the Gauteng province, which found that the greatest development need for school leaders was the management of human resources (Piggot-Irvine et al., 2013). This is further supported by data from exit interviews with Gauteng province school leaders (Bush & Glover, 2010), which found that the greatest challenge reported by most of their respondents was in the area of managing their staff. This is not unexpected data, given the very contentious labour and union issues that exist in South Africa (Piggot-Irvine et al., 2013). One of the respondents from the study stated that the unions make them feel 'very vulnerable' since they have no training in labour law issues.

Davies and Hand (2015) state that there is a distinction between managing people to ensure good quality education, and the managing of conflict situations that involve legal issues. Senior school leaders are generally more familiar with issues that involve educational matters about teachers, students and parents, but have often had very little training or experience in dealing with complex labour dynamics and the legal aspects involved in the managing of people. One respondent explained her concerns regarding the risks involved in dealing with the unions and legal aspects:

> It puts me in a space where I am afraid to do my work. We need constant guidance and support on this matter because we are at risk of doing things in good faith and we expose our lack of knowledge in certain areas.

The respondents in the study, who had had previous managerial experience before being appointed into a senior leadership role, stated that they felt that they were better able to cope with the 'leading people' function. This resonates with Robinson et al. (2008) and Bush and Heystek (2006), who suggest that it is important that aspiring leaders be given the opportunity to be involved in, and developed in, the role of leading people in the organisation before they take up their positions as senior school leaders.

Leading the Community Development

It is interesting to note that only a limited number of previous studies focused on the development needs of senior school leaders in the area of 'leading the community.' The results of the study conducted for this paper reveal that school activities are often intertwined with the community in which the school is situated, and school leaders are expected to play a supporting role in interacting with the broader community. This concept is supported by Fataar (2015) in his analysis and discussion of how three

school leaders navigate the social dynamics of the community in which their schools are situated, in relation to their leadership practices in townships schools in the Western Cape.

Based on the survey information, the following areas of 'leading the community' were identified as the most important developmental needs by the respondents:

1. Establishing effective communication strategies between the school and community
2. Developing strategies to encourage parental involvement
3. Encouraging and developing partnerships with local communities

The school as a community centre plays an important role in supporting various community activities, especially in disadvantaged communities in South Africa. For many families living in impoverished and often unsafe neighbourhoods, the school is perceived as an institution that provides a secure, pastoral and caring environment for their children. As many parents work long hours, often leaving home before the children are awake in the morning and only returning home after dark, it is parents' expectation that the school environment provides a safe place where children are supervised and taken care of for a period of time every day. The school is often considered to be the focal point of the community, an entity that acts as a consistent support structure that can develop the community (Hart, 1993; Leithwood, 1992; Normore, 2004; Fataar, 2015). One of the study's respondents explained how his school is expected to support the needs of the parents and community:

> Our greatest challenge is the socio-economic circumstances the children find themselves in, but we have a feeding scheme for them and a swop shop. They bring school-related products to stock the shop, which is supported by other schools. The parents contribute bread to the school, which is distributed to 600 children on a Wednesday. They get porridge at the school. We have sponsors that supply children with clothes. If it is their birthday, the sponsors give them gifts.

Supporting the needs of the school community appears to be a significant challenge for many new WCED senior school leaders. One of the respondents noted that as school leaders they are not trained specifically to assist with the needs of the broader school community and neither do most schools have the funds or staffing capacity to support the community needs. Most of the new senior school leaders perceived their roles as being more focused on the requirements of the school, staff and students within the school. However, the South African Department of Education states that

interaction with the community and leading the community is a very important function of the senior school leaders (Department of Education, 2013).

The importance of encouraging the parents to become role players in the school community is seen as a supportive function, in that parents are perceived as being able to play a productive role in the school by supporting their children's schooling. Nonetheless, in many cases, parental school involvement contributes to the frustration of senior school leaders. The results from the survey suggest that many of the newly appointed senior school leaders had very little desire to deal with parents and community members as a result of 'constant frustration caused by some parents' (survey respondent). The data further suggests that, for some new senior school leaders who take up positions in schools where they are new to the community, it may be difficult to be accepted by the community. One respondent explained how difficult it was for him to motivate the local school community to accept him:

> I am not from this community, so every time I reach out to get them involved, they reject my invitation. They support the school leader who lives in this community and whom they know well.

