

Factors for the management of scarce human resources and highly skilled employees in IT-departments - a systematic review

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Abstract

Due to an unsatisfying demographic development in most European states, companies have to solve a trade-off between a needed increasement of productivity on the other hand and fewer highly skilled employees on the other hand. In this paper, authors propose factors for different layers of a framework to manage scarce resources in IT-departments. These layers aim for different relevant dimensions of employee satisfaction like wages, psychological development of employees and work life balance. Authors present a structured literature review to screen relevant publications on the topic. This paper offers white range of different factors regarding the management of labour shortage and highly skilled employees in companies which can be used to build a holistic model or framework to solve the challenges of the upcoming demographic change in Europe. Although the topic is quite popular in scientific literature, there is not a study devoted to identify these factors in organizational contexts. This paper is aimed to bridge this gap.

Keywords – Human Resources, Information Technology, demographic development in Europe, scarce resources, shortage of skills

Paper type – Research paper

1. Introduction

The software industry is a powerful wealth creator, generating billions in revenues, millions of jobs, countless new companies and innovative business models (Slaughter, 2014). In spite of its importance and overall impact, as any other industry in the world, it is facing threats and challenges. One of these challenges is the scarcity of various goods and resources (Booch, 2009). Given that software development is highly intensive in human capital, the key factor for industry is personnel. Not in vain, software development is a human centric and sociotechnical activity influenced by personnel factors (Ricardo Colomo-Palacios, Casado-Lumbreras, Misra, & Soto-Acosta, 2014).

Maybe the biggest issue the industry is facing is the shortage of IT professionals all over the world, which has been pointed out by many works and reports e.g. (Mithas & Krishnan, 2008). The problem is rooted on the erosion of its student base (Hirschheim & Newman, 2010; Sabherwal, 2010), on the retirement of babyboomers (Stone & Deadrick, n.d.) and on the relative low success of initiatives like Global Software Development (Casado-Lumbreras, Colomo-Palacios, Ogwueleka, & Misra, 2014; R. Colomo-Palacios, Casado-Lumbreras, Soto-Acosta, Misra, & García-Peñalvo, 2012). Thus, in a perspective of demographic change skilled software practitioners will continue to be hard to find due to decreasing birth rate (Radant, 2014). While systematic resource governance approaches (Stantchev, Petruich, & Tamm, 2013) and project portfolio management paradigms (Stantchev & Franke, 2009; Stantchev, Franke, & Discher, 2009) can provide higher utilization of available human resources, this provides only a limited amelioration of the resource problem in the field.

In any case, apart from the problem of manpower, there is also an issue in the scarcity of specialized knowledge in software industry. Skills obsolescence is especially important in a sector that witness fast paced technological, domain, and process changes leading to rapid skills obsolescence, unless these skills are updated often (Bapna, Langer, Mehra, Gopal, & Gupta, 2012). In other words, a constant development of the software practitioner's knowledge is fundamental as highlighted by previous works on the field (Agarwal, Pande, & Ahuja, 2014; Khemaja & Mastour, 2014). Main assets in software industry are not servers, buildings or machines. The main asset is knowledge capital. Due to the fluctuation of labour and the fact that available resources are not increasing along with the increasing needs, knowledge management, training and education in software engineering are even more important (Rus & Lindvall, 2002).

To solve these conflicts and challenges, companies need to use a holistic approach which allows them to retain current employees in the company, be attractive to applicants and use untapped employee potential within their organization. For this reason, factors for a further building of a framework to manage scarce resources are identified in this publication.

However, to the best of authors' knowledge and although the topic is quite popular in scientific literature, there is not a study devoted to identify these factors in organizational contexts. This paper is aimed to bridge this gap.

2. Research Methodology

2.1. Motivation and Objectives

The literature presents a variety of studies about scarce resources and the challenges of companies and specifically their IT-departments. But, exploring previous research shows that a comprehensive systematic review does not exist on this topic. Therefore, this study will facilitate the understanding of the current status of research in different areas and address further investigation.

