



## Evaluation of E-recruitment as a Business Model through Internet of Things Approach

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### ABSTRACT

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**Objective** – Modern e-businesses are developing rapidly as new modern enterprises; e-business management is an important topic across contemporary management and modern information technology. The purpose of the paper is to investigate e-recruitment based on Business Model Ontology framework, to provide useful implication of e-recruitment as a business model. The aim is to create a usable model for building company's value added through e-business, helping companies to evaluate contribution of each element added to the model.

**Methodology/Technique** – The research done by reviewing previous studies in related areas.

**Findings** – E-recruitment's effect on initial job-seeker interest is limited, decreasing the potential possibility to attract a job-seeker and receive positive feedback. Information interaction plays a certain role in job seeker's attitude and job acceptance decisions, but the motivation-enhancing possibilities are likely to be less effective than traditional ones

**Novelty** – The proposed model of study will provide a practical framework for business users.

**Type of Paper:** Review

**Keywords:** E-Recruitment; Internet of Things; E-Business; Business Model Ontology; Value Creation; Information and Communication Technology.

**JEL Classification:** M15, M51, D83.

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### 1. Introduction

Under conditions of globalization, the boundaries of labor market continue to expand generating new opportunities and challenges. Workforce became more geographically mobile searching for well-paid job and better life circumstances. The increasing migration of workforce creates a surplus of available labor in developed countries and the shortages of labor in less prosperous countries. In addition, organisations look for developmental possibilities expanding their market. Activities of these organizations include the expansion or relocation of business abroad, the utilization of cost-efficient forms of labor (e.g. flexible types of employment) etc. All of the above is supported by scientists and worldwide organisations. In majority of cases, organizations encounter the matter of personnel recruitment. As Deloitte's survey "Global Human Capital Trends 2015" demonstrates, the organizations' need for talent and contingent workers will continue

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to grow (Delotte, 2015), thereby recruitment process must be extensive and high calibrated simultaneously. The Boston Consulting Group's survey "Creating people advantage 2014-2015" reveals that the future importance, urgency and invested effort of recruiting processes and strategy are higher in high-performance organisations than in low-performance organisations (The Boston Consulting Group, 2014).

The rapid development of electronic environment over the last decade has fostered the growth of e-recruitment and has provided companies with opportunities that they previously did not have. By employing advantages of e-recruitment, entrepreneurs can ensure expedient and effective communication with the target audience, by promoting their services on the global market. The performed scientific studies show that proper and skillful use of modern technologies can contribute to the significant development of companies. Up to now, no unequivocal studies have been performed with the use of the electronic environment in ensuring development of micro, small, and medium enterprises. Ph. Kotler, D. Tapscott, P. Drucker, and J. A. Pearce (Sceulovs, 2013) maintain that two parallel markets exist and are developing – the traditional and the electronic environment. The electronic environment is used for various needs – for trade, marketing, advertisement, studies, communication, training, etc. Simultaneously, there is an opinion claiming that in future, the majority of businesses will be performed on the electronic market, hence advancing the dominant position of the e-environment in achieving entrepreneurship competitiveness (Nistor, C., Nistor, R., & Muntean, 2010). In recent years, corporate intellectual capital (IC) has gained increased attention due to globalization and integration of capital markets, greater mobility of monetary and actual goods, tougher competition, new dominating industries, and developments in information and communication technology (ICT).

Scientists (Carter, 1971; Eustace, 2001; Upton, 2001; Xiao, 2002) have argued that demand for information (external communication) on knowledge-based resources is growing as companies increasingly base their competitive strength in the value of know-how, patents, skilled employees and other intangibles. The electronic environment already offers companies practically all necessary marketing and communication tools for development by creating competitive advantages, nevertheless, not all companies can employ the opportunities rendered by e-environment in order to increase their competitiveness and productivity. These trends promote e-recruitment as a new form of business that has changed conventional recruiting to a more efficient "continuous mode" (Lee, 2005) and has reduced hiring costs compared to traditional recruiting through newspapers and magazines (Gill, 2001). Competitive advantages provided by e-recruitment methods and value creation process principles should be better explained in order to create effective business model. Recent findings stated that more than 20% of job seekers have rejected job opportunities simply based on poorly designed websites (Pastore, 2000) and that company-designed websites are so complicated that about three-quarters of all job seekers are unable to use them successfully (Brown, 2004). Conventional management studies of employee e-recruitment methods have failed to provide managers with a theory-based understanding of how e-recruitment contribute to recruiting success (Allen, Van Scotter, & Otondo, 2004; Breaugh & Starke, 2000) or explain "not only what happens, but why it happens" (Barber, 2006).

Considering challenges coming from using e-recruitment methods, this article develops an e-recruitment evaluation system framework based on Business Model Ontology (BMO). The new model is created to identify crucial e-recruitment factors. This model has based on the statement that conventional evaluation system is not suitable for the recruiting process and a new one should be developed. From this perspective, the model presents e-recruitment as an e-business and evaluates in BMO context. The model is aimed to create sustainable e-business by identifying value creation process and significant factors.

## **2. E-recruitment business requirements**

In general, e-recruitment (or online recruitment, internet recruitment, web-based recruitment) is the process of human resource (HR) recruitment exploiting electronic resources. The majority of definitions of e-recruitment are derived from the view of human resource management theory and practice, so the focus is

one-recruitment as an instrument or a process which ensure organisation's needs for workforce. For example, Armstrong defines e-recruitment as the use of the internet to advertise or 'post' vacancies, provide information about jobs and the organization and enable e-mail communication to take place between employers and candidates; the latter can apply for jobs online and can e-mail application forms and their CVs to employers or agencies (Armstrong & Taylor, 2014). Some HR specialists interpret e-recruitment not only as the using internet for hiring, but also emphasize the application of HR software (HRZone, 2015). The academic works examining e-recruitment are increasing, but many studies analyse this subject from human resource management, psychological or information and communication technology perspectives. Searching relevant articles in database Scopus, applying keywords "e-recruitment", or "e-recruiting", "online recruitment", "internet recruitment", and "business" and "model" for document's title, abstract or keywords, only fifteen results were obtained. Approximately half of search results could be referred to the topic of e-business.

