



Patrycja Klimas

University of Economics in Katowice
Faculty of Management
Department of Management Theory
patrycja.klimas@uekat.pl

Dagmara Wójcik

University of Economics in Katowice
Faculty of Management
Department of Management Theory
dagmara.wojcik@uekat.pl

CORE SKILLS IN ICT – SYSTEMATIC REVIEW OF ACADEMIC AND GREY LITERATURE

Summary: This paper introduces a systematic literature review as a tool for both training (TNA) and learning (LNA) needs analyses. Additionally, given the systematic approach it presents findings on core skills in ICT industries obtained using both academic and grey literature analyses applied few and far between by scholars.

In particular, the aim of the paper is to show systematic literature review as valuable not only in an academic field (namely for scientists, scholars, and researchers) but also for practitioners. Therefore, it is claimed to be useful for companies interested in employees' development and training as well as for educational institutions interested in tailoring of their training programs and educational offer to business requirements and students' needs.

Keywords: core skills, systematic literature review, academic literature, grey literature, training needs analysis, learning needs analysis.

JEL Classification: J24.

Introduction

Generally, this paper presents the results of the first phase of activities realized under the STARTIFY7 project: *A Team-Building, Thematically-Focused and Lean-Training Summer Academy System for Young Future ICT Entrepreneurs*¹. This

¹ This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 644424. Polish research team was coordinated by Wojciech Czakon and supported by University of Economics in Katowice. STARTIFY7 consortium comprised of 11 partners from 8 countries (i.e.: UK, Italy, Germany, Spain, Greece, Netherlands, Belgium, and Poland) and founded by European Union Horizon 2020 research and innovation program. STARTIFY7 aimed to address two major hurdles that persist in existing European ICT entrepreneurship training initiatives. First, the fragmentation of European ICT entrepreneurship education and training programs resulting in a 'one-size fits-all' model that po-

phase of the project was conducted by research team from the Department of Management Theory, University of Economics in Katowice, and was aimed at identification of the training needs of potential ICT entrepreneurs. The recognition of core skills was needed in order to develop the necessary knowledge base for future organization of seven summer schools aimed at development of missing skills recognized among ICT students and graduates from different European countries (Report provided to European Commission – Deliverable 1.2)².

This paper shows the systematic literature review as a valuable and useful tool for training and learning needs analyses as well as presenting its main results. Given that the process of the systematic literature review was related to STARTIFY7 project, it has been addressed to the knowledge gap regarding the question: *what are the core skills in ICT industries?* To achieve comprehensive and holistic perspective, the review included both academic and grey literature³, thus the initial literature base has been supplemented by industry and public reports on core skills in ICT industries along with unpublished reports.

The article consists of three parts. First, the systematic literature review is presented. It is claimed as an applicable tool for training and learning needs analyses applied by both organizations interested in employees' development and training (Training Needs Analysis, TNA) as well as by educational institutions interested in development of competitive and current learning programs (Learning Needs Analysis, LNA). Second part, a procedure and results of the systematic literature review on core skills are outlined. In general, it was possible to identify 566 skills aggregated under three labels: general skills, missing skills, and critical skills. The following skills were the most frequently described in particular skill sets: flexibility among general skills, communication in critical skills, and communication in missing skills. Furthermore, an application of the systematic approach to the grey literature review allowed us to identify technological skills (business and industry reports) and managerial skills (business press) as the critical ones. Third part of the paper provides briefly some concluding remarks, summarizes the main findings, and outlines limitations of the conducted research.

tentially does not fit anyone. Second, is a lack of a holistic training structure and the general absence of a 'learning-by-doing' approach by providing a more 'hands-on' and practical learning experience. More information is available at: <http://startify7.eu/>

² W. Czakon, P. Klimas, D. Wójcik: Report on the STARTIFY7. Deliverable 1.2 – part of the general report provided to the European Commission (ICT-35-2014: Innovation and Entrepreneurship Support).