2.2. Research Method

One way to construct an overview of the state of the art is by using a method which is called Systematic Literature Review (SLR). A systematic literature review is a means of identifying, evaluating and interpreting all available research relevant to a particular research question, or topic area, or phenomenon of interest (Kitchenham, 2004). A systematic review is a process of assessment and interpretation of all available research related to a research question or subject of interest. Kitchenham also describes several reasons of undertaking a systematic review, the most common are to synthesize the available research concerning a treatment or technology, identification of topics for further investigation and formulation of a background in positioning new research activities (Afzal, Torkar, & Feldt, 2009; Kitchenham & Charters, 2007). A scientific research has to start with a literature review of some sort. However, unless a literature review is structured and substantial, it has little scientific value. This is the main reason for undertaking systematic reviews. A systematic review combines existing work in manner that is fair and seen to be fair. For example, systematic reviews must be undertaken in accordance with a predefined search strategy. The search strategy must allow the completeness of the search to be assessed. In particular, researchers performing a systematic review must make every effort to identify and report research that does not support their preferred research hypothesis as well as identifying and reporting research that supports it (Kitchenham & Charters, 2007). There are several reasons to perform a SLR:

- To summarise the existing evidence concerning a treatment or technology, e.g., to summarise the empirical evidence of the benefits and limitations of a specific agile method.
- To identify any gaps in current research in order to suggest areas for further investigation.
- To provide a framework/background in order to appropriately position new research activities.

Systematic reviews require considerably more effort than traditional reviews. One advantage is, that they provide information about the effects of some phenomenon across a wide range of settings and empirical methods. If studies give consistent results, systematic reviews provide evidence that the phenomenon is robust and transferable. If the studies give inconsistent results, sources of variation can be studied. A second advantage, in the case of quantitative studies, is that it is possible to combine data using meta-analytic techniques. This

increases the likelihood of detecting real effects that individual smaller studies are unable to detect. However, increased power can also be a disadvantage, since it is possible to detect small biases as well as true effects. The main advantage is the structured approach with a SLR. It differs itself from a conventional literature review in the following way:

- Systematic reviews start by defining a review protocol that specifies the research question being addressed and the methods that will be used to perform the review.
- Systematic reviews are based on a defined search strategy that aims to detect as much of the relevant literature as possible.
- Systematic reviews document their search strategy so that readers can access its rigour and completeness.
- Systematic reviews require explicit inclusion and exclusion criteria to assess each potential primary study.
- Systematic reviews specify the information to be obtained from each primary study including quality criteria by which to evaluate each primary study. (Kitchenham, 2004)

2.3. Research questions

The goal of this SLR is to identify which preliminary papers and other scientific materials are published about this topic up to this date (June 2015). For this reason it is mandatory to develop a set of research questions to search, identify and extract the significant publications. The questions this work proposes are the following:

RQ1: What are factors for fundamental wages for high skilled employees in IT-departments?

RQ2: What are factors for measures to optimize and educate the employee pool with reference to untapped potential within an organization?

RQ3: What are factors for measures to support the psychological healthiness of the employees?

RQ4: What are factors and metrics for measures to optimize the work environment of the employees?

RQ5: What are factors for measures to support the work-life balance of the employees?

Factors describe what and metrics how something is measured.

3. Search strategy

The research strategy follows the model of the structured literature review. It includes search terms, literature resources and search process, which are detailed one by one as follows:

3.1. Search Terms

The search string has to be defined based on the population under study, and the keywords and their synonyms. Therefore, the study population includes the relevant keywords from all five layers of the proposed framework.

With this population the list of keywords and their synonyms, used to generate the search string was:

- employee wages: employee salary
- Education of employees: education of personnel, untapped potential in organizations
- psychological development of employees: psychological changes of employees
- workplace environment: workplace optimization, workplace development
- Work life balance

To generate the search string a Boolean language with AND and OR, and quotation marks for exact text were used. The string format is recognized by all sources of information used, as well as many others. So finally the search string used is as follows: ("employee wages" OR "employee salary") AND ("education of employees" OR "education of personnel" OR "untapped potential in organizations") AND ("psychological development of employees" OR "psychological changes of employees ") AND ("workplace environment " OR "workplace optimization" OR "workplace development") AND ("work life balance").

