

Analysis of reasons, implications and consequences of demographic change for IT departments in times of scarcity of talent- a systematic review

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The skill shortage is becoming an ever-increasing challenge for IT departments. Allocation of resources in the best possible way is even more important. The challenge is to improve the enterprise not only on the side of the organizational and process level, but to develop new strategies and approaches in human resource management. Only a symbiosis of the disciplines economics, psychology and information technology will enable relevant and indispensable employees and promote loyalty to the company. A frequent change of the work place, for a well-trained professional, is so long associated with normality until they find the best environment for fulfilling their needs and expectations. These expectations are no longer just on a financial level. This paper will analyse the previous work on these topics and demonstrate first conclusions regarding a way forward.

Keywords: demographic change, skill shortages, IT-Management, human resource Management, psychological implications on employees.

1. Introduction

In current times, companies are confronted with continuous changes. They have to face new challenges faster and more goal oriented, adapt to new circumstances while maintaining a high level of productivity. The requirements on companies will increase in the coming years due to the scarcity of various goods and resources.

The allocation of resources is not a new issue for companies, but in the current situation it becomes more and more important. The relevance of information technology in businesses is due to the pace of change with automation of processes playing an increasingly more important role for companies. Within the IT industry, human resources have been recognized as one of the most decisive and scarce resources (Colomo-Palacios, Casado-Lumbreras, Misra, & Soto-Acosta, 2014). With IT skill shortages projected to reach unprecedented levels, making the right choices for IT human resource management gains higher importance for shaping a firm's competitive advantage (Colomo-Palacios, González-Carrasco, López-Cuadrado, Trigo, & Varajao, 2014). The complexity associated with the fluctuating demand for IT skills, coupled with dynamic and innovative approaches to short-term and long-term staffing, as well as the inevitable delays in skill acquisition, makes this a challenging task (Choi, Nazareth, & Jain, 2008). It's no longer a pure support factor, but provides a valuable contribution to the companies' results. Without a functioning IT department, the production of goods and the provision of services is almost impossible.

Cutting edge software and hardware can be provided relatively easy by financial resources. In comparison to this, the recruiting of appropriate resources is much more difficult. At first the company need to have transparency about their needed profiles (Nilles & Senger, 2012). Standards like the IT Infrastructure Library (ITIL) (Pereira & da Silva, 2010) or the Control Objectives for Information and Related Technology (COBIT) and ISO/IEC 27002 (Sahibudin, Sharifi, & Ayat, 2008), as well as approaches for Cloud Governance (K. Petruch,

Stantchev, & Tamm, 2011; Stantchev & Stantcheva, 2012) provide a good framework for this issue but an accurate recording and selection of resource-requirements is still needed. After the relevance was determined, the recruiting of the identified profiles becomes a tough challenge (Colomo-Palacios, Casado-Lumbreras, Soto-Acosta, & García-Crespo, 2013). Because of demographic change, the market for IT professionals developed from a buyer's to a seller's market (Buscher, Dettmann, Sunder, & Trocka, 2009; McEwan & McConnell, 2013). This means that applicants can choose the company based on their needs and expectations. The result is a steady loss of competitiveness among enterprises that are not selected by the graduates. Nevertheless, it is important that the companies are aware of their lack of personnel and take the appropriate actions. If possible, the demand can be met through increased remuneration, for example, a rise of salary. This is often not a viable option. Therefore, organizations strive to find other options to compensate this disadvantage. This can be achieved with a consistent number of employees by providing a better productivity and a more rational allocation of staff (Martensson, 2006). A step further is to deploy more sophisticated approaches to manage existing personnel resources in the area of IT (Casado-Lumbreras, Colomo-Palacios, Ogwueleka, & Misra, 2014; Konstantin Petruch, Tamm, & Stantchev, 2012; Stantchev, Petruch, & Tamm, 2013). Nevertheless, every optimization of an organization or a functioning system has its limits, especially in a fast changing environment like IT-departments. The result is, that also after a nearly impossible perfect optimization, the company needs to look after further possibilities and options to expand their business if it wants to grow or maintain the same level of productivity. This is also due to the fact, that because of an evolving IT, a specialization of the personnel is obligatory (Dayal, 2004). One of the options that many companies are embracing is offshore outsourcing (Casado-Lumbreras, Soto-Acosta, Colomo-Palacios, & Ordoñez De Pablos, 2011; Leeney, Varajão, Ribeiro, & Colomo-Palacios, 2011) although these approaches present a considerable amount of challenges for personnel (Colomo-Palacios, Casado-Lumbreras, Soto-Acosta, García-Peñalvo, & Tovar, 2013; Misra, Colomo-Palacios, Pusatli, & Soto-Acosta, 2013).