In relation to the aspect of 'leading the community,' the respondents suggested that communicating with the community, as well as initiating strategies to encourage productive parental involvement and partnership building in the community, are areas in which they believe need the most development.

Conclusion

The results of the survey questionnaires and interviews of newly appointed senior school leaders in the Western Cape suggests that many new school leaders believe they are inadequately prepared for the diverse challenges of their new roles. As highlighted in this paper, the respondents indicated that they believe they need development in most of the leadership areas listed in the Norms and Standards for Educators document (Department of Education, 2011a, 2011b). However, due to the huge disparity in South African schools, leadership development that takes the needs of their particular school context into account is a top priority. From the research data presented in this paper, it is therefore suggested that 'leading strategically' is the most important development need identified by new senior school leaders. The respondents suggested that this aspect of their roles contributes much to their daily pressure and stress; all the respondents expressed the belief that they lack the ability to manage this area.

Secondly, the function of 'leading people' was identified by the respondents as a significant development need for newly appointed WCED senior

school leaders. The respondents suggested that they are not equipped to deal with the 'leading people' function of their leadership role. They indicated that the additional element of dealing with unions created a stressful situation, especially directly after their appointment when they had little or no practical experience in this area of leadership. The respondents in this study stated that they felt vulnerable as a school leader as a result of the lack of support in this area.

While it might be argued that new senior school leaders are often given the opportunity to prepare for their roles as senior school leaders following their appointment to leadership positions, such as head of department or subject head, the respondents in this study stated that this basic preparation failed to adequately adapt them for the challenges of a senior school leadership role. The respondents noted that the requirements and expectations of the skills requirements for a school leader are significantly different to that of a head of department or subject head. Thus, the position of a senior school leader cannot be compared to that of other leadership roles in a school and respondents felt strongly that separate development programs should be scheduled on a regular basis in a contextually specific manner in order to satisfy the expertise advancement of all senior school leaders.

In conclusion, the five elements investigated, namely leading strategically, leading teaching and learning, leading the organisation, leading people, and leading the community, each revealed various sub-sections where the new senior school leaders perceived the need for support and development. The respondents noted that it would be helpful to focus on task-specific training and re-training before taking up their new leadership positions.

Recommendations

The suggestion, therefore, is that potential new senior school leaders should be identified and developed prior to their appointment into senior leadership roles. The WCED must identify individual needs of new senior school leaders and adapt the current programmes on offer by the department to provide a local contextualised development programme. The WCED must apply structures wherein the new senior school leaders may find coaching and mentoring support, while establishing themselves in their new roles.

Moreover, the current practice of a mandated teaching load for new senior school leaders must be adapted to assist the new senior leaders to focus on their new roles by relieving them from their teaching duties during the first year following their appointment. This policy change may result in a far more successful and focused new leader while alleviating the stress of the new role.

Senior school leaders are in a paradoxical position. On the one hand, they are expected to shape a vision of academic success for all students by implementing mandated reforms. On the other, they must simultaneously guide teachers and staff educators to improve the quality of instruction through human resource management; initiating refresher lecturer, teacher and trainer development; managing school employees, data and processes to foster school improvement; establish technology-based laboratories; physical education activities; and vocational guidance.

The author of this article believes this multifaceted approach toward developing student achievement and enhancing teaching techniques is the cornerstone of school improvement. The question 'What knowledge, skills, and dispositions should all students acquire to learn at high levels?' focuses the attention on teaching pupils how to learn. In other words, familiarising pupils with basic learning styles: visual, auditory, and kinaesthetic/manipulative; it is not uncommon to combine primary and secondary learning styles.

Gardner (1991) identified seven distinct profile intelligences that explain how different kinds of minds learn, remember, perform, and understand the process of learning. According to his theory, 'we are all able to know the world through language, logical-mathematical analysis, spatial representation, musical thinking, and the use of the body to solve problems or to make things, an understanding of other individuals, and an understanding of ourselves.'

Gardner (1991) further states that these differences 'challenge an educational system that assumes that everyone can learn the same materials in the same way and that a uniform, universal measure suffices to test student learning.' Our current educational system in South Africa is heavily biased toward linguistic modes of instruction and assessment and, to a somewhat lesser degree, toward logical-quantitative modes as well. Gardner (1991) argues that 'a contrasting set of assumptions is more likely to be educationally effective. Students learn best in ways that are identifiably distinctive. The broad spectrum of students would be better served if disciplines could be presented in a numbers of ways and learning could be assessed through a variety of means.'