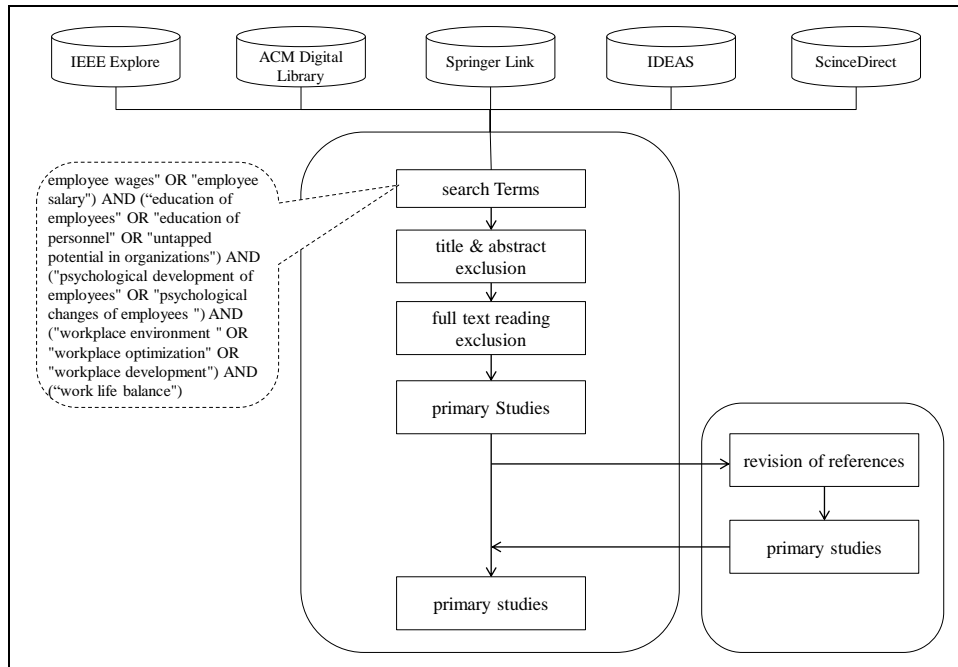
3.2. Literature resources

Given the variety of sources to be consulted electronically via the web, five electronic databases of established literature resources were used for the present SLR. This systematic review considers the following list of sources:

- IEEE Digital Library (<http://ieeexplore.ieee.org>),
- ACM Digital Library (<http://portal.acm.org>),
- SpringerLink (<http://link.springer.com>),
- IDEAS Digital Library (<http://ideas.repec.org/>) and
- ScienceDirect (<http://www.sciencedirect.com/>)

3.3. Search process

The SLR was conducted in the following way: at first, the named digital libraries were searched according to the defined search items for relevant publications. Second, the publications found were reviewed by title and abstract in order to estimate their relevance for the topic. After that, a full text review was conducted which leads to a set of primary studies. Fourth, the primary studies were reviewed whether there are references to other publications with other relevant papers to this topic.



3.4. Data extraction

The data extracted from each paper was documented and kept in a reference manager. After identification of the papers, the following data was extracted:

- Source (journal or conference)
- Title
- Authors
 - Publication year
 - Classification according to topic 3.
 - Summary of the research, including which questions were solved

Based on the criteria for classifying papers, all the papers were reviewed, and the corresponding data was extracted. With the information collected in that form, it was possible to obtain qualitative and quantitative information to answer the planned research questions. In particular, the following information was collected:

- factors for fundamental wages for high skilled employees in IT-departments,
- factors for measures to optimize and educate the employee pool,
- factors for measures to support the psychological healthiness,
- factors for measures to optimize the work environment,
- factors for measures to support the work-life balance.