One further option is to attract applicants with other measures to compensate them for their financial loss. This can be done with innovative working time

models and an improved work-life balance. Satisfied employees are the most valuable and productive asset of a company.

Further challenge for IT-companies and IT-departments is the need to recruit within the Generation Y. This is a moniker for the specific group of individuals born from 1978 to 1994, who have never known a world without cell phones, cable TV and the Internet. Their demands and expectations are having a profound effect on academia, work environments and companies. Generation Yers are pushing changes on all fronts of the society (Sheahan, 2005). Understanding this trend is the key to adapt to the critical change of the economy (Holley, 2008). This generation of possible employees is unlike other generations, a segment of employees which is considered to be in need of focused attention and with unique and challenging expectations like participation in companies decision making and a better work-life balance (Shatat, El-Baz, & Hariga, 2010). To meet the expectations of the employees and the company itself, new and innovative work models must be developed. The challenge for the company is, to solve the conflict between a more open culture, a higher degree of temporal flexibility and potentially more leisure for the employees, while maintaining or increasing productivity.

Although the relevance of these topics is generally accepted, to the best of the authors' knowledge there is no structured assessment of research activities that look at the scarcity of IT talent and its reasons and implications. In this work the authors present specific research questions related to it, a sound research methodology to assess these questions, as well as the main findings that resulted from the application of the methodology.

The rest of this work is organized as follows: first there is an outline of the research methodology and research questions; second, the intended Systematic Literature Review (SLR) process is described; third, the results of the execution of the SLR are presented; fourth, the main findings are presented; and finally, there is a discussion of the results and findings.

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). 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.

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 synthesises 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).

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 differentiates 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 (March 2014). 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 is the impact of the demographic change on IT-Organizations?

RQ2: What is the impact of the demographic change on IT-personnel?

RQ3: What solutions for companies are provided by the scientific literature?

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 inputs (skills shortage, demographic change) and the outputs (IT-resource management, IT-management, psychological development of employees) in relation to the topic of an analysis of reasons, implication and consequences for IT-departments in times of scarcity of talent. With this population the list of keywords and their synonyms, used to generate the search string was:

- skills shortage: labour shortage
- demographic change: demographic development
- IT-resource management: IT-labour management, IT-resource management strategy
- IT-Management: IT Organization
- psychological development of employees: psychological changes of employees

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: ("skills shortage" OR "labour shortage") AND ("demographic change" OR "demographic development") AND ("IT-resource management" OR "IT-labour management") AND ("IT-Management" OR "IT Organization") AND ("psychological development of employees" OR "psychological changes of employees").

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
- Wiley Online (<http://onlinelibrary.wiley.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.

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 (skills shortage, demographic change, resource management, IT-Management, psychological development).

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 relate to the research questions,
 - Publications that refer to issues of IT-Departments in companies.
- 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 February 2014, returning 224 papers in total. Irrelevant and duplicate papers were removed and a set of 211 unique papers remained. The result is shown in Table 1.