The author of this article concedes that 21st century teaching carries with it a complex mix of challenges and opportunities. Challenges include issues like teacher turnover, accountability, changing student expectations, mounting budget pressures, and ever-changing demand to build students' 21st century in-demand job skills. The increasing demand for expertise in technology-based skills and resources should motivate the education community to keep abreast of international developments. It is therefore critical that senior school leaders address these requirements by establishing a

supportive productive environment to enable educators to continuously advance their skills so that they are competent in teaching and in supporting pupils' learning needs and potential. In order to address a commitment of 'lifelong learning,' teachers should be encouraged to opt for digital learning to strengthen not only their professional vocational development but also that of the pupils.

Pupils, parents and the community rely on the school, as a supportive instructional environment, to sustain a high level of education. This includes access to engaging content, and the opportunity to broaden pupils' knowledge in collaboration with peers, teachers, and the larger world community. Pupils today thrive in a digital environment; they are familiar with the Internet, text messaging, social networking, and multimedia. Consequently, they expect a parallel level of technology and opportunities in their academic lives. The senior school leader is responsible for closing this gap in South Africa's current school system.

Just as education methods must change so must the governing authorities, teachers, parents and community develop a cooperative and successful approach that balances economic realities with educational imperatives. The senior school leader has a pivotal role in bringing about this critical transformation. Developing a school through strategic innovation starts with crafting an effective school improvement plan, not different from a business plan. Key aspects of the plan include writing a mission statement that describes the school's purpose and defines needs assessments that gauge strengths, weaknesses, and areas for improvement. The school improvement plan serves multiple purposes, such as maintaining focus, securing finance, motivating ambitions, introducing beneficial extramural modules such as cultural and sports activities, and elightening teaching and non-teaching staff, school board members, and stakeholders.

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Abstracts in Slovene

Pristop rudarjenja besedil za pridobivanje izkušenj iz projektne dokumentacije: nazorna študija primera

Benjamin Matthies

Pridobljene izkušnje so pomembni sestavni elementi za nadaljnje izobraževanje v projektno osnovanih organizacijah. Kljub temu pa je praktična stvarnost ta, da pridobljene izkušnje pogosto niso dosledno ponovno uporabljene za organizacijsko učenje. V tem kontekstu sta običajno opisana dva problema: prevelika količina informacij in pomanjkanje postopkov in metod za ocenjevanje in izvajanje pridobljenih izkušenj. Ta dokument obravnava te probleme in združuje primerne rešitve v sistematičen proces pridobljenih izkušenj. Prvi problem naj bi rešila Latentna Dirichletova razporeditev (angl. *Latent Dirichlet Allocation*). Kar zadeva drugi problem so bile uveljavljene metode obvladovanja tveganja prilagojene. Celoten proces pridobljenih izkušenj bo predstavljen v praktični študiji primera.

Ključne besede: menedžment znanja projekta, projektna dokumentacija, pridobljene izkušnje, rudarjenje besedila

IJMKL, 6(2), 153–174

Poslovni modeli malih in srednje velikih podjetij (MSP) in spremembe kompetenc

Hannele Lampela

Kot posledica sprememb v lokalnem ali regionalnem poslovnem okolju, mala in srednje velika podjetja (MSP) v številnih državah čutijo potrebo po temeljni spremembi svojih poslovnih modelov in po tem, da izkoristijo nove priložnosti, sicer bodo primorani prenehati s poslovanjem. Kljub temu, da je pomemben vpliv MSP za gospodarsko rast in ustvarjanje novih mest dobro znan, je sedanje znanje precej omejeno na učinke kompetenc za spremembo poslovnih modelov pri MSP. Ta dokument je osredotočen na povezave med spremembami kompetenc in inovacijami poslovnih modelov MSP v industrijskih strukturnih spremembah v zunanjem okolju. Ugotovitve primerjalne študije primerov ruskih in finskih MSP so identificirale pozitiven odnos do sprememb in aktivnosti v zunanjih omrežjih in do iskanja novih priložnosti kot so omogočanje kompetenc za inovacije poslovnih modelov. Praktične posledice poudarjajo strategije preoblikovanja kompetenc, ki omogočajo inovacije poslovnih modelov in vpliv različnih institucionalnih okolij.