The typical forms of e-recruitment are corporate websites, commercial job boards and recruitment agencies' sites (Armstrong & Taylor, 2014). The last two represent e-business. According to usual sequences of staffing process, commercial job board is relatively narrow form of e-business, where main source of revenue is advertisement of vacancies. In contrast, recruitment agencies offer much more services and its completions – from investigation of pool of potential candidates to support for hired employee. The vacancies market handled by job boards and recruitment agencies is divided by location, economy sector, job types and level (Barber, 2006). There are different types of recruitment agencies that provide external recruiting services for organisations including retained search, contingency search, full-scale recruitment process outsourcing (RPO), on-demand RPO, and staff augmentation/placing consultants (Greenberg, 2013). Retained search agencies, or executive search firms, provide search services for senior, executive, or other highly compensated positions. Retained search agencies work exclusively with clients, require an upfront retainer, and typically charge 30 to 35 percent of the salary of the position. Payments are made according to milestones in the recruitment process, so at least some fees will be paid regardless of whether a hire is actually made. Contingency search agencies search for candidates for their clients and are paid when a candidate they present is hired. Their search fees are typically 20 percent of the candidate salary when hired. Full-scale RPO agencies act as a company's internal recruitment function for a portion or all of its jobs. RPO is utilized when a company experiences high volume staffing needs that internal HR cannot cost-effectively handle along with their core responsibilities, or when there is no HR function in the company. On-demand RPO agencies provide recruiting, sourcing, and coordination on an as requested basis rather than with long-term contracts. The agencies can also provide companies with their own consultants for project or high-demand business objective. To provide effective and efficient services, all types of recruitment agencies have to use e-recruitment advantages, which are associated with wider access, faster processes, reduced costs, corporate image promotion and reinforcement (Barber, 2006; Beatrice, S., Firoiu, D., Maria, C., Mihalcescu, 2009). As Kelly Outsourcing and Consulting Group's survey "Global Trends in RPO and Talent Recruitment 2014" demonstrates, organisations are very interested in recruitment service outsourcing (Berklich, 2014), so there are favourable conditions to develop commercial side of e-recruitment.

### **3. E-Value creation process in a business**

The most important aspect of value creation process is e-recruitment revenue streams that the source for a business model. (e.g., advantages over other products, website design, attitude-relevant information, user-friendly interface and etc.). In practice, these main advantages in e-recruitment environment are promoting intensive knowledge (information) interactions between employers and applicants (i.e., its interactive characteristics), and the degree to which it provides necessary information. The goal of e-recruitment business is to influence job seeker attitudes toward job application and that the ability to accomplish this goal

is affected by the ability to manage key indicators. Management decisions should promote these key indicators that affecting job seeker decisions (Stefan, Duica, Coman, & Radu, 2010).

Various theories were developed many years ago, when the electronic market was not yet developed, and hence are suitable for the conventional market. Due to this reason, the authors of the article suggest that companies use the Alexander Osterwalder’s value proposition concept (Osterwalder, 2004) or the approach that is a constituent element of the author’s developed business model canvas. (see Figure 2). The Osterwalder’s business model was formed based on Freeman’s stakeholder theory (Freeman, 1984). The model is adapted to today’s market needs and conditions, and the importance of the electronic environment, i.e. of the electronic market, in entrepreneurship is taken into account. Osterwalder distinguishes between “value proposition” and “elementary value proposition”, which is an element of the value proposition. The authors wish to draw attention to Osterwalder’s “value life cycle” consisting of five stages: value creation, appropriation, consumption, renewal, and transfer (Osterwalder, 2004). All life cycle stages are linked to value consumption, using the electronic environment: value creation process (based on ICT) – adaptation of various products for the needs of an individual consumer. Value appropriation – “a one click purchase” at an internet shop. Value consumption – listening to music, watching a movie and etc. Value renewal – various software updates, value transfer – disposal of old computers and other machinery, giving away unnecessary books and equipment for further use, etc. Upon combining analyzed models, it can be seen that the information and communication technologies (in the Osterwalder’s model) or the information communication technology bear great importance in creating value for consumers and that they undoubtedly affect the company’s image. The value concept is broadly used in various business models, including e-business models. The value forms the basis of several business models. The e-business model is based on the mutual integration of key flows and values and implementation thereof between e-market participants, through the use of the e-environment. Three main e-business model elements can be distinguished: flows, participants, value. The term e-business model describes a broad spectrum of informal and formal models, which may be used in companies to depict various business aspects, such as operational processes, organizational structures, and financial forecasts (Laudon, K., Traver, 2010). The conceptual business models enable companies to analyze the current condition more broadly and to evaluate the already existing business. By employing this analysis, companies can develop new business development directions or improve the existing ones, because a modern market demands that companies change and are aware of their global condition. Entering the global market allows companies to reduce their dependency on local market fluctuations. The use of ICT promotes communication (Figure 1); moreover, ICT is at the basis of the first stage “value creation” of the value life cycle.

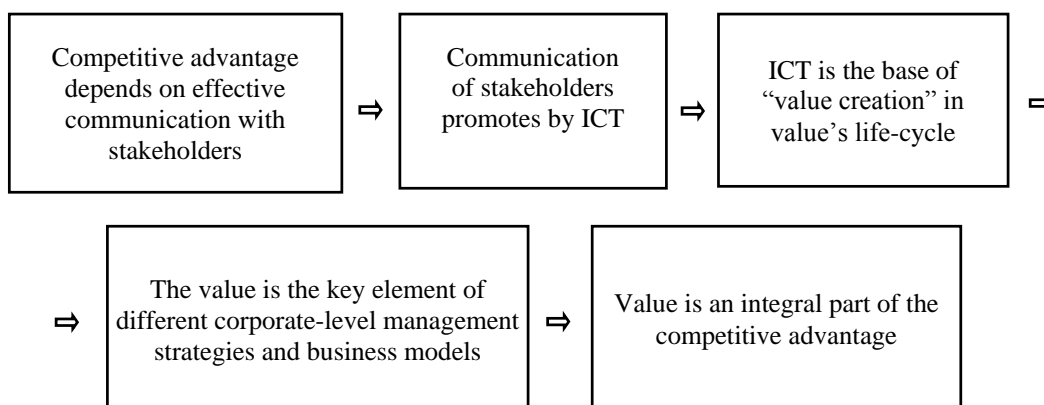


Figure 1. Competitive advantage, ICT and value intermediation (Shatreovich & Šceulovs, 2014)

Based on the authors’ performed study about the use of e-environment in e-business companies(Šceulovs & Gaile-Sarkane, 2010), having studied value formation theories, having analysed the types and theories of

business models, the authors have drawn a conclusion that the most suitable course of action would be to base further development on the Osterwalder's Business Model Canvas (Osterwalder, 2004). Forbes has referred to this business model canvas as a simple instrument for creating innovative business models (Sceulovs, 2013). The model is based on the active use of the e-environment in entrepreneurship. There are nine stakeholder groups on the basis of the model. Meanwhile, reciprocal and effective interaction and communication between the stakeholders promotes a company's competitiveness (Osterwalder, Pigneur, & Smith, 2009).