³ The term is explained in the second section of the paper. In general, grey literature includes different forms of published and unpublished articles, reports, and statements not indexed by peer-reviewed journals [Van Cauwenbergh et al., 2010].

1. Systematic literature review – the role in learning and training needs analyses

The literature review is seen as an analytical process used by scholars to evaluate and synthesize the recent knowledge in order to identify knowledge gap(s) [Czakov, 2011]. However, more often some scholars stress that peculiar narrative, traditional review is not enough as it has some important disadvantages [e.g. Langely 1999; Tranfield, Denyer, Smart, 2003]. Ones say that it can be biased by the researcher, lacks thoroughness and methodological rigor; therefore it provides inadequate reasoning for making general statements and incomplete evidence for drawing conclusions [Fink, 1998; Hart, 1998; Langely, 1999]. It is also said that traditional reviews lack a critical assessment, thus more systematic approach is required [Levy, Ellis, 2006]. As Czakov [2011] claims, traditional review starts with discussion about other researchers' studies before a research question is stated – such an approach is not in line with the methodological rigor [Bartolucci, Hillegass, 2010]. Furthermore, it is emphasized also [Czakov, 2011] that in traditional review a whole literature important for the analyses is not considered (i.e. unclear or not applicable inclusion and exclusion criteria, selective and purposeful decision on the literature used in review, etc.), which makes analysis fragmentary. All in all, the traditional literature review does not assess objectively and quantitatively the quality of utilized research which makes it impossible to fulfil the methodological rigor conditions.

In opposition to the traditional review, the systematic one implements a replicable, scientific, and transparent process, therefore minimizes bias through exhaustive literature searches of published and (more often also) unpublished studies. It provides an audit trail of the reviewers' decisions, procedures, and conclusions [Cook, Mulrow, Haynes, 1997; Tranfield, Denyer, Smart, 2003] showing the most important contributions and critical knowledge gaps [Czakov, 2011]. Furthermore, the systematic approach is much more objective than traditional one [Bartolucci, Hillegass, 2010] as it applies some quantitative methods and techniques like frequency analysis, bibliometric analyses (i.e. forward and backward citation analyses, co-citation analysis) [Czakov, 2011], or meta-analysis [Moher et al., 2009; Bartolucci, Hillegass, 2010]. Given the above, the systematic literature review has become a “fundamental scientific activity” [Mulrow, 1994, p. 597] of particular importance in outlining the relevant and desired research directions, research settings, and assumption in particular area of knowledge [Klimas, 2011].

1.1. Training and learning needs analyses

Identification of knowledge, skills, abilities, and competencies gaps is usually carried out during either the training needs analysis (TNA) or the learning needs analysis (LNA). The general distinguishing criteria between these two seem to be as follows: the type of organization which applies particular analysis, the general aim of particular analysis, and the targeted beneficiaries (people who are going to be trained or taught) of the results from particular analysis.

TNA is carried out by a wide range of organizations interested in employees' development and training. The studies show that among the typical aims of TNA there are for example the following ones: assessment of training and development needs, improvement of current performance, assistance in career planning decisions, and setting out the performance objectives for the future [Leat, Lovell, 1997]. Given the objective perspective, training needs analysis may assume the task-focused training (aimed at preparing the staff for new tasks, objectives, and works) or the results-focused training (aimed at achieving more effective results in present tasks, objectives, and works) [Taylor, O'Driscoll, Binning, 1998]. Both types of TNA consist of four phases [Forbes, While, Ullman, 2006], while first two refer to an identification of necessary knowledge and skills for work-based goals and to an identification of required but missing professional knowledge. All of those gaps, needs and missing skills, are identified among the current employees. In general, it is acknowledged that an identification of unknown and unaware training needs facilitates the reality and the reasonability of a continuous training and a professional development [Markaki et al., 2009] what directly and significantly correspond with the company's profitability [Huerta, Audet, Sabata, 2012].