4. Systematic Review Execution

For a better understanding and organization of the researched publications, a classification was conducted. For this purpose, the publications were divided into five areas. These areas are defined according to the search terms.

4.1. Study selection

Included and excluded studies are presented in stages following the search process described above. Because of the length of some of the list of references, they have been hosted online and can be downloaded at any time.

Once initial search results were retrieved, an exclusion/inclusion review procedure was applied with the following inclusion and exclusion criteria:

- Inclusion criteria:
 - Publications that match one of the search items,
 - Publications that have an empirical content or refer to practical examples in Europe,
 - Publications, that are related to an allocation of resources in scarce resource situations,
 - Publications, that are related to Information Technology departments,
 - Publications, that are related to more than five EU-Countries,
 - Publications, that are related to a highly qualified workforce,
 - Publications that relate to the research questions.
- Exclusion criteria:
 - Publications that not match one of the search items,
 - Publications that do not have empirical content or refer to practical examples,
 - Publications that are published before or on the 31.12.2004.

4.2. Primary studies obtained in the first phase

The first search was conducted in June 2015, returning 191 papers in total. Irrelevant and duplicate papers were removed and a set of 178 unique papers remained. The result is shown in Table 1.

Table 1. First phase results without filtering

IEEEExplore	48
ACM Digital Library	27
ScienceDirect	39
SpringerLink	38
IDEAS	39
Total	191
Total (without duplication)	178

Of the 191 searched papers, 13 were duplicated. Table 2 shows the distribution of the searched papers and its source with reference to the search items.

Table 2. First phase results – distribution without duplication

	IEEE	ACM	ScienceDirect	SpringerLink	IDEAS	Sum
Employee wages	10	3	13	6	6	38
Education of employees	21	7	3	3	6	40
Psychological	3	5	8	16	6	38

development of employees						
Workplace environment	4	7	6	3	5	25
Work life balance	7	4	5	6	15	37
Sum	45	26	35	34	38	178

Of these remaining 178 results, 10 were discarded for being incomplete or not related to the research questions. Of the 168 remaining, 136 were excluded after reading the title and abstract, so 159 results were excluded in the first filter, which left 42 results to be filtered by full-text reading using the inclusion and exclusion criteria. If there was doubt about the relevance of a publication, it was included in the relevant group, leaving the possibility of discarding the paper during the next phase when the full texts of the papers were studied.

Table 3. First phase results

Excluded	149
Included	42
Total	191

4.3. Primary studies obtained from the second phase

The reference lists from the primary studies obtained from the first phase were retrieved and the same filters previously used were applied to them. A total of 32 references were obtained by reading the title and abstract. From these references, 11 were finally selected using the criteria of inclusion and exclusion.

Table 4. Second phase results

Excluded	10
Included	32
Total	42

5. Results and Findings

In this section, the final papers will be matched to the research questions. Furthermore, the research questions are tried to answer with the help of these papers.

5.1. Results

The following tables will show how the retrieved papers fit into a categorization regarding the research questions.

Table 5. Research questions and corresponding papers

research question	publication
RQ1: What are factors for fundamental wages for high skilled employees in IT-departments?	(Grund & Westergaard-Nielsen, 2005), (Peng & Eunni, 2011), (Anger,