At the same time, the value is an intrinsic part of a competitive advantage. It can be concluded that a competitive advantage depends on effective communication with stakeholders and customers. The previous study done by the authors about the competitiveness of companies shows that it is the use of communications networks, being a constituent element of competitiveness of companies, that the companies are using the least (Sceulovs, 2013). Thus, the authors of the paper assume that by increasing e-environment element as part of IC system, the competitiveness of companies will also increase.

For the practical use of the quantitative evaluation model in e-business authors of the paper develop BMO (Osterwalder, 2004). The BMO's roots are found in management science and information systems research. Its four basic areas of the preoccupation of a business model, the value proposition, the customer interface, the infrastructure management and the financial aspects stem from management literature (Iii & Singer, 1999; Kaplan & Norton, 2010; Markides, 1999). The proposed business model elements providing a practical contribution for business users. Its scientific roots originate in so-called design science (C. Owen, 1997) and its recent upsurge in Information Systems research (Au, 2001; Ball, 2001; Hevner, March, Park, & Ram, 2004; March & Smith, 1995).

#### **4. Information communication technologies, e-recruitment and value creation intermediation**

The identification of value-drivers elements in e-business and their subsequent management is seen as the key to value added. Since the relationship between value elements and VA are complicated (e.g. IC elements), this paper is aimed to create a model for building company's added value through intellectual capital. In the context of knowledge, because knowledge itself is invisible, its creation and use are hardly measurable. Investing in Information Communication Technologies (ICT) many valuable outputs are generated (brand, know-how, patents etc.). The value generated by the knowledge will probably have time lag (long-term) and not always have an instant impact on profit (short-term). Using this model can describe the methodology of our evaluation model. Promoting investments to ICT and specifically to e-business, it is possible to evaluate company value. The authors present the model of IC system which portrays how IC resources are used to increase value added in e-business. The IC model designed by the authors is composed of mainly three components: human capital, structural capital (organizational capital) and relational capital (social capital).

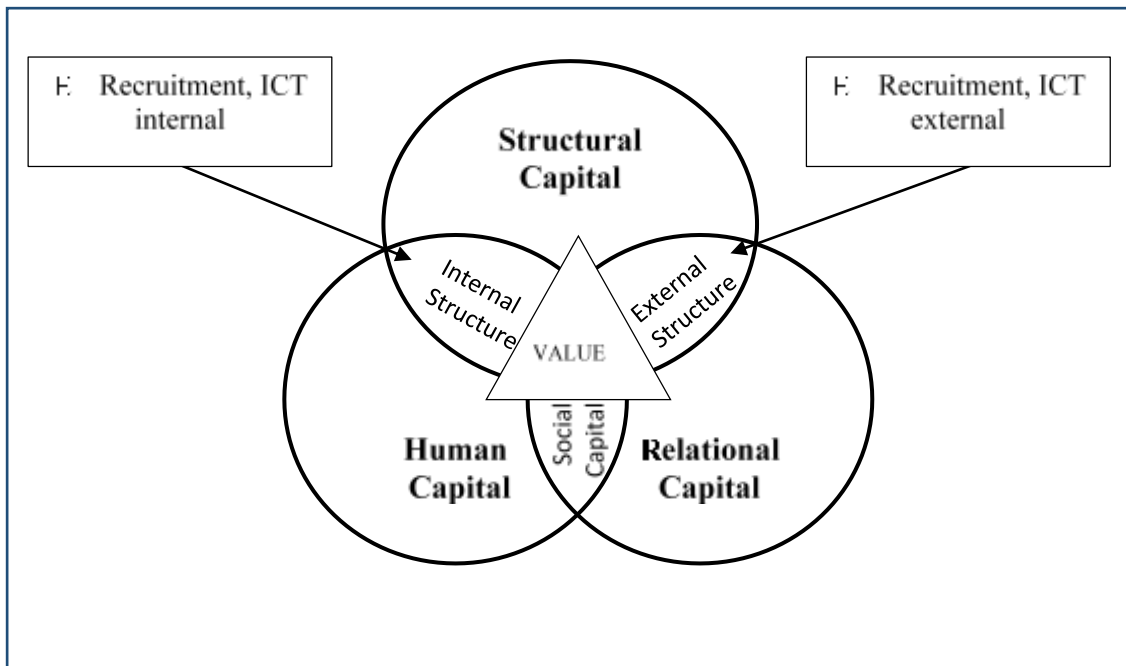


Figure 2. ICT, E-Recruitment and value creation intermediation (Hermans & Kauranen, 2005)

This model (Figure 2) presents three main elements of VA creation. Human Capital is defined as the combined knowledge, skill, innovativeness, and ability of the company’s individual employees to meet the task at hand. It also includes the company’s values, culture and philosophy. Structural Capital is the hardware, software, databases, organizational structure, patents, trademarks, and everything else of organizational capability that supports the productivity of employees – in other words, everything that gets left behind at the office when the staff goes home. Customer capital (Relational Capital) – is provided by structural capital, the relationships developed with key customers.

### 5. Measurement of intellectual capital and information communication technologies

At first, a company should calculate the investment it has made into ICT, comparing it to abnormal revenue flow generated by ICT and intangible value created.

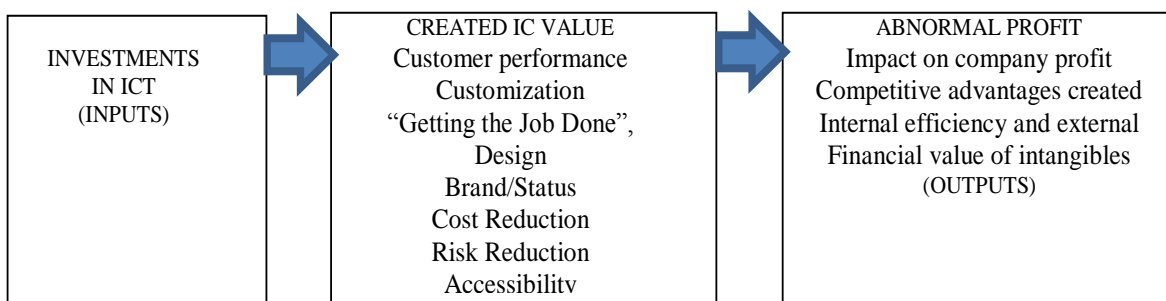


Figure 3. Evaluation of ICT, E-Recruitment and value creation intermediation (Pulic, 2000)

This model helps to describe the methodology of authors of the paper in quantitative evaluation model. Based on the model (Figure3), it puts an emphasis on external efficiency. Current quantitative model concentrates on external reporting, including internet statistics, investment analysis and methods for reporting the nonfinancial value of intangibles. So quantitative model is based mostly on VAIC (Value-Added Intellectual Coefficient) approach.

$$TR_t + IC_t = HR_t + SC_t + RC_t \quad (1)$$

where:

$TR_t + IC_t$  - capital (physical and financial) invested by company to specific IC and TR project or competitive advantage at time t;

$HR_t$  - Human Resources dedicated to investments (inputs) made in specific IC or TR project (According to Pulic's concept for IC, mainly labor costs) at time t.