LNA is carried out by a wide range of educational institutions interested in tailoring of their training programs and educational offer to the business requirements and the skills expectations. In particular, the learning needs analysis should be seen as a constitutive element of a continuous professional development process (CPD). As a part of CPD it is aimed at identification of knowledge, skills, and abilities (KSA) not only desired but also necessary to be acquired by pupils or students. It is believed that those KSAs have to be learned in order to meet the needs of the future employers or the business market requirements [While, Ullman, Forbes, 2007]. Given the goals' perspective, the learning needs analysis is carried out in order to outline the future requirements for quality of the higher education [The Quality Assurance Agency for Higher Education, 2002], develop or adjust the educational course for current requirements set by

the business practice [City Hall of Slupsk, 2016], the continuous adjustment of the on-going professional development path [Forcheri, Molfino, Quarati, 2000; Forbes, While, Ullman, 2006]. LNA, in opposite to TNA, is run especially by educational organizations (e.g. primary schools, pre-secondary schools, secondary schools, universities, and other educational institutions) having the responsibility of teaching people for which those specific skills must be acquired. Moreover, it targets pupils and students being the future, but still not active labour force which is targeted by TNA.

1.2. Systematic literature review approach in training and learning needs analyses

Each effective training and learning needs analyses must identify the skills to be taught or acquired by the learners before the training and learning course is started [Drummond, 1996]. Usually, the training and learning needs analyses begin with consultations, surveys, interviews in order to define the shortcomings in knowledge, skills, and competencies in population considered to be trained or taught [Gould et al., 2004]. Thus, the gathering of relevant data is the starting point. As indicated by Ferreira and Abbad [2013] there is little agreement on how to identify and measure the training and learning needs and – what is more important – usually the measurement processes do not consider any contextual factors (e.g. industry specificity, global/international/national trends in the knowledge management and learning policy). Due to the lack of common measurement practices, the very different methods of data collection in TNA/LNA have been used so far. However, the vast majority of research has used only the primary (both qualitative and quantitative) data [Gould et al., 2004] whereas the secondary sources may also be valuable and useful. All in all, data available from secondary sources may broaden the perspective and give an opportunity to cover the training and learning needs imperceptible by particular organization [see the approach to TNA, proposed by While, Ullman, Forbes, 2007]. Moreover, there are researchers who suggest [e.g. Moore, Dutton, 1978; While, Ullman, Forbes, 2007] that it is possible and recommended to use also other data sources, such as: the results of research in other industries, professional journals, industry or business documents and reports, government sources, Ph.D. thesis, etc. Although, the secondary data sources are suggested to be included, such practices remain not popular and are implemented rather occasionally – Table 1.

Table 1. Examples of traditional approach to data collection in TNA and LNA

Authors	Analysis	Approach	Method	Sample	Field	Country
Ullah, Ameen, Bakhtar [2011]	TNA	Qualitative research	Interviews	20	Medicine	Pakistan
Price, Lee, Kozman [2010]	TNA	Qualitative research	Brainstorming	30	Oil and gas	USA
Nelson, Morrison-Beedy [2008]	TNA	Qualitative research	Documentation analysis and interviews	NA	Medicine	NA
Jusoh, Ziyae, Asimiran, Kadir [2011]	TNA	Qualitative research	Interviews	30	Entrepreneurs from ICT	Malaysia
Markaki, Alegakis, Antonakis, Kalokerinou-Agnostopoulou, Lionis [2009]	TNA	Quantitative research	Survey questionnaire	119	Nursing	Greece
Forcheri, Molfino, Quarati [2000]	TNA / LNA	Qualitative research	Interviews and controlled experiment	41	SMEs from ICT	Italy
Forbes, While, Ullman [2006]	LNA	Quantitative research	Survey questionnaire	110	Nursing	UK
Mahmood, Ajmal Khan [2007]	LNA	Quantitative research	Survey questionnaire	200	Library and information science	Pakistan
Department of Education in City Hall of Słupsk [2016]	LNA	Quantitative research	Survey questionnaire	100 / 350	Teachers and Pupils	Poland

* NA – not available; TNA – Training Needs Analysis, LNA – Learning Needs Analysis

We claim that literature review, especially this following the systematic approach, ought to be applied in both TNA and LNA. We believe that among the “non-academic” users of the systematic literature review in the context of TNA and LNA there are:

- universities, high schools, and primary schools interested in identification of relevant and current knowledge, skills, and competencies necessary to possess by students and pupils;
- wide range of organizations (institutions and companies) interested in identification of knowledge and skills necessary to acquire or develop by their employees.