	2007), (Zhao, 2011), (Dao, 2013; Gouveia & Correia, 2013), (Bessette, 2014)
RQ2: What are factors for measures to optimize and educate the employee pool with reference to untapped potential within an organization?	(Schmidt & Kunzmann, 2006), (Mehairi & Binning, 2014), (LeRouge, Wiley, & Maertz, 2013), (Crow & Liggett, 2014), (Bykov & Shyshkina, 2014), (Asgrahani & Shankararaman, 2014), (Asgarkhani & Shankararaman, 2014), (Grice, Peer, & Morris, 2011)
RQ3: What are factors for measures to support the psychological healthiness of the employees?	(Mehairi & Binning, 2014), (Koppi et al., 2009), (Beard, Schwieger, & Surendran, 2008), (Ross & Thomas, 2008), (Grice et al., 2011), (Zeng, Zheng, & Shi, 2010), (Kabak, Şen, Göçer, Küçüksöylemez, & Tuncer, 2014), (Aykan, 2014), [23], (Altinoz, Cakiroglu, & Cop, 2012), (Vries, Bakker-Pieper, & Oostenveld, 2010)
RQ4: What are factors and metrics for measures to optimize the work environment of the employees?	(Sykes, 2011), (Allen, Armstrong, Reid, & Riemenschneider, 2009), (Rehman, Nasar, & Mugheri, 2010), (Finna & Forgacs, 2010), (Gratton, 2011)
RQ5: What are factors for measures to support the work-life balance of the employees?	(Nissen & Termer, 2014), (Lazar, Osoian, & Ratiu, 2010), (Humpert, 2014), (Ford & Collinson, 2011)

5.2. Findings

The findings of the SLR are shown in the following chapter in which the five research questions are answered.

5.2.1. RQ1: What are factors for fundamental wages for high skilled employees in IT-departments?

It is a common mistake that most employees use the term compensation synonymously with the money that they receive on their paycheck. Total compensation, however, extends beyond salary. Total compensation may be defined as the package of quantifiable rewards that an employee receives for his or her labours. It is the resources that employers offer to attract, motivate and retain employees. An employee's total compensation includes base compensation, pay incentives and benefits or indirect compensation. In the following we will discuss these three components and identify how they are used in an organization's human resources strategy (Bessette, 2014).

a. Labour costs

Labour costs are defined as the monetary value that the company has to pay to employ an employee. These are therefore pre-tax expenditures, base compensation or fixed income (Bessette, 2014), which includes costs for social security and insurance contributions. Also, further financial incentives (Grund & Westergaard-Nielsen, 2005) like bonuses and pay incentives like car rental programs, overtime payment etc. are included (Anger, 2007; Zhao, 2011).

b. Geographic payment differences

These are differences between purchasing power of two up to n countries, in this research the countries of the European Union (Dao, 2013; Gouveia & Correia, 2013).

c. Wage inequality

Wage inequality is the dispersion of wages for employees within an organization. This spread could be a result of the age, skills, the experience or the performance of an employee (Grund & Westergaard-Nielsen, 2005; Peng & Eunni, 2011; Zhao, 2011).

5.2.2. *RQ2: What are factors for measures to optimize and educate the employee pool with reference to untapped potential within an organization?*

Availability of highly skilled engineering staff and workers is essential for the productive forces of society, and a significant source of innovative development and competitiveness of the national economy. Training highly skilled personnel for high-tech industries is particularly important and difficult, but is also one of the most effective ways to ensure qualitative improvement of the employment structure, and to increase the technological level of production and competitiveness in markets for goods and services (Asgrahani & Shankararaman, 2014). With the rapid expansion of the use of information technology throughout our global society, there is a need to recruit capable new employees to the information technology workforce. As a result, employers need to be aware of the employment issues and concerns of the entire labour pool, and what it takes to satisfy these workers. While the vast majority of information technology workers are men, women and underrepresented minorities also bring valuable talents to this field (Ross & Thomas, 2008).

a. Employee performance

Employee performance is the productivity per person in a given environment or working field in a company. The performance of employees is influenced by several internal and external factors, such as:

- data and information;
- resources, tools, and environmental support;
- consequences, incentives, and rewards;
- skills and knowledge, i.e., internal to the individual; when skills and knowledge are missing, this leads to poor performance by the individual;