$SC_t$  - investments (inputs) made to structural capital at time t,

$RC_t$  - the relational capital investments (inputs such as advertising costs – e.g. Google index for IC and etc.) at time t.

Therefore, the authors present formula based on the Sveiby (Sveiby, 1997) VA creation model, and the based on the Pulic:

$$VA_t = (\alpha'_t TR_t + \alpha''_t IC_t + \beta_t AP_t) * \delta_t IV_t, \quad (2)$$

where:

t - time when certain value added are created from competitive advantage or project;

$\beta_t$  - is coefficient, representing significance for strategy of specific investment (function of time-series properties);

$\alpha_t$  - is coefficient, representing significance of received profit for the specific project or competitive advantage (function of time-series properties and is corresponding to company strategy);

$\delta_t$  - an abnormal profit generated by company through IC and TR project or competitive advantages per t period or reported abnormal profit;

$AP_t$  - representing intangible value (IV) significance for strategy at time t;

$IV_t$  - intangible value generated by IC at time t; or it could be seen as:

$$VA_t = \sum_{i=1}^n ((\alpha'_{i,t} HR_{i,t} + \alpha''_{i,t} SC_{i,t} + \alpha'''_{i,t} RC_{i,t}) + \beta_{i,t} AP_{i,t}) \cdot \delta_{i,t} IV_{i,t}, \quad (3)$$

where:

n - number of investments made to specific IC or TR project or competitive advantages.

$\alpha_{i,t}$  – is coefficient representing significance for strategy of specific investment (function of time-series properties);

$HR_{i,t} + SC_{i,t} + RC_{i,t}$  – investments made by company to specific main component of IC and TR project or competitive advantage at time t;

$\beta_{i,t}$  – is coefficient representing significance of received profit for the specific project or competitive advantage (function of time-series properties);

$AP_{i,t}$  – an abnormal profit generated by company through IC and TR project or competitive advantages per t period;

$\delta_{i,t}$  – representing intangible value (IV) significance for strategy at time t;

$IV_{i,t}$  – intangible value generated by IC at time t.

Intangible value ( $IV_t$ ) generated by IC at time t could be calculated using specific factors presented in Table 1. In common cases  $IV_t$  can be written as function of factors R:

$$IV_t = \Phi (R_1^{(t)}, R_2^{(t)} \dots R_m^{(t)}), \quad (4)$$

and consequently,  $\Phi$  :

$$\Phi_i (R_1^{(t)}, R_2^{(t)} \dots R_m^{(t)}) = \sum_{j=1}^m \mu_{i,j} R_j^{(t)} + \mu_{i,0}, \quad (5)$$

where

$m$  – number of IC factors used by company' strategy for VA assessment;

$R_j^{(t)}$  – factors presented in Table 1 at time  $t$ ;

$\mu_{i,j}$  – significance coefficient for specific factor;

$i = 1, 2, 3, \dots$  – corresponding  $IV_t$  value index for specific project;

$j = 1, 2, 3, \dots$  – corresponding  $R_j^{(t)}$  factor.

The authors recommend using indicators presented in Table 1, Table 2 or developed in previous intellectual capital studies (Buse, L., Ganea, 2011; Uppal, S. R., Gulliver, 2015). Regarding the financial part of VA creation model (formula2),  $\alpha$ ,  $\beta$  and  $\delta$  are specific significance coefficients for projects. The authors also conclude that coefficient values are highly related to the company's strategy. After analyzing the financial figures (expenses and profits), the authors suggest (for more information see also (Roos, 1998). that  $\alpha$ ,  $\beta$  and  $\delta$  coefficients should be based on the company's strategy. It means that, if company's strategy is sustainable development,  $\delta$  should be more sensitive, but, in the case when company's shareholders support speculative strategies  $-\alpha$ ,  $\beta$  coefficients are correspondingly more sensitive. It could be easily understood as soon as one of IC capital fundamentals is long-term value creation with investment lag. As for the non-financial part of the model, the authors find that  $\delta$  and  $\mu$  as the IV coefficient are more complicated. Due to the limitations of the study, empirical research of correlation coefficients for IC factors was not made in the present thesis and should be conducted in later research. Significance coefficients for the specific factor are obtainable through Analytic Hierarchy Process (AHP) (Saaty, 2010; Saaty & Vargas, 2012). For the practical use of the formula, the authors adopt the Business Model Ontology (BMO).

The proposed model elements are a synthesis of the authors' formula (3), providing a practical contribution for business users. Its scientific roots originate in the so-called design science (C. L. Owen, 1998) and its recent upsurge in Information Systems research (Ball, 2001; Hevner et al., 2004; March & Smith, 1995).

In HR management sources, many indicators for recruitment evaluation can be found allowing to measure some quantitative and qualitative aspects of this process (Table 1).

Table 1. Examples of traditional indicators for recruitment (based on Hall et al., 2003)

Quantitative indicators	Qualitative indicators
Number of applicants attracted per method	Ratio of qualified to unqualified applicants
Number of candidates interviewed	Job performance of employee attracted by method
Costs per applicant attracted	Tenure of employee attracted by method
Total recruiting cost per employee hired	Proportion of those interviewed who receive invitations to visit
Time from start to hiring of applicant	Organisation's or Applicants' satisfaction with recruitment process



Obviously, the traditional indicators for recruitment are not sufficient to evaluate e-recruitment as business. Using discussed above approach authors propose an additional set of indicators to evaluate e-recruitment (Table 2).