In that vein, the systematic review may provide evidence to support policy and practice decisions [Benzies et al., 2006] as it should include a triple perspective [Forbes, While, Ullman, 2006]: (1) population (pupils, students) needs; (2) team (organizations) needs; (3) employee (graduates) needs. The learning needs analysis – as an important element of continuous professional development (CPD), aims at helping the future employees to identify the learning objec-

tives at different stages of the continuous learning process, for instance before they choose a particular educational program or learning course offered by a school or an university.

Furthermore, the systematic review may be useful in the field of the training needs analysis carried out by the companies and other types of organizations. It is acknowledged that TNA is used at three different levels [Salas, Cannon-Bowers, 2001; Dachner et al., 2013]. *Organizational analysis* presents identification of training needs regarding such factors as organizational goals, available or constrained resources, and firm's performance. At this level the literature review may provide insights about the training needs identified in a particular industry [Huerta, Audet, Sabata, 2012], by the main business rivals or the market leaders. *Job (task) analysis* shows identification of the training needs required to work at a particular workplace. At this level the literature review may be particularly important when an organization is working on the creation of any new workplaces, hence it lacks of knowledge about the tasks, competencies, skills, and abilities required at those workplaces. Moreover, literature review may shed some lights on the required sets of procedures, mental processing, and mental requirements significant for job performance investigated during *the cognitive task analysis*. *Person analysis* [Herbert, Doverspike, 1990] aimed at identification of the training needs reflected by employees who needs to be trained and in which aspects they have to be trained. In general, this level covers recognition of some individual characteristics important for training, such as [Salas, Cannon-Bowers, 2001]: cognitive ability, self-efficacy or goal orientation. Therefore, at this level the literature review may be useful to identify the general personal, relational, and social skills desired among the staff (e.g. it can be important in both selection and recruitment processes). Last but not least, we claim that the systematic literature review may be also valuable not only in recognition of missing skills, but also general competences and critical skills in other fields than only the training or learning needs. For instance, it can be used in order to design a workplace or prepare a detailed job description [Moore, Dutton, 1978], specify the resources needs [Taylor, O'Driscoll, Binning, 1998], as well as to reveal the critical body of knowledge [Price, Lee, Kozman, 2010] important in the development of competitive advantage.