- individual capacity, which has to do with talents or capability to perform; different jobs require different talents;
 - motives, which are deeply embedded characteristics that are possessed by people; motives include the reasons why people do what they do, how they view themselves, their needs, desires, and internal personality traits (Crow & Liggett, 2014).
- b. Process costs and process duration
- Process costs are the total unit cost of the output of a continuous production run in which a product passes through several processes. These costs involve also expenditures for personnel. Process duration or cycle time, is the period required to complete one cycle of an operation or to complete a function, job, or task from start to finish. Cycle time is used in differentiating total duration of a process from its run time.
- c. Return of investment in employee education
- Investment in employee education conjoins the amount of financial or non-financial resources which are invested in training measures of employees in a certain timeframe (Bykov & Shyshkina, 2014). The impact of highly skilled employees on firm performance is not clear since employee skills increase both the benefits and the costs to an organization. It is therefore essential to measure the effect of education on the performance of a company (Asgrahani & Shankararaman, 2014).
- d. Staff potential within an organization
- The staff potential represents the amount of highly skilled employees in an organization which are not successfully integrated in the best interest of the company (LeRouge et al., 2013). Regarding Information Technology departments, this includes especially women, elderly employees and other minorities in ICT departments (Quesenberry, Trauth, & Morgan, 2006; Ross & Thomas, 2008).
- e. Identification of vacancies within an organization
- This factor illustrates the needed profiles of a company to achieve a certain strategic goal. The identification is compiled via a transparency analysis of processes or departments (Asgarkhani & Shankararaman, 2014).
- f. Employee fluctuation
- Fluctuation is generally defined as the change or variation in a quantity over time. Employee fluctuation is the rate of change of the workforce of a company or department in a given timeframe (Grice et al., 2011).
- g. Strategy for corporate education and employee development
- This strategy represents a companywide competence management system on an organizational perspective and delivers a management approach by providing

processes and a methodological framework for developing the competencies of an organization by aligning human resource development activities with business goals (Schmidt & Kunzmann, 2006).

h. Knowledge management

Knowledge management is defined by a system or framework of a company to acquire or distribute ideas, work experiences, information and competent skills (Mehairi & Binning, 2014) at the needed time and with the required coverage of a topic.

5.2.3. *RQ3: What are factors for measures to support the psychological healthiness of the employees?*

Considering previous research exploring the negative effect of job-demands on psychological healthiness of the employees it became obvious that only focusing on the negative effect of job-demands is not suitable (Zeng et al., 2010). Job-demands are a sword with two sides: on one hand, it is a stressor and higher job-demands would result in emotional exhaustion of IT employees; on the other hand, it can stimulate the employees, and properly high job-demands could be helpful for stimulating working motivation of the employees and increasing the employees' professional efficacy (Yan, 2014). In general, the ability to work plays a critical role in mental and physical wellbeing. Work is a primary determinant of socioeconomic position and plays a key role in social life participation, the development of identity and self-esteem. However, there is strong evidence that a poor psychosocial work environment can increase the risk of mental health problems (Reavley, Ross, Martin, LaMontagne, & Jorm, 2014).

a. Company culture

The culture of a company defines how it deals or handles employees and their expectations and needs. The culture of a company could have diverse characteristics e.g. an employee-oriented culture which focusses on the employee and his needs and abilities or a work-oriented culture which concentrates fully on the work packages regardless of welfare or abilities of the employees (Mehairi & Binning, 2014). Also, the style of leadership and the hierarchical structure of a company can influence the psychological health of an employee (Vries et al., 2010).

b. Employee-/ job-satisfaction

This factor applies to the overall satisfaction of employees. It conjoins all possible influences from private life, the relationship to colleagues or superiors till the satisfaction with the assigned work packages (Altinoz et al., 2012). Job satisfaction is mainly regarded as a phenomenon that occurs when the properties of a job fit together with the demands of employees (Kabak et al., 2014).

c. Psychological pressure

This factor conjoins influencing issues on the psychological healthiness of employees. It comprised the job security of employees, missing appreciation, workload, job

complexity, workplace bullying, ongoing change in technology or the behaviour of superiors etc. (Koppi et al., 2009; Pienaar & Willemse, 2008).