Table 2. Non-financial indicators for e-recruitment company's development determination (based on Sceulovs, 2013)

<b>Indicator name</b>	<b>Explanation</b>
Market share by purchased units	Market share by purchased units (%) = (Purchased units (%)) / (Total units of Purchased units (%))
Market share by revenue	Market share by revenue (%) = (Revenue from sales) / (Total revenue from market sales) x 100%
Relative market share	Relative market share (%) = (Brand market share) / (Biggest competitors market share) x 100%
Relative market share	Relative market share (%) = (Brand market share) / (Biggest competitors market share) x 100%
Market concentration	Shows which a relatively small number of companies account for a large market share.
Brand development index	Brand development index = ((Brand sales for a group)/(Household in a group)) / ((Total brand sales)/(Total household))
Indicator name	Explanation
Penetration share	Penetration share (%) = (Brand penetration) / (Market penetration) x 100%
Awareness	Awareness scale with point grading system.
The total number of active consumers	Percentage of consumers who at least once certain periods of time have bought a brand or product.
Desire to search	Percentage of the number of consumers who want to postpone purchase, changes stores or reduce purchases volume, focuses on other brands
Trial rate	Trial rate (%) = (Applied first time in period t) / (Total population (number of customers)) x 100%
Penetration t	Penetration = (Penetration t x Replicates rate (%)) x first purchased in period t
Sales forecast	Sales forecast = Penetration x The average purchase frequency x Average number of sold units
Repeated purchases	Number of repeated number of buyers = Trial number x Repetitions rate (%)
Sales forecast	Sales forecast = Penetration x The average purchase frequency x Average number of sold units
Repeated purchases	Number of repeated number of buyers = Trial number x Repetitions rate (%)
Trial volume	Trial volume = Trial number x Number of appliances
Repeated purchases volume	Repeated appliances volume = Repeated buyers number x Number of appliances made by one customer x Repeat times
Numerical distribution	Numerical distribution (%) = (Number of brand banners) / (Total number of banners) x 100%
All products distribution	All products distribution (%) = (Total sales volume of all brand's sales places) / (Total sales volume of sales places (banners)) x 100%
Distribution of particular type of product (PTP)	Distribution of PTP (%) = (Total PTP brand's sales places sales volume) / (Total sales volume of sales places (banners)) x 100%
Premium price	Premium price (%) = (Revenue market share) / (Product market share) x 100%
Impressions, Opportunities-to-See, Exposures	Impressions = Network Reach x Frequency Network Reach – the percentage of reach of the certain audience through the media; Frequency – certain ad or others activity views number, which done by one user.
Clickthrough Rate	Clickthrough rate = Clicks / Effect
Penetration (market or brand)	Market penetration (%) = (Customers who bought product) / (Total population) x 100%
Website traffic statistics dynamics	How many internet users visited a given site during a given period.

Web site visit duration	Average time which users spent on the site.
Visits indicators	Visits, Sessions –a particular company's website first-time attendance of users. Visitors, Unique Visitors – the number of users who visit a particular website of the company for a given period. Clickstream – the way, how user find website. Abandonment Rate – the percentage of abandoned number of websites. Cookie – the small visitor's file, which recorded by website and helps identify user next on visiting time.
Site visitors characterization	Behaviour: new and repeated visitors, frequency etc. Demographic data: language, location, gender, etc.
Technologies	Technologies used in site attendance: device, from which the attendance made; browser and operating system, with which help made attendance; provider used for site visiting; visitors flow (what content were visited on the site); in what way was visited site - directly or via link and/or divert from other sites.

Business Model focuses on the design of a company's value creation model, visualization of value creation in BMO is highly relevant, and such visualisations are used to explain a model to stakeholders. Additionally, it proposes specific diagrams, for instance for distribution channel strategies or activity configurations.

### 5. The concept of e-recruitment as a business model

Authors see e-recruitment business model advantages in e-recruitment methods, transferring knowledge to job seeker through automated processes creating the ability to accomplish these processes in a shorter time. These advantages are the main technical feature of the e-recruitment business. Particularly, it is an interaction with a job seeker in e-environment, thus reducing costs associated with the first phase (Socialisation, Figure 4). The impact of information was noted long ago (Behling, O., Labovitz, G., Gainer, 1968), who observed that job choice decisions are based on a thoughtful assessment of key information concerning objectively measurable job attributes such as pay and working conditions. Information interaction is suggested by authors to be the central point as soon as job seeker's interaction process is very important. The importance of knowledge is found in information processing studies, which have demonstrated that prior knowledge of product characteristics greatly affects the way in which consumers investigate, process, and organize product related information (Alba & Hutchinson, 1987). This phase (Externalisation, Figure 5) is analyzed in management studies showing interaction experience create substantially different variations in the ways that job seekers gather and use labor market information (Rynes, Orliizky, & Bretz, 1997). Experienced customers are better able to extract and analyze important central information (Meglino, B.M., Denisi, A.S., Ravlin, 1993). The implication of these findings for e-recruitment is that e-recruitment business model potentially could neglect these shortcomings by using only last two phases (Combination and Internalisation). The advance of modern ICT has launched the Industry 4.0, to take up a leader role in industrial IT which is currently revolutionizing the manufacturing engineering sector (Germany Trade and Invest, 2014).

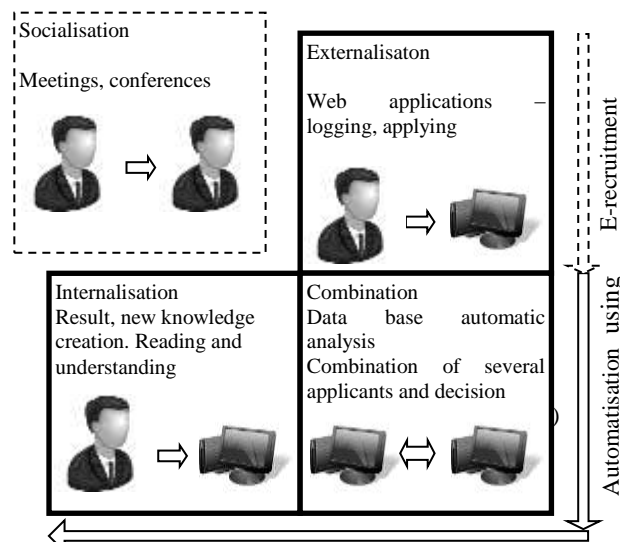


Figure 4. E-recruitment as a business model (framework) (based on Nonaka, 1995)

Technology breakthrough is allowing to increase the level of automation for interaction with job-seekers and labor cost decreased (Gombak, 2015). These trends will be more focused on intangible assets (associated with IC) managing company data flow, plant specific software and the “hardware” of manufacturing technology. Since ICT is only one part of the Industry 4.0, the other is its use in the industrial sector and the utilization of the benefits that it brings to the value chain (Figure 6).

“Industry 4.0” (sometimes referred as a Smart industry) advantages are coming from the technological evolution from embedded systems to cyber-physical systems. Industry 4.0 connects embedded system production technologies and smart production processes associated with the new technological age advantages (Figure 5). Decentralized intelligence helps create intelligent object networking and independent process management, with the interaction of the real and virtual worlds representing a significant new aspect of the manufacturing and production process. Industry 4.0 creates the vision (Figure 4) of an entirely networked production, in which orders managed automatically throughout entire value chains, order processing machines and material and organize their delivery to the customer (Berger, 2014). Using these data efficiently provides a considerable competitive advantage (reducing downtimes, accurate planning, reducing unit costs and etc.).New Industrial revolution (Industry 4.0) is also called Internet of Things, Data, and Services (Figure 6).