2. ICT skills identification – the systematic literature review approach

The systematic approach to the literature review is recommended in the methodological research practice for more than two decades [Mulrow, 1994; Cook, Mulrow, Haynes, 1997]. It is so, as systematic approach is shown as much more reliable and valid than the traditional one [Tranfield, Denyer, Smart, 2003; Moher et al., 2009; Czakon, 2011]. However, more and more scholars point its limitations hampering the fully sound reasoning [e.g. Levy, Ellis, 2006; Bartolucci, Hillegass, 2010; Klimas, 2011]. Among the greatest disadvantages, there are indicated the following ones: a long process of review and publication, a narrow and scientific focus, drawing conclusions based on research carried out usually in the large companies; a limited data availability as it is reached through electronic and licensed data bases. To be stricter, the above limitations of the systematic review of academic literature are only a few examples of the main shortcomings which, however, may be eliminated or at least minimized by supplementing the database with the grey literature [Van Cauwenberghe et al., 2010]. Following the U.S. Interagency Grey Literature Working Group, the grey literature should be defined as “publicly available, foreign or domestic, open source information that is usually available only through special channels and may not enter normal channels or systems of publication, distribution, bibliographic control, or acquisition by book sellers or subscription agents” [Benzies et al., 2006, pp. 55-56]. The main advantage of broadening the database by the grey literature it is an opportunity to add new information, usually the newest studies and fresh empirical findings. It should be noticed however, that grey literature may be based on narrowed sampling, thus giving (sometimes) not statistically significant results, nonetheless usually the presented empirical findings inside meet the highest requirements of methodological rigor [Conn et al., 2003]. The inclusion of grey literature (both published and unpublished) not indexed by peer-reviewed journals [Van Cauwenberghe et al., 2010] influences significantly on research process (including reliability, validation, relevance, etc.), thus it is recommended “to identify, retrieve, and include all reports and grey works” [McAuley, Tugwell, Moher, 2000, p. 1228] in any type of the literature review, including a box-score, the systematic review or meta-analysis. Given the above, in our study we decided to include the typical types of the grey literature [Benzies et al., 2000; Conn et al., 2003], like: government and committee reports, industry and business reports, world consulting firms’ reports, best practice documents, business analyses. We conducted the review at two stages. At the first stage, the academic literature was analysed whereas the second one was devoted to the grey literature review.

2.1. Literature screening and preliminary findings

Before the systematic literature reviews have been applied, the research team decided to organize the brainstorming session aimed at identification of the searching criteria. Three researches have been reviewed independently the basic literature and seminal studies on TNA and LNA related to ICT industries. The aim of the initial literature screening and brainstorming session was to specify the most commonly used keywords applicable during the systematic reviews. As a result, three types of skill sets have been identified: general skills, missing skills, and critical skills. Preliminary assumptions regarding the searching of prior academic and grey literature were discussed and accepted by all partners cooperating under the STARTIFY7 project.

General skills are considered as the most relevant skills to the world of work. Usually, under these skills set the following skills are considered [e.g. Jayaram, Engmann, 2014; OECD's Programme..., s.a.]: cognitive, non-cognitive, and technical. Following the research run in South Asia [Jayaram, Engmann, 2014]: 56% of general skills are non-cognitive (e.g. communication, problem solving, punctuality or flexibility), 23% are technical and industry specific (e.g. use of technology, machinery, autonomy and repetitiveness, time management or physical tasks), 14% refer to the general values and believes (e.g. personality traits, behaviors, individual preferences), while 7% are cognitive in nature (e.g. literacy skills, perception, and reading skills). Those findings remain in line with the list of skills created by OECD's Programme for the International Assessment of Adult Competencies (PIAAC). It is worth noting that among the general skills a great attention is paid to the development of critical thinking skills [The Quality Assurance Agency for Higher Education, 2002] including e.g.: reasoning, evaluating, analysing, judging, inferencing, conceptualizing, understanding, and reflecting. A development of those skills desires the social sense reflected in ability and willingness for articulation and discussion of own ideas with others (especially peers and supervisors) [Guiller, Durdell, Ross, 2008]. Following the empirical findings provided by Wang and Woo [2010], the critical thinking skills acquisition needs both learning of and openness for novelty, bringing outside knowledge or experience, inquiring of any ambiguities, linking different ideas and perspectives, sound and objective justification, critical but constructive assessment, practical importance and utility with theoretical insights. Note however that, although the critical thinking skills are acknowledged as required in all industries and professions, the vast majority of graduates miss them what makes the growing number of information harder to analyse and

assess. What is more, the shortcomings in critical thinking skills hamper the abilities of reasonable arguments construction and applying holistic perspectives being crucial abilities in the era of interdisciplinary, specialized and dynamic knowledge-based economy [Wang, Woo, 2010].

