

Internet of Things as a Framework for E-recruitment's Business Model?

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Abstract— Modern e-businesses are developing rapidly as new modern enterprises, e-business management is an important topic across contemporary management and modern information technology. This paper investigates e-recruitment based on Business Model Ontology framework, to provide useful implication of e-recruitment as a business model.

Keywords— e-recruitment, Internet of Things, e-business, Business Model Ontology, value creation, information and communication technology.

I. INTRODUCTION

Under conditions of globalisation the boundaries of labour 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 labour in developed countries, and the shortages of labour in less prosperous countries. Also, organisations look for developmental possibilities expanding their market. These organisations' activities include the expansion or relocation of business abroad, the utilisation of cost efficient forms of labour (e.g. flexible types of employment) etc. In majority of cases, organisations encounter the matter of personnel recruitment. As Deloitte's survey "Global Human Capital Trends 2015" demonstrates, the organisations' need for talent and contingent workers will continue to grow [1], 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 [2].

The rapid electronic environment development over the last decade has fostered the e-recruitment growth and has provided companies with opportunities that they previously did not have. By employing advantages offered by the 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 skilful use of modern technologies can contribute to significant development of companies. Up to now, no unequivocal studies have been performed about 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 [3] 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. In recent years, companies' intellectual capital (IC) has gained increased attention due to globalisation 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 [4; 5; 6; 7] 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 now offers companies practically all the necessary marketing and communication tools for ensuring company development by creating competitive advantages, nevertheless, not all companies can employ the opportunities rendered by the e-environment, in order to increase company competitiveness and productivity. These trends promotes e-recruitment as a new form of business that has changed conventional re-cruiting to a more efficient "continuous mode" [8] and has reduced hiring costs compared to traditional recruiting through newspapers and magazines [9]. 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 [10] and that company-designed websites are so complicated that about three-quarters of all job seekers are unable to use them successfully [11]. 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 [12, 13] or explain "not only what happens, but why it happens" [14].

Considering challenges coming from using e-recruitment methods, this article develops an e-recruitment evaluation

system framework based on Business Model Ontology (BMO). New model is created to identify crucial e-recruitment factors. This model is based on statement that conventional evaluation system is not suitable for the recruiting process and 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.

II. 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 the definitions of e-recruitment are derived from view of human resource management theory and practice, so focused to e-recruitment as instrument or process by which organisation's needs for workforce is ensured. 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 [15]. Some HR specialists interpret e-recruitment not only as the using internet for hiring, but also emphasize the application of HR software [16]. 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 this search results could be referred to the theme of e-business.

The typical forms of e-recruitment are corporate websites, commercial job boards and recruitment agencies' sites [15]. 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 [17].

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 [18]. 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 get 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 acts 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 can't cost-effectively handle along with their core responsibilities, or when there is no HR function in the company. On-demand RPO agencies provides recruiting, sourcing, and coordination on as requested basis rather than with long-term contracts. The agencies can also provide companies with 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 [17]. 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 [19], so there are favourable conditions to develop commercial side of e-recruitment.

III. VALUE CREATION PROCESS IN A BUSINESS

The most important aspect of value creation process is e-recruitment revenue streams that the source for 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 ability to manage key indicators. Management decisions should promote these key indicators that affecting job seeker decisions.

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 [20] or the approach that is a constituent element of the author's developed business model canvas. (see Fig. 2). The Osterwalder's business model was formed based on Freeman's stakeholder theory [21]. 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 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 [20].

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 analysed 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 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, organisational structures, and financial forecasts [22].

The conceptual business models enable companies to analyse 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 (Fig. 1); moreover, ICT is at the basis of the first stage “value creation” of the value life cycle.

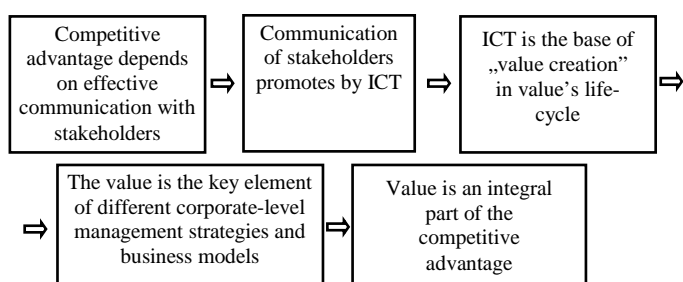


Fig. 1. Competitive advantage, ICT and value intermediation [23]

Based on the authors’ performed study about the use of e-environment in e-business companies [24], 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 [11]. Forbes has referred to this business model canvas as a simple instrument for creating innovative business models [3]. The model is based on active use of the e-environment in entrepreneurship. There are nine stakeholder groups at the basis of the model. Meanwhile, reciprocal and effective interaction and communication between the stakeholders promotes a company’s competitiveness [25].