Table 1. First phase results without filtering

IEEEExplore	60
ACM Digital Library	8
ScienceDirect	61
SpringerLink	38
Willey Online	31
IDEAS	26
Total	225
Total (without duplication)	211

Of the 225 searched papers, 14 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

	IEEE	ACM	ScienceDirect	SpringerLink	Wiley Online	IDEAS	sum
skills shortage	14	3	8	1	9	12	47
demographic change	2	1	17	10	2	8	40
IT-resource management/ IT-resource management strategy	10	0	0	2	0	0	12
IT-Management	21	5	0	12	3	0	41
psychological development employees	1	5	34	8	17	6	71
Sum	48	14	59	33	31	26	211

Of these remaining 211 results, 10 were discarded for being incomplete or not related to the research questions. Of the 201 remaining, 179 were excluded after reading the title and abstract, so 203 results were excluded in the first filter, which left 22 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. Of the 22 useful results for the next filter, 13 were journal papers and 9 were conferences papers. The results are shown in Table 3.

Table 3. First phase results

Excluded	203
<i>Included</i>	22
Total	225

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 22 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	11
<i>Included</i>	11
Total	22

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 is the impact of the	(Meland, Waage, & Sein, 2005); (Zhang,

demographic change on IT-Organizations?	2011); (McEwan & McConnell, 2013); (Thompson, 2010); (Buscher et al., 2009); (Grice, Peer, & Morris, 2011)
RQ2: What is the impact of the demographic change on IT-personnel?	(Meland et al., 2005); (Zhang, 2011); (Thompson, 2010); (Christensen & Knardahl, 2012); (Zeng, Zheng, & Shi, 2010);
RQ3: What solutions for companies are provided by the scientific literature?	(Meland et al., 2005); (Zhang, 2011); (Buscher et al., 2009); (Xia & Wei, 2007); (Choi, Nazareth, & Jain, 2012); (Martensson, 2006); (Grice et al., 2011)

5.2. Findings

5.2.1. RQ1: What is the impact of the demographic change on IT-Organizations?

There will be or already is a shortage of skilled labour in organizations and especially in IT-Organizations. This finding is supported by several papers and publications (Grice et al., 2011; McEwan & McConnell, 2013; Thompson, 2010). The results of that skills shortage will be blatant for every company which is involved in information technologies. In our industrialized world, it would be very much every major and medium-sized business^a. The results of that issue will be much higher in territorial states like Thuringia in Germany. (Buscher et al., 2009).

Often, effects of demographic change and skills shortage are not measurable for companies (Dombrowski, Schulze, & Zahn, 2009). This leads to increased insecurity for the development of competitive- and human resources strategies. Recruiting and preservation of employees in this department is accordingly a relevant factor for the growth and the success of a company (Menez, Munder, & Töpsch, 2001).

Furthermore, a detailed survey of the skills of the employees is necessary. If a company conduct this analysis, they will be able to allocate and promote them in

^a "SME" stands for small and medium-sized enterprises, as defined in EU-law these are companies with <250 employees and a turnover of < 50 million Euro or a balance sheet total of <43 million Euro.

the best possible way. Often the actual employment is not equal to the actual skills of the employees (Colomo-Palacios, Casado-Lumbreras, Soto-Acosta, García-Peñalvo, & Tovar-Caro, 2013).

Nowadays companies must spend a significant financial amount in order to find suitable candidates for their open positions. In some areas of the IT industry that alone is no longer sufficient, as there are far more jobs than qualified applicants. As a result companies cannot serve the demand of the market and lose money every single day.

If it is possible to hire a desired professional, it is important to keep him in the company. Additionally to the cost of acquiring, the care of the employee is a considerable effort as well. This includes not only targeted training and a good salary, but also expenses for wellbeing in order to increase employees' productivity. An example of this expenditure may be called to balance work and family.

While the market for companies to hire young graduates, especially in technical fields is getting tighter in the upcoming years, the corporate identification and loyalty of the employees will continue to decrease. This is due to the fact that the frequent change of the work environment, for a well-trained professional, is so long associated with normality until they find the best environment for their needs and expectations. These expectations are no longer just on a financial level.