Missing skills are considered as those relevant to the particular industry context, hence not acquired by the graduates or the newly-employed employees. Given the context of different ICT industries, the following missing skills have been identified so far:

- analytical skills [Siaw, 2002];
- business, business development, and international business skills [Watkins-Mathys, Foster, 2006];
- collaborative and cooperative skills [Siaw, 2002];
- critical thinking skills [Guiller, Durndell, Ross, 2008];
- financial literacy and investment skills [Watkins-Mathys, Foster, 2006];
- marketing and selling skills [Watkins-Mathys, Foster, 2006];
- lack creativity and flair [Teo, Wong, 2000];
- oral communications [Teo, Wong, 2000];
- personal and interpersonal skills [Siaw, 2002; Teo, Wong, 2000];
- specific problem-solving skills [Siaw, 2002; Teo, Wong, 2000; Neo, 2003].

Given the above, some general skills gaps in ICT industries seem to be revealed, namely critical thinking, interpersonal skills, communication, or problem solving, just to name a few. Those skills ought to be considered as important for TNA and LNA applied by companies operating in ICT industries or universities providing courses oriented on teleinformatics.

Critical skills are considered as crucial and the most important skills in ICT industries. Academic literature identifies the following ones [International Labour Organization, 2007, after: Wang, 2012]:

- cognitive problem solving – the ability to analyse and solve technical and/or business-related problems effectively, using high-level thinking skills, and by applying methodologies [also identified by Sondergaard et al., 2012];
- social – the ability to interrelate with others, work in teams, motivate and demonstrate leadership, and manage client relations;
- communication – the ability to read, write, and handle information;
- personal behavioural/ethical – appropriate personal and professional attitudes and values, the ability to make sound judgments and take decisions;
- learning – the ability to acquire new knowledge, learn from experience, and be open to innovation [also identified by Sondergaard et al., 2012];

- higher-order knowledge skills – ability to apply knowledge, use know-how to complete complex tasks, choose or change methods of work, and solve industry-specific problems [Sondergaard et al., 2012].

It should be emphasized that the vast majority of those skills were identified as missing. Only two of them – both related to the level of the possessed knowledge – seem to be acquired by the graduates and the newly-employed workers in ICT industries namely learning skills and higher-order ones.

The above groups of skills classifications (general, missing, and critical) determined the searching criteria applied during the systematic literature reviews. However, in order to achieve a more comprehensive overview and to broaden the searching scope, besides a “skills” keyword, we used “competences” and “abilities” keywords as well. Such an approach remains in line with other scholars, e.g. Price, Lee, and Kozman [2010], who run the training needs analysis applying the Competency-Based approach. Furthermore, we did not use a “knowledge” keyword considered usually under the Knowledge-Skills-Abilities (KSA) approach typical for TNA as the focus of STARTIFY7 project was paid to the dynamic activities and not to the static knowledge. It does matter, as the whole project had to meet the basic assumptions of the learning-by-doing approach to training and teaching [DuFour, DuFour, 2013].

2.2. Systematic academic literature review – results

In the range of the academic literature review we used four databases: EBSCO, Scopus, ISI Web of Science, and Google Scholar. Other details connected with the set of searching criteria (keywords) and additional restrictions (i.e. including and excluding criteria) were presented in Table 2.

An application of searching, inclusion and exclusion criteria allowed us to create the list of skills labelled as general, missing or critical in peer-reviewed academic journals. Using the word cloud it was possible to evaluate a particular frequency of the identified skills. Generally, the higher size of a particular skill in the word cloud presented in Figure 1 the more often it appeared in the analysed academic databases.

Table 2. Academic literature review – searching criteria

Databases
EBSCO, Scopus, ISI Web of Science, Google Scholar
Keywords
missing + skills or competencies or abilities + ICT
critical + skills or competencies or abilities + ICT
business start-up + skills or competencies or abilities + ICT
training needs + ICT
training needs analysis + ICT
lean-training + ICT
critical success factors + ICT
training initiatives + ICT
Additional restrictions
title/abstract/keywords
social sciences
*including: business, economy, management
*excluding: proceedings, books, working papers
30 most cited (in all Databases)
full text

Figure 1. Cloud of all identified skills (general, missing, and crucial)

Source: Own elaboration using [www 1].