At the same time, 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 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 [3]. Thus, the authors of the paper assume that by increasing e-environment element as part of IC system, the competitiveness companies will also increase.

For the practical use of the quantitative evaluation model in e-business authors of the paper develop BMO [20]. The BMO’s roots are found in management science and information systems research. Its four basic areas of preoccupation of a business model, the value proposition, the customer interface, the infrastructure management and the financial aspects stem from management literature [26; 27; 28]. The proposed business model elements providing practical contribution for business users. Its scientific roots originate in so-called design science [29] and its recent upsurge in Information Systems research [30; 31; 32; 33].

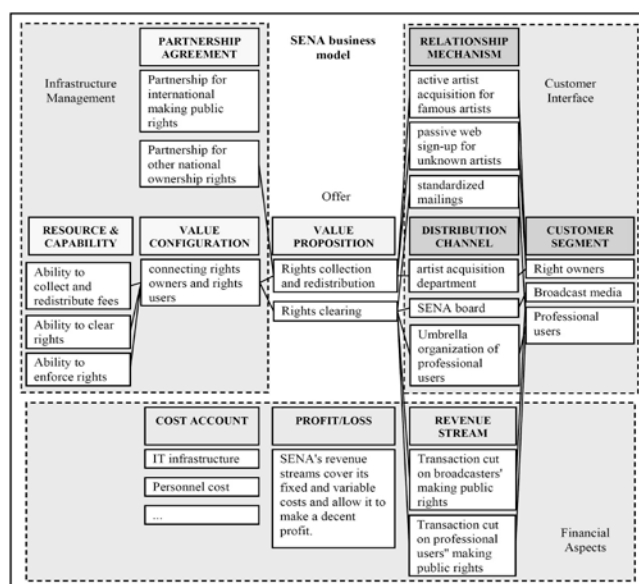


Fig. 2. SENA business model [34]

Authors of the paper see business model as a conceptual tool that contains a set of elements and their relationships that allows expressing the business logic of a company. It is a description of the what, the who, the how and the how much in a company [26; 27; 28] In other words it describes the value a company offers (what?) to one or several segments of customers (who?) and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital (how?), in order to generate profitable and sustainable revenue streams (how much?). This business model has a good visualization, allowing understanding value creation logic.

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

TABLE I. EXAMPLES OF TRADITIONAL INDICATORS FOR RECRUITMENT [35]

Quantitative indicators	Qualitative indicators
Number of applicants attracted per method	Ratio of qualified to unqualified applicants attracted
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 II. NON-FINANCIAL INDICATORS FOR E-RECRUITMENT COMPANY'S DEVELOPMENT DETERMINATION [3]

Indicator name	Explanation
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%
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))
Penetration (market or brand)	Market penetration (%) = (Customers who bought product) / (Total population) x 100%
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
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.
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.
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.

IV. THE CONCEPT OF E-RECRUITMENT AS A BUSINESS MODEL

Authors see e-recruitment business model advantages in e-recruitment methods, transferring knowledge for 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 interaction with job seeker in e-environment, thus reducing cost associated with first phase (Socialisation, Fig. 3).

The impact of information was noted long ago by Behling, Labovitz, and Gainer (1968), who observed that job choice decisions are based on thoughtful assessment of key information concerning objectively measurable job attributes such as pay and working conditions [36].

Information interaction is suggested by authors to be 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 [37].

This phase (Externalisation, Fig. 3) is analysed in management studies showing interaction experience create substantially different variations in the ways that job seekers gather and use labour market information [38]. Experienced customers are better able to extract and analyse important central information [39].

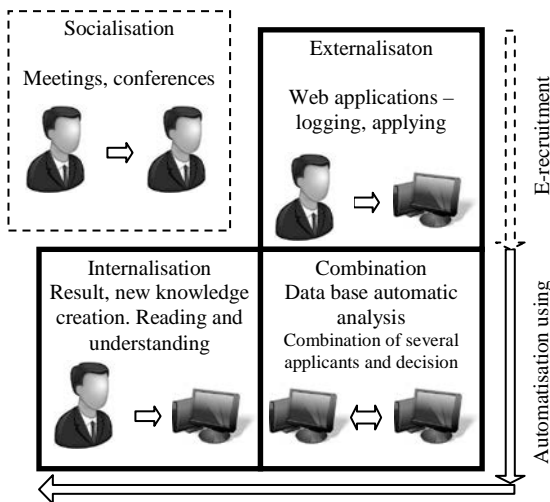


Fig. 3. E-recruitment as a business model (framework) [40]

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 [41].

Technology breakthrough is allowing to increase the level of automation for interaction with job-seekers and labour cost decreased. These trends will be more focused on intangible assets (associated with IC) managing company data flow, plantspecific 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 (Fig. 4).