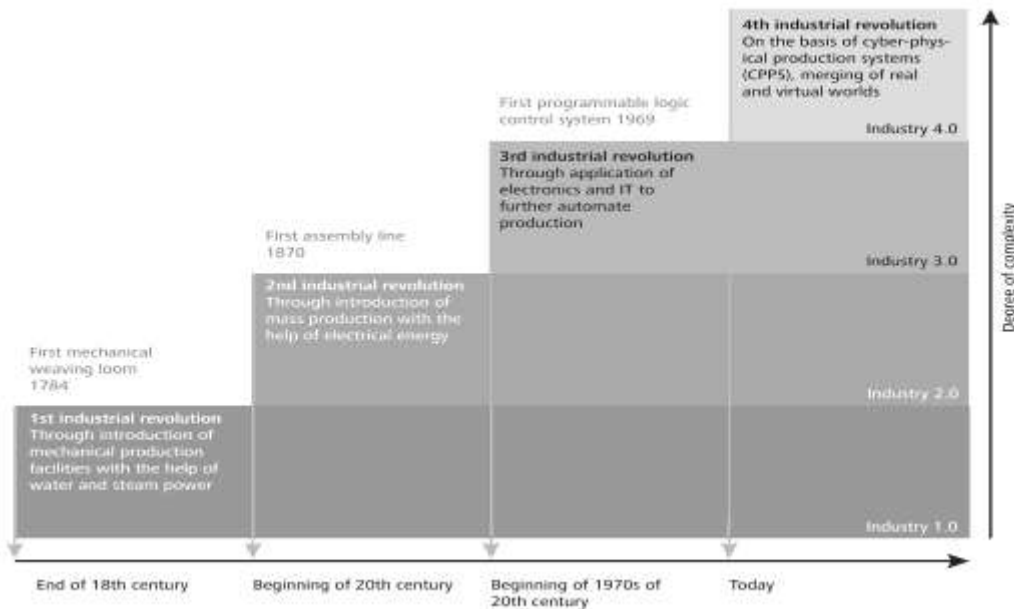


Figure 5. The evolution of embedded systems into the internet of things, data and services (Schlick, Stephan, & Zühlke, 2013)

Cyber-physical systems provide the basis for the creation of an Internet of Things, which combines with the Internet of Services to make Industry 4.0 possible. The widespread adoption by e-recruitment automatic operations of ICT is increasingly blurring the boundaries between the real world and the virtual world in what are known as cyber-physical production systems (CPPSs) (Kagermann, Wolfgang, & Helbig, 2013). In

contrary to e-recruitment, studies of interviewers as recruiting sources have found that such factors as interviewer personableness, competence, empathy, interest in the applicant, communication skills, and enthusiasm often play significant roles in applicant interest in a job and intention to accept a job offer (Harris & Fink, 1987; Maurer & Howe, 1995; Powell, 1991). E-recruitment lacks these advantages and these findings show that motivation of job seeker will be affected (Petty, Cacioppo, & Schumann, 1983) and decreasing their motivation (Mackenzie & Spreng, 1992). These findings emphasize that search motivation is a key element of a job-seeker, and that e-recruitment must carefully consider negative effects. Nonetheless, the authors see E-recruitment as a business model is concentrated in “Combination” phase efficiency due to business requirements and new trends (Figure 6).

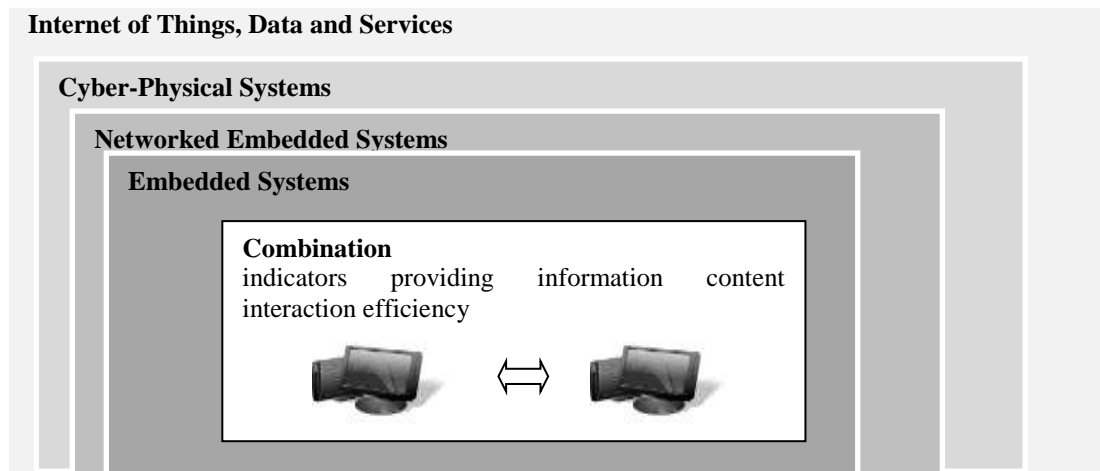


Figure 6. E-recruitment as a business model (framework) (created by the authors based on Acatech, 2011)

## 6. Discussion and Conclusion

The modern labor market goes through dramatic changes which raise numerous discussions among scientists and organizations. The contemporary cornerstone advantage of e-recruitment methods lies in labor cost. E-recruitment methods represent a growing and high potential opportunity for business to reduce recruiting costs (Cappelli, 1992). Hence the goal of e-recruitment is to satisfy needs of job-seekers by providing a competitive virtual environment to a traditional one. The ability to manage value creation process as interaction effect's efficiency is one of the main goals, meeting job-seeker needs and web applications capabilities. Controversially, the problems discussed here socialisation affect toward motivation and the effort needed to attract a job offer should be taken into consideration. The focus of e-recruitment only on outcomes such as job acceptance decisions or application attractiveness should be carefully evaluated. Thus e-recruitment's effect on initial job-seeker interest is limited, decreasing the potential possibility to attract a job-seeker and receive positive feedback. Information interaction plays a certain role in job seeker's attitude and job acceptance decisions, but the motivation-enhancing possibilities are likely to be less effective than traditional ones. Such our findings provide e-recruitment with a contemporary approach to value creation. Based on business model approach by the authors of the paper, e-recruitment should create a virtual recruiting environment that effectively interacts with job-seeker partially motivating his decision process. E-recruitment as a business model should be based on indicators providing effective (user-friendly) information content required to affect job seekers' positive decision, besides labor cost efficiency advantages. Offering modern “Internet of Things” concept to e-recruitment provides new business models with an efficient framework for identification of indicators. To contribute to this process, the authors present their indicators to evaluate important issues associated with information interaction in order to develop effective e-recruitment business model. Our findings indicated that the relations between IC