d. Psychological induced illness

This factor conjoins the number of psychological induced illnesses in a company in a given timeframe. This factor is not limited to burnout, which is defined as a kind of chronic stress reaction that the individual continuously faces emotional and interpersonal stressors during the work, including emotional exhaustion, cynicism and low professional efficacy (Zeng et al., 2010) but includes any disease related to psychological illness because of job demands. It has to be considered, that these are multi-dimensional phenomena that include emotional, physical and cognitive illnesses (Pienaar & Willemse, 2008).

e. Workforce generation gaps

IT-companies and departments have to consider, more than other departments [11], the diverse expectations of different generations of employees. The influence on the work environment of the “Millennials”, Generation X and Y is getting more complex. Each generation possesses different characteristics, expectations, and approaches to work. They also have different technological backgrounds (Grice et al., 2011). This has to be considered in organizational structures, team assignments, training activities or career development.

f. Turnover Intention

The definition of turnover intention is the destructive and active actions of employees in case of dissatisfaction from the working conditions. Turnover intention is perceived as a negative factor over the efficiency and productivity of the organization since it results in several negative outcomes for the organization such as loss of an employee, interruption of organizational activities, training and orientation of new employee replacing the previous one and consequent additional costs and expenses (Aykan, 2014).

g. Loneliness

Loneliness expresses a permanent emotional affective disorder in case of alienation, misunderstanding and rejection feelings of an individual or in case of absence of social partners required in activities creating opportunities for social integration and affections. There are two types of loneliness, emotional and social. Social loneliness covers the social relations of an individual and usually occurs together with depression and distress because of lack of social network. Emotional loneliness usually originates from lack of close link to another person and covers the feelings of anxiety and emptiness. The individuals thinking that the promises made to them were broken by the organization may feel themselves as worthless, nothing, lonely and excluded within the organization and may cut off the communications with the organization and colleagues (Aykan, 2014).

5.2.4. *RQ4: What are factors for measures to optimize the work environment of the employees?*

Workers' performance is tightly linked to their working environment (Del Rio Vilas, Longo, & Monteil, 2013). Work environment consists of different areas, such as the actual physical environment (including temperature, lighting, noise, equipment's in the office, the employee's personal space and right posture), the psychological and social environment (such as labour demand, personal connections, work relationships, the physical and psychological characteristics of the employee) and it also the effects of how work is organized and what tasks are delegated (Finna & Forgacs, 2010).

a. Physiological healthiness and workplace design

Besides the psychological healthiness, the physiological healthiness of employees plays an important role for companies due to the highly negative effect on the job performance (Rehman et al., 2010). One factor is a workplace ergonomics aims at creating a work place that suits the employee's needs. A well-developed office does not only increase work efficiency but it can also significantly reduce costs (Finna & Forgacs, 2010).

b. Job organization

The use of different types of job organization can have important influences on the performance and risk mitigation of an organization. The concept of job rotation for example allows a company to spread important knowledge over the organization. Also, it avoids monotony work environments which raises the overall satisfaction of employees (Allen et al., 2009). Further, the change in technology and emerging societal trends, that more and more employees, whatever their age, gender or nationality will increasingly value greater flexibility in terms of where and when work takes place and how they work will influence the organization of a company significantly (Gratton, 2011).

c. Interruptions in the workplace

There are different types of interruptions (both on- and off-task) that occur during typical office computer-based activities (Sykes, 2011). These disruptions from the assigned tasks reduce productivity of the employees and can also lead to psychological stress. Therefore it is essential for a company to minimize them to a minimum. Typical interruptions could be the telephone, instant Messenger, and updating system notifications (e.g., Windows update, Adobe, Java, etc.), email notifications, colleague initiated discussion in the participant's office, and distractions (e.g., surrounding office noises, such as, fans, doors, people walking by, nearby conversations, nearby washroom, etc.).