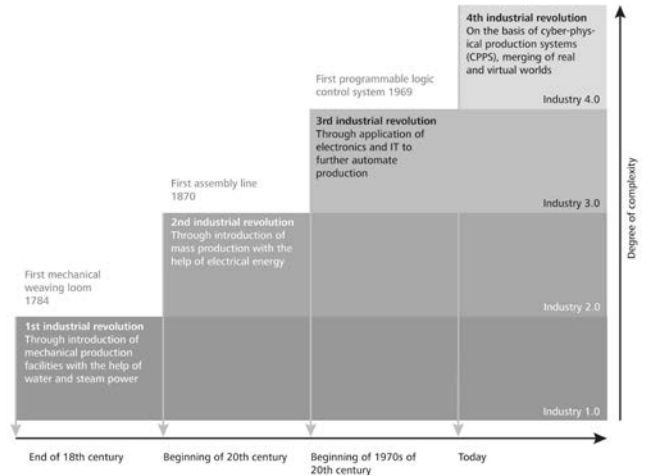


Fig. 4. The evolution of embedded systems into the internet of things, data and services [42]

“Industry 4.0” (sometime referred as 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 (Fig. 4). 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 (Fig. 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 [43].

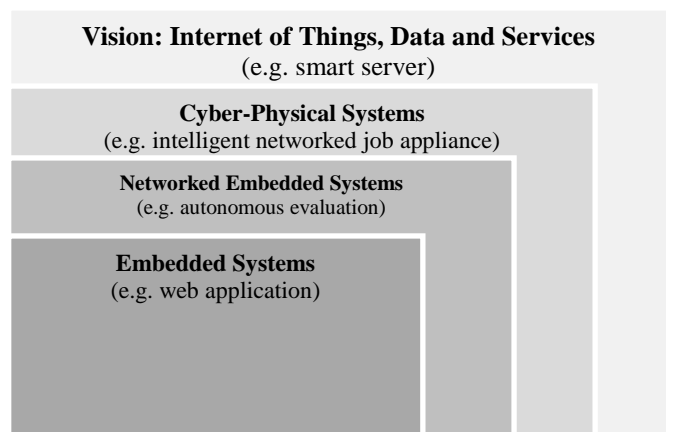


Fig. 5. The evolution of embedded systems into the internet of things, data and services [44]

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 (Fig. 5). 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.

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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) [45].

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 [46; 47; 48]. E-recruitment lacks these advantages and these findings show that motivation of job seeker will be affected [49] and decreasing their motivation [50]. 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.

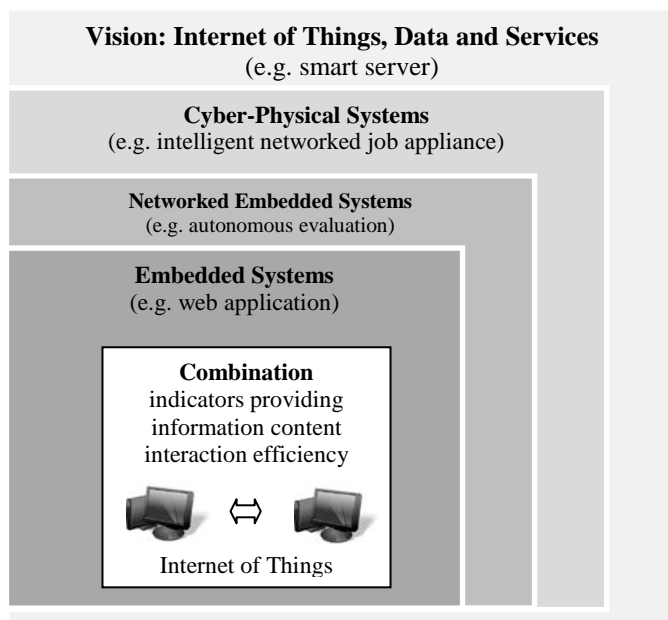


Fig. 6. E-recruitment as a business model (framework) [created by the authors based on Federal Ministry of Education and Research [44]]

V. CONCLUSION

The contemporary cornerstone advantage of e-recruitment methods lies in labour cost. E-recruitment methods represent a

growing and high potential opportunity for business to reduce recruiting costs [51]. Hence the goal of e-recruitment is to satisfy job-seekers needs by providing competitive virtual environment to traditional one. The ability to manage value creation process as interaction effect's efficiency is of the main goals, meeting job-seeker needs and web applications capabilities.

Controversially the problems discussed here about socialisation affect toward motivation and the effort needed to attract a job offer should be taken in consideration. E-recruitment focus 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 playing a certain role for a 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 in value creation.

Based on our business model approach, 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 labour cost efficiency advantages. Offering modern “Internet of Things” concept to e-recruitment provides new business models with efficient framework for indicators identification. To contribute to this process, authors present their indicators to evaluate important issues associated with information interaction in order to develop effective e-recruitment business model.

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