elements and VA are complicated; outputs from IC elements are not homogeneously received. This relationship has different inputs with different evaluating methods and specific impact on VA. Therefore, this paper was aimed to create a usable model for building company's value added through e-business, helping companies to evaluate the contribution of each element added to the model. Firstly, we created the concept model of ICT, E-recruitment and Value creation intermediation to discover the relation between company's value added and intellectual capital - the main theoretical and practical aspects of the relations between company's value added (VA) and intangible assets. Secondly, in order to evaluate the relation between company's value added and intellectual capital, our mathematical model is created to explain the causal relation among these three types of capital in IC model and value added. Authors added the indicators that will help companies to evaluate the contribution of each element of IC. The authors declare that Intellectual capital is one of the most relevant intangibles for e-recruitment, and the practical concept of measurement and the relation with value creation is necessary for modern markets. Finally, authors of the paper presented an e-recruitment model. Our practical model is making a contribution, both from a financial perspective and easy business logic conceptualization to the research of IC dynamic nature and its relation to VA. The proposed model was created to provide a practical framework for business users, the authors were focused on representing intermediation of IC and value creation of the company, in order to conceptually visualize the way a specific company does business and its logic in earning revenues.

## References

- Acatech. (2011). *Cyber-Physical Systems - Driving force for innovation in mobility, health, energy and production* ("Industry 4.0" Working Group report). *acatech Position Paper*. <https://doi.org/10.1007/978-3-642-27567-8>
- Alba, J. W., & Hutchinson, J. W. (1987). Dimensions of Consumer Expertise. *Journal of Consumer Research*, 13(March), 411. <https://doi.org/10.1086/209080>
- Allen, D. G., Van Scotter, J. R., & Otondo, R. (2004). Recruitment communication media features: Impact on prehire outcomes. *Personnel Psychology*, 57(1), 143–171. <https://doi.org/10.1111/j.1744-6570.2004.tb02487.x>
- Armstrong, M., & Taylor, S. (2014). *Handbook of human resource management*. <https://doi.org/10.1007/s10551-011-1141-1>
- Au, a Y. (2001). Design Science I: The Role of Design Science in Electronic Commerce Research. *Cais*, 7, 1–18.
- Ball, N. L. (2001). Design Science II: The impact of design science on e-commerce research and practice. *Communications of the Association for Information Systems*, 7, 1–19.
- Barber, L. (2006). E-recruitment developments. Retrieved from <http://www.employment-studies.co.uk/resource/erecruitment-developments>
- Beatrice, S., Firoiu, D., Maria, C., Mihalcescu, C. (2009). Internet and eBusiness. *Proceedings of the WSEAS*, 10, 179.
- Behling, O., Labovitz, G., Gainer, M. (1968). College recruiting: A theoretical basis. *Personnel Journal*, 47, 13–19.
- Berger, R. (2014). Industry 4.0: A driver of innovation for Europe. Retrieved September 17, 2017, from <http://www.think-act.com/blog/2014/industry-4-0-a-driver-of-innovation-for-europe/>
- Berklich, P. (2014). Global Trends in RPO & Talent Recruitment 2014. Retrieved from [http://www.kellyocg.com/uploadedFiles/7-KellyOCG/2-Knowledge/Workforce\\_Trends/2013\\_Global\\_RPO\\_Report.pdf](http://www.kellyocg.com/uploadedFiles/7-KellyOCG/2-Knowledge/Workforce_Trends/2013_Global_RPO_Report.pdf)
- Breaugh, J. A., & Starke, M. (2000). Research on employee recruitment: so many studies, so many remaining questions. *Journal of Management*, 26(3), 405–434. [https://doi.org/http://dx.doi.org/10.1016/S0149-2063\(00\)00045-3](https://doi.org/http://dx.doi.org/10.1016/S0149-2063(00)00045-3)
- Brown, D. (2004). Unwanted online job seekers swamp HR staff. *Canadian HR Reporter*, 17(7), 1–2.
- Buse, L., Ganea, M. (2011). Considerations on the Use of Non-Financial Indicators in Assessing the Performance of Daily Businesses. *Recent Researches in Tourism and Economic Development*, 359–361.
- Carter, E. E. (1971). The Behavioral Theory of the Firm and Top-Level Corporate Decisions. *Administrative Science Quarterly*, 16(4), 413. <https://doi.org/10.2307/2391762>
- Eustace, C. (2001). The intangible economy impact and policy issues, (Bruselas, Comisión Europea.), 68.
- Freeman, R. (1984). Strategic Management: a Stakeholder Approach.
- Germany Trade and Invest. (2014). Industrie 4.0. Smart manufacturing for future. Future Markets. Retrieved from [http://www.gtai.de/GTAI/Content/EN/Invest/\\_SharedDocs/Downloads/GTAI/Brochures/Industries/industrie4.0-smart-manufacturing-for-the-future-en.pdf](http://www.gtai.de/GTAI/Content/EN/Invest/_SharedDocs/Downloads/GTAI/Brochures/Industries/industrie4.0-smart-manufacturing-for-the-future-en.pdf)