5.2.5. *RQ5: What are factors for measures to support the work-life balance of the employees?*

Work life balance is the compatibility of working life and private life (Nissen & Termer, 2014). But how does the “unbalance” in work and life, such as this “insufficient time and non-achievement in work” and “increased time for private life,” affect employees in IT? This question is relevant to how we view work-life balance. While multiple definitions exist for work-life balance, it generally refers to an individual’s state in which both work and private life are satisfying and fulfilling (Pasamar & Valle, 2011). Although studies investigating the interface between work and private life have been accumulating in organizational psychology, the mainstream so far has been the studies exploring the conflicts between work and personal life. However, in the past decade, the idea is growing among researchers that work and private life are not only in conflictive relationships, but are also in mutually enhancing relationships to enrich each other, and positive experiences in the two domains bring synergy that works together (Fujimoto, Shinohara, Tanaka, & Nakata, 2013).

a. Compatibility of job and private life

In the beginning, family/children is deemed less important, especially for young IT employees. But after some years of working life, the desire for family and children becomes stronger. This aspect then loses its importance when their children have become more independent and leave their parents’ home. After this, areas such as hobbies, culture and travelling gain increasing interest (Nissen & Termer, 2014). Thus, there are different definitions of a work-life-balance depending on the age, gender or cultural background (Ford & Collinson, 2011).

b. Working time models

Organizations can implement various initiatives and working time models that may assist employees to better balance their work and family responsibilities, gain improvements in well-being and provide organizational benefits (Lazar et al., 2010). These could be: flexible working hours, job sharing, part-time work, compressed work weeks, parental leave, home office arrangements, compressed work weeks and on-site child care facility.

c. Workload of employees

In general overtime is found to be dissatisfying as it affects leisure time, lowers employee satisfaction and has therefore a negative influence on companies performance (Humpert, 2014).

6. Discussion and conclusion

Software development is crucial for every company in every industry and for the people itself (Hernandez-Lopez, Colomo-Palacios, & García-Crespo, 2013; Rashid & Roni, 2012; Siddiqui, Hussain, & Hussain, 2006). In a permanently changing business environment, companies and especially their IT-Departments have to adapt to changes in the market and be

more agile and customer-oriented than ever before (Stoica, Mircea, & Ghilic-Micu, 2013). An educated workforce, especially in the IT-Department is critical for the ability of a company to innovate and compete in the market. Surprisingly, there is very little research on how education contributes to the profitability of IT firms and how employees contribute to research and development activities (Banker, Wattal, Liu, & Ou, 2009). In addition human resources management is a very complex domain on its own and a SLR conducted in March 2014 has shown that the the problem of skill shortage in companies can only be solved if further scientific areas, e.g. psychology, sociology or organization theory are considered as well (Radant, 2014; Radant, Colomo-Palacios, & Stantchev, 2014).

This paper shows that the research community currently does not provide satisfactory answers for the problem of scarcity of talent and skill shortage in IT-departments. That it is not only necessary but essential to connect the mentioned research areas is verified by the wide range of different factors which are identified and simultaneously influence the productivity of employees and companies. In sum, 24 different factors are identified which are divided in five different research areas.

Table 6. Areas and corresponding factors

Research area	Factor
1. Wages of employees	labour costs, geographic payment differences, wage inequality
2. Optimization and education of employee pool	employee performance, process costs and process duration, return of investment in employee education, staff potential within an organization, identification of vacancies within an organization, employee fluctuation, strategy for corporate education and employee development, knowledge management
3. Psychological healthiness of employees	company culture, employee-/ job-satisfaction, psychological pressure, psychological induced illness, workforce generation gaps, turnover intention, loneliness
4. Optimization of work environment	physiological healthiness and workplace design, job organization, interruptions in the workplace
5. Work-life balance	compatibility of job and private life, working time models, workload of employees

The findings are subject to the usual limitations of a literature review. The results completely rely on previously published research, the availability of these studies using the method outlined in the search methodology and the appropriateness of these studies with the criteria of the selection/exclusion procedure. However, the results provide a strong fundament for further research activities. The identified factors answer the question “what” should be measured. The next question that should be answered is “how” the identified factors could be quantified for the operational use in companies. For this purpose, corresponding metrics will be assigned to every factor.

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