Ključne besede: poslovni model, kompetenca, MSP, Finska, Rusija

IJMKL, 6(2), 175–192

O formalnih in neformalnih dejavnikih: omogočanje učenja za varne dejavnosti na morju

Trygve J. Steiro, Astrid Thevik in Eirik Albrechtsen

Razmišljanje o varnosti se je tradicionalno nanašalo na raziskovanje naključnih vzročnih zvez, da bi se z njih lahko kaj naučili. Vseeno pa uspešno poslovanje predstavlja veliko večino vseh poslovanj. Zato bi bilo zanimivo, če bi se osredotočili na učenje iz poslovanja ki je bilo uspešno. Namen trenutne študije je identificirati dejavnike, ki bi lahko pripomogli k uspešnemu poslovanju v zvezi z varnostjo. K temu namenu pristopa empirična raziskava, sestavljena iz desetih intervjujev z ljudmi, ki delajo na krovu vrtalni ploščadi, ki trenutno deluje na Norveškem. Obveščevalci, ki so sodelovali v intervjujih, imajo različne položaje in prihajajo iz različnih podjetij, ki jih zastopajo na krovu ploščadi. Odkritja te raziskave kažejo, da je težko označiti ali določiti uspešno poslovanje. Definicija bo subjektivna; vseeno pa obstajajo nekatere skupne značilnosti uspešnega poslovanja. Na prvem mestu je ohranjanje življenja in zdravja ljudi. Uspešno delovanje mora pripeljati tudi do predvidenega proizvoda, kljub temu, da lahko traja nekaj več časa, kot je bilo načrtovano. Uspešno delovanje ustvari veliko dejavnikov in pogojev. Ta raziskava je identificirala 27 dejavnikov, ki bi lahko prispevali k uspešnemu delovanju v zvezi z varnostjo. Velik del teorije razlaga osredotočenost uspešnega delovanja neformalnih dejavnikov, ki se nanašajo na ljudi in njihova dejanja. Vseeno pa odkritja te raziskave namigujejo, da morajo biti prisotni tako formalni kot tudi neformalni faktorji.

Ključne besede: komunikacija, organizacijsko učenje, menedžment, vrtanje na morju, formalna struktura, neformalna struktura

IJMKL, 6(2), 193–214

Zgodnja vpletenost in integracija v gradbene projekte: koristi oblikovanja za odličnost (DfX) pri odstranjevanju odpadkov

Heikki Halttula, Harri Haapasalo, Aki Aapaoja in Samuli Manninen

S tipičnimi gradbenimi procesi nastajajo odpadki: odpadni material, toda še posebej odpadki, ki so nastali pri procesu. Večino teh odpadkov je mogoče preprečiti, in sicer z učinkovitim načrtovanjem na začetku projektov. Glavni cilj je opisati, kako lahko pojem Oblikovanje za odličnost (DfX) zmanjša najhujše odpadke v gradbenih projektih. Na osnovi pregleda literature o odpadkih in zahtevah, ki pomagajo pri zgodnjem vključevanju in integraciji, smo izdelali anketo za analizo in prednostno obravnavo vseh vrst odpadkov v gradbeni industriji. Opisali bomo, kako DfX zmanjša te odpadke, še posebej z zgodnjim vključevanjem in integracijo. DfX pri uporabi ustvarja spodbude za izvajalce projektov, da z zgodnjim vključevanjem in integracijo avtomatsko izločijo odpadke.

Ključne besede: oblikovanje za odličnost (DfX), varčnost, odpadki, zgodnje vključevanje, integracija

IJMKL, 6(2), 215–237

Visokošolsko izobraževanje v tujini kot inovativen odgovor na izziv globalnega učenja

Damian Kedziora, Elzbieta Klamut, Timo Karri in Andrzej Kraslawski

Svetovno obsežno izvajanje strategij preselitve storitev v tujini je bilo vidno in proučeno predvsem na poslovnih področjih kot so informacijske tehnologije, računovodstvo, upravljanje s človeškimi viri in centri za pomoč uporabnikom. Vseeno pa je bil prenos procesov na lokacije v tujini izveden na področju visokošolskega izobraževanja. Z odzivom na demografske in socialne izzive ter na izzive globalizacije, skušajo ugledne univerze najti inovativne rešitve, ki bi izboljšale kakovost in privlačnost njihovega delovanja, hkrati pa utrjujejo njihovo konkurenčno prednost. Dokument – z upoštevanjem razlike med visokošolskim izobraževanjem in standardnim poslovanjem v tujini – obravnava primer ameriške univerze, ki izvaja študijske programe na različnih lokacijah v Evropi.