Basing on the searching criteria we specified three groups of skills divided into three lists: (1) List A: general skills, (2) List B: missing skills, (3) List C: critical skills – details are presented in Table 3. Note that “communication” was the most frequent skill pointed out in the academic literature review.

Table 3. Academic literature review – all identified skills

All skills types	Quantity
All skills identified	236
Without duplication	155
After labelled (similar types)	121
The most frequent (general skill) – knowledge	18
The most frequent – communication	12

In the range of the academic literature review, within the most common skills that appeared as the most frequently considered, there were the following ones: communication, management, problem solving, team working, knowledge (including acquisition, application, sharing), creativity, flexibility or technical skills (e.g. analysing, modelling). Given the applied three general groups of skills the results regarding the most commonly considered skills were as follows: (1) List A (general skills): knowledge (including acquisition, application, sharing), creativity, flexibility, languages, anticipation; (2) List B (missing skills): communication, management, knowledge (including acquisition, application, sharing), problem solving, team working / collaboration, creativity, business skills; (3) List C (crucial skills): communication, management, team working, problem solving, knowledge (including acquisition, application, sharing, evaluation), information appraising, learning skills.

2.3. Systematic grey literature review – results

In the range of grey literature review we distinguished two groups of sources regarding:

1. Reports and analyses provided by world and international consulting firms, associations, and research consortia including both published (e.g. Deloitte, PricewaterhouseCoopers, Ernst & Young, Accenture, KPMG, IBM, Fujitsu, Capgemini, A.T. Kearney, Grant Thornton LLP, McKinsey & Company, SkillStorm) as well as unpublished materials (e.g. Report provided by Danish Business Authority to OECD and Entrepreneurship Skills for Growth-Orientated Businesses (2012); Report provided to the Swiss Cooperation Office SDC, Helvetas Swiss Intercooperation and Management Development Associates by STIKK Kosovo Association of Information and Communication Technology regarding the project titled Enhancing Youth Employment (2013); Report provided by Skillnets to the Irish Department of Education and Skills under the Training Networks Programme “Training Needs Analysis (TNA) Guide” (2013); Report provided to European Commission regard-

In the range of the grey literature within the group of the world consulting firms reports and unpublished reports from wide range of research on current core, the most common and the most frequently pointed out type of skills were “technological” ones. Simultaneously, within the group of the business press field, the most common and the most frequently pointed out type of skills were “technological” but also “management” ones – Table 5.

Table 5. Skills in the grey literature review

Skills in grey literature review	World consulting firms & unpublished reports	Business press
Total	134	196
Without duplication	78	110
After labelled (similar types)	70	85
The most frequent (general skill)	technological (12)	management (19)
The most frequent	technological (12)	technological (8) management (8)

Generally, among the most common skills that appeared the most frequently during the analysis of grey literature there were the following skills: technological, technical, management, communication, problem solving, team working / networking, leadership, business skills, creativity, flexibility, soft skills, social skills, learning skills or innovative thinking.

Conclusions

On the basis of the systematic literature review the core skills in ICT industries were identified. The most commonly suggested skills there are “communication” skills, regarding both verbal and written aspects (Table 6). The next frequently pointed out skill is “problem solving” regarding both basic (operational) level and advanced (strategic) levels. The next important skills there are “technological” ones (at both basic and advanced levels) and further – “team working” skills. Another most frequently indicated skills were “technical” ones at basic, advanced, and even professional levels. Last but not least pointed out were “management” skills regarding for example following areas: finance, marketing, project, HR, risk, production, sales or quality management, and “knowledge” skills connected with for example: knowledge acquisition, application or sharing. Moreover, it was the specific skills category regarding also other peculiar ranges, such as: mathematics, products, IT or technical and more general like management or practical knowledge as well.