- Gill, J. (2001). Now hiring. Apply on-line. Retrieved from [http://www.businessweek.com/careers/content/jul2001/ca20010718\\_003.htm](http://www.businessweek.com/careers/content/jul2001/ca20010718_003.htm)
- Gombak, J. (2015). Introducing Autonomy in Internet of Things, 215–221.
- Greenberg, A. (2013). 5 types of recruiting companies. Retrieved from <http://www.recruitingdivision.com/5-types-of-recruiting-companies/>
- Hall, A. T., Frink, D. D., Ferris, G. R., Hochwarter, W. A., Kacmar, C. J., & Bowen, M. G. (2003). Accountability in human resource management. *New Directions in Human Resource Management*, 29–63.
- Harris, M. M., & Fink, L. S. (1987). A Field Study of Applicant Reactions to Employment Opportunities: does the Recruiter make a Difference? *Personnel Psychology*, 40(4), 765–784. <https://doi.org/10.1111/j.1744-6570.1987.tb00623.x>
- Hermans, R., & Kauranen, I. (2005). Value creation potential of intellectual capital in biotechnology empirical evidence from Finland. *R & D Management*, 35(2), 171–185. <https://doi.org/10.1111/j.1467-9310.2005.00381.x>
- Hevner, V. A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems. *Harvard Business Review*, 32(4), 1–7.
- HRZone. (2015). What is E-Recruitment? Retrieved March 16, 1BC, from <http://www.hrzone.com/hr-glossary/what-is-e-recruitment>
- Iii, J. H., & Singer, M. (1999). Unbundling the cororation. *Harvard Business Review*, 77(April), 133–41, 188. <https://doi.org/10387769>
- Kagermann, H., Wolfgang, W., & Helbig, J. (2013). *Securing the future of German manufacturing industry. Recommendations for implementing the strategic initiative INDUSTRIE 4.0. Final report of the Industrie 4.0 Working Group* (Final report of the “Industrie 4.0” Working Group). *Plattform INDUSTRIE 4.0*. Retrieved from <http://www.plattform-i40.de/finalreport2013>
- Kaplan, R. S., & Norton, D. P. (2010). *The balanced scorecard: Measures that drive performance*. Boston, Mass.: Harvard Business Review Press.
- Laudon, K., Traver, C. (2010). *E-commerce* (6th ed.). Upper Saddle River, NJ: Prentice Hall.
- Lee, I. (2005). The evolution of e-recruiting: a content analysis of Fortune 100 career web sites. *Journal of Electronic Commerce in Organizations*, 3(3), 57–59. <https://doi.org/10.4018/jeco.2005070104>
- Mackenzie, S. B., & Spreng, R. A. (1992). How Does Motivation Moderate the Impact of Central and Peripheral Processing on Brand Attitudes and Intentions? *Journal of Consumer Research*, 18(4), 519–529. <https://doi.org/10.2307/2489263>
- March, S. T., & Smith, G. (1995). Design and Natural Science Research on Information Technology”, *Decision Support Systems*, 15(1995), 251–266.
- Markides, C. (1999). *All the Right Moves*. Boston, MA: Harvard Business School Press.
- Maurer, S. D., & Howe, V. (1995). Comparing personnel representatives and line managers/engineers as engineering recruiters: An application of the elaboration likelihood model of persuasive communication. *Journal of High Technology Management Research*, 6(2), 243–259. [https://doi.org/10.1016/1047-8310\(95\)90017-9](https://doi.org/10.1016/1047-8310(95)90017-9)
- Meglino, B.M., Denisi, A.S., Ravlin, E. C. (1993). Effects of Previous Job Exposure and Subsequent Job Status on the Functioning of a Realistic Job Preview. *Personnel Psychology*, 46, 803–822. <https://doi.org/10.1111/j.1744-6570.1993.tb01570.x>
- Nistor, C. , Nistor, R. , Muntean, M. (2010). E-commerce - winners’ choice. *Proceedings of the WSEAS*, 10, 298–303.
- Nonaka, I. (1995). Managing Innovation as an Organizational Knowledge Creation Process. *Elsevier*, Pp. 73–109.
- Osterwalder, A. (2004). *The business model ontology: A proposition in a design science approach*. PhD thesis. Lausanne: Université de Lausanne.
- Osterwalder, A., Pigneur, Y., & Smith, A. (2009). *Business Model Generation. Business Model generation*.
- Owen, C. (1997). Design research: Building the knowledge base. *Journal of the Japanese Society for the Science of Design*, 5, 36–45.
- Owen, C. L. (1998). Understanding design research: Toward an achievement of balance. *Design Studies*, 19(1), 9–20.
- Pastore, M. (2000). Web expands role in corporate recruiting. Retrieved from <http://www.clickz.com/showPage.html?page=330331>
- Petty, R. E., Cacioppo, J. T., & Schumann, D. (1983). Central and Peripheral Routes to Advertising Effectiveness: The Moderating Role of Involvement. *Journal of Consumer Research*, 10(2), 135–146. <https://doi.org/10.2307/2488919>
- Powell, G. N. (1991). Applicant Reactions To the Initial Employment Interview: Exploring Theoretical and

- Methodological Issues. *Personnel Management*, 44, 67–83. <https://doi.org/10.1111/j.1744-6570.1991.tb00691.x>
- Pulic, A. (2000). VAIC TM: an accounting tool for IC management. *International Journal of Technology Management*, 20(5,6,7,8).
- Rynes, S. L., Orliizky, M., & Bretz, R. D. (1997). Experienced Hiring Versus College Recruiting: Practices and Emerging Trends. *Personnel Psychology*, 50, 309–339. <https://doi.org/10.1111/j.1744-6570.1997.tb00910.x>
- Roos, J. (1998). *Intellectual capital: Navigating in the new business landscape*. New York: New York University Press.
- Saaty, T. L. (2010). *Principia mathematica decernendi: Mathematical principles of decision making generalization of the analytic network process to neural firing and synthesis*. Pittsburgh Pa.: RWS Publications.
- Saaty, T. L., & Vargas, L. G. (2012). *Models, Methods, Concepts and Applications of the Analytic Hierarchy Process* (Vol. 175). Boston, MA: Springer US. <https://doi.org/10.1007/978-1-4614-3597-6>
- Sceulovs, D. (2013). *Use of Electronic Environment in Entrepreneurship Development*. Riga Technical University.
- Schlick, J., Stephan, P., & Zühlke, D. (2013). Produktion 2020 - Auf dem Weg zur 4. industriellen Revolution. *Industrie 4.0 – Wie Sehen Produktionsprozesse Im Jahr 2020 Aus?*, 27, 1–76.
- Shatrevich, V., & Šceulovs, D. (2014). Using of e-environment as a tool for value creation in a company. In *WMSCI 2014 - 18th World Multi-Conference on Systemics, Cybernetics and Informatics, Proceedings* (Vol. 1, pp. 62–67). International Institute of Informatics and Systemics, IIS. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-84923122925&partnerID=tZOtx3y1>
- Stefan, V., Duica, M., Coman, M., & Radu, V. (2010). Enterprise Performance Management with Business Intelligence Solution. ... *Conference on BUSINESS ...*, 4(1), 244–250. Retrieved from <http://www.wseas.us/e-library/conferences/2010/Cambridge/ICBA/ICBA-32.pdf>
- Šceulovs, D., & Gaile-Sarkane, E. (2010). Identification of factors affecting consumer habits in the e-environment. *The 6th International Scientific Conference "Business and Management 2010". Selected Papers*, 13(15), 965–970. <https://doi.org/10.3846/bm.2010.129>
- The Boston Consulting Group. (2014). *Creating People Advantage 2014-2015*, 1–36. [https://doi.org/Acedemico/material didatico/bibliografia 2105](https://doi.org/Acedemico/material%20didatico/bibliografia%20105)
- Uppal, S. R., Gulliver, S. (2015). Factors Determining E-Learning Service Quality. *Advances in Computers and Technology for Education*, 168–169.
- Upton, W. S. (2001). *Business and financial reporting, challenges from the new economy* (Vol. no. 219-A). Norwalk Conn.: Financial Accounting Standards Board of the Financial Accounting Foundation.
- Xiao, J. Z. (2002). Business Reporting: Harnessing the Power of the Internet for Users. *British Accounting Review*, 34(3), 284–286. <https://doi.org/10.1006/bare.2002.0195>