Ključne besede: tujina, inovacija, kakovost, globalizacija, izobraževanje

IJMKL, 6(2), 239–260

Uporaba IKT/spleta v visokošolskem izobraževanju na Hrvaškem: primer ekonomije in študijskih programov menedžmenta

Josip Mesarić, Anita Prelas Kovačević in Dario Šebalj

Dokument predstavlja rezultate raziskave o sprejemanju in uporabi IKT (informacijsko-komunikacijska tehnologija) in o napredni spletni tehnologiji med učitelji v postopku visokošolskega izobraževanja ekonomije in menedžmenta na Hrvaškem. Sprejemanje in uporaba IKT in napredne spletne tehnologije sta ocenjena s številom in vrsto digitalnih gradiv, ki so jih ustvarili učitelji in z individualno uporabo različnih vrst in pogostosti IKT in napredne spletne tehnologije. Predpostavlja se, da sta sprejemanje in uporaba IKT rezultat pridobljenih izkušenj pri prejšnji uporabi tehnologij, opazne enostavne uporabe, opazne uporabnosti tehnologije in nekaterih »zunanjih« spremenljivk. Model, ki ocenjuje sprejemanje tehnologije, je spremenjen model sprejemanja tehnologije TAM (angl. Technology application modul). V našem modelu smo predpostavili, da dejanska uporaba tehnologije izvira iz predhodno pridobljenih namenov za uporabo tehnologije in iz predhodno pridobljene opazne enostavne uporabe in opazne uporabnosti tehnologije. Zaradi tega uporaba modela sprejemanja tehnologij TAM predstavlja interpolacijo omenjenega modela o pridobljeni izkušnji. Podatki so bili pridobljeni s stratificiranim spletnim vprašalnikom, ki je vseboval 42 vprašanj, na katere je odgovorilo 98 anketirancev. Rezultati so pokazali, da imajo odvisnosti nižje koeficiente korelacije med konstrukti, ki se nanašajo na tiste, pridobljene v »osredotočenem« modelu sprejemanja tehnologije TAM. Študija je prav tako pokazala, da je med učitelji v visokošolskih ustanovah na področju ekonomije in menedžmenta na Hrvaškem neizkoriščen potencial za sprejemanje in uporabo IKT in spletnih tehnologij in da bo njihova nadaljnja raba najverjetneje bolj intenzivna, če želijo nameniti več pozornosti izobraževanju.

Razvojne potrebe novoimenovanih srednješolskih vodij v pokrajini Western Cape, Južna Afrika: študija primera

Nelius Jansen van Vuuren

Bistvena vloga, ki jo imajo vodje srednjih šol, da bi zagotovili učinkovito strateško vodenje v šolah, je že vrsto let predmet intenzivnih razprav. Ključnega pomena za to razpravo je vzpostavitev strokovno učnih in vodstvenih pristopov za novoimenovane srednješolske vodje. Priporočila za politiko in prakso poudarjajo pomembnost ustreznih, večstranskih, razvojnih podpornih iniciativ za novoimenovane vodje šol. V številnih državah, vključno z Južno Afriko, so kvalifikacije za poučevanje in v številnih primerih obsežne izkušnje poučevanja, edina zahteva za to, da je nekdo imenovan kot srednješolski vodja v šoli. To govori v prid temu, da nadaljnji strokovni razvoj novoimenovanega vodje ni potreben, kar je obravnavani problem tega dokumenta. Ta dokument poroča o glavnih ugotovitvah v zvezi z zaznanimi razvojnimi potrebami novoimenovanih srednješolskih vodij v pokrajini Western Cape, v Južni Afriki, in predlaga, da vodje šol zasedejo edinstveno in strokovno vlogo na področju izobraževanja, ki zahteva ustrezno in specifično pripravo za podporo učinkovitega vodstva. Anketiranci te raziskave so poročali o pomanjkanju kontekstualnega izobraževanja in podpore pred in po njihovem imenovanju za opravljanje novih vlog, s čimer ustvarjajo edinstvene razvojne potrebe. Ta dokument zatorej uporablja pristop z mešanimi metodami, da bi zbral podatke za razumevanje zaznanih potreb dvajsetih novoimenovanih srednješolskih vodij v provinci Western Cape, v Južni Afriki.

Ključne besede: novoimenovani srednješolski vodje, vodenje in menedžment šol, strokovni razvojni programi, razvojne potrebe vodstva šol

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