Table 6. Academic and grey literature review – summary

Academic and Grey Literature Review	Quantity
In total	566
After the elimination of duplicates	207
The most frequent (detailed labels):	
– communication	25
– problem solving	22
– technological	18
– team working	15
– technical	13
– management	12
– knowledge	12

The next phase of the whole research project was connected with a validation of the achieved results in practice – basing on survey within young people (students and pupils) and interviews with ICT entrepreneurs. The results of this investigation will be published in the future authors' papers.

The authors believe that adopting both types of literature made it possible to achieve more comprehensive overview on the core skills and identify more than two hundred of core skills in ICT industries. In a next step, all of those skills were examined in detail, aggregated into four skills sets (including technological, managerial, relational, and personal skills), and validated using several in-depth interviews. Finally, those skills considered under the four skills sets were used in European research aimed at identification of core skills among students and graduates interested in the career development in ICT industries. The results of the mentioned research are currently going through the publication process.

The reliability of the provided exploration requires an attention to the certain limitations. First, it was a small-scale investigation restricted to ICT industries only, thus the possibility of drawing the general conclusions about the core skills is limited. Second, given the perspective of both TNA and LNA, it should be considered that application of the systematic literature review was restricted only to the initial phase of them. Third, the applied research method [e.g. Levy, Ellis, 2006; Bartolucci, Hillegass, 2010; Czakon, 2011; Klimas, 2011] entails common, methodological restrictions including: consideration only the English publications, limited access to full-text publication through the digital databases, limited access to the newest publications, due to the licensing agreements, perception bias critical during identification of searching criteria, and researchers' subjectivism in interpretation and aggregation of revealed skills. Last but not least, according to the concept of fashions in management theory and practice [Abrahamson, 1996], there is a risk that identified skills reflect the general and

current fashions in TNA and LNA expressing extraordinary important role of “soft skills” in Knowledge Based Economy. In such perspective the result of the study may be seen as learning and teaching fashions, hence may be considered as transience, superficiality, and based rather on thoughtless diffusions patterns driven by mimetic pressures [Czakov, 2014] than on real training and learning needs of students, graduates or newly-hired employees. However, we believe that the aforementioned shortcomings were minimized by supplementing the academic systematic literature review by both published and unpublished grey literature as well as by application of the iterative searching and interpreting processes carried out independently by three scholars.

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KLUCZOWE UMIEJĘTNOŚCI W ICT – SYSTEMATYCZNY PRZEGLĄD LITERATURY AKADEMICKIEJ I SZAREJ

Streszczenie: Artykuł przedstawia systematyczny przegląd literatury jako wartościowe narzędzie identyfikacji potrzeb szkoleniowych (*Training Needs Analysis*) oraz analizy potrzeb edukacyjnych (*Learning Needs Analysis*). Dodatkowo, wykorzystując podejście systematyczne, artykuł prezentuje wyniki badań dotyczących kluczowych umiejętności w sektorach teleinformatycznych (ICT), przeprowadzonych nie tylko na podstawie analizy literatury akademickiej, ale także literatury szarej, która jest rzadko stosowana przez badaczy w ogóle, natomiast w Polsce dotychczas była wykorzystywana niezwykle rzadko. Celem artykułu jest w szczególności przedstawienie systematycznego przeglądu literatury jako użytecznego narzędzia analitycznego znajdującego zastosowanie nie tylko w obszarze akademickim (badacze, naukowcy), ale również w praktyce gospodarczej. W opracowaniu przyjęto, iż rzeczony narzędnik znajduje uzasadnione zastosowanie w przedsiębiorstwach ukierunkowanych na rozwój i szkolenie pracowników, jak również w instytucjach edukacyjnych zorientowanych na opracowanie oraz dostosowanie programów szkoleniowych i oferty edukacyjnej do aktualnych potrzeb czy wymagań praktyki gospodarczej.

Słowa kluczowe: kluczowe umiejętności, systematyczny przegląd literatury, literatura akademicka, literatura szara, analiza potrzeb szkoleniowych, analiza potrzeb edukacyjnych.