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 labor pool. While the vast majority of information technology workers are men, women and underrepresented minorities also bring valuable talents to this field (Daniels & LaMarsh, 2007). However, there are high hurdles as expectations diverge greatly from those of men (Ahuja, 2002) and interpersonal skills are a much more important factor (Cappelli, 2000). Both groups have individual needs and lifestyles that have to be coordinated with the appropriate economic goals of the company.

Due to an evolving IT a necessary specialization of employees is mandatory. As a result, the available resources will be further reduced. New ways to maintain productivity must be found.

5.2.2. *RQ2: What is the impact of the demographic change on IT-personnel?*

Human capital is the crucial factor for economic growth in the upcoming years. (Buscher et al., 2009). To answer this research question, it is important to understand what characterizes IT-personnel. According to (Zhang, 2011) these are the most common attributes:

- Employees in IT-enterprises and departments are generally young.
- The quality and the academic requirements are relatively high.
- The salary of employees is relatively high.
- The outflow of talents is serious.

Additionally, (Zeng et al., 2010) point out that IT employees facing high job demands. The stress factor with the highest influence on the working people is emotional exhaustion. In consideration of this, it does not surprise that the impact of the demographic change on IT personnel is relatively high compared to other departments. (Zeng et al., 2010). The outcome of this situation is a high rate of mental or physiological illnesses, like burnout (Christensen & Knardahl, 2012) and a lower level of quality and productiveness of the department and the employees.

That these circumstances are not yet anchored within companies is shown by the fact, that the number of mental illnesses such as depression and burnout continue to rise from 4,6 sick days per 1000 a year in 2004 to 63,2 days in 2011 (BKK - professional health insurance Company Hessen, 2011). Through close examination of the research on these phenomena, more facets as underuse by repetitive activities, the so-called Boreout (Cürten, 2013) is identified. According to the Stress Report of the Federal Institute for Occupational Safety and Health in Germany the most common mental demands are the supervision of different work at the same time (58%), severe time pressure and tight deadlines (52%) but also frequent interruptions (44%). The work on the power limit is rated by respondents with 16% approval. Nevertheless this requirement is perceived by 74% as psychologically stressful, lack of (73%) or not timely information (65%) is

followed (Lohmann-Haislah, 2012). These factors are confirmed by further studies (Gao, 2011; Zeng et al., 2010). They show that the HR strategies and the company's relations with its employees need to be adjusted to the circumstances of today. Plus to the factors mentioned above Lee et. al (1995) pointed out, that technologically induced stress is a crucial multiplier. This is caused by strong technological transformation of an organization (Lee, Foo, & Cunningham, 1995). Furthermore these models do not address the psychological stress and the latest scientific findings. Furthermore, they neglect the massive change in the expectations and emancipation of workers. They also exclude the cultural dimension as (Hofstede, 1984) describes in detail. However, this is in relation to the internationalization of IT becoming increasingly important. The inclusion of these factors is a fundamental part of today's work environment, since the burden on knowledge carriers are higher and a company usually cannot afford a stoppage of work.

5.2.3. *RQ3: What solutions for companies are provided by the scientific literature?*

The solutions, presented by the scientific literature are not sufficient. A few of them are mathematically based and cannot be applied in practice without further adjustments, (Yang & Bai, 2010) refer to the implementation of new technologies (Choi et al., 2012) or are not profoundly enough (Martensson, 2006). Also these solutions only referencing to one part of the equation. Either they focus on solution for organizations like the integration and symbiosis between business and IT and process-related networking achieved through the implementation of Enterprise Resource Planning (ERP) systems. By this it is possible, to distribute information faster, which leads to an acceleration of the processes and thus in reduced costs (Appandairajan, Khan, & Madijagan, 2012; Parvizi, Oghbaei, & Khayami, 2013). Or they providing solutions for a better understanding of the demands of employees and recommend to take measures in the company to a corresponding prevention of mental illnesses such as burnout and implement them in the HR strategies (Bertram, 2013). Also there are various models for assessing the value in the different phases of the employment relationship in enterprises and the contribution of human capital to operating profit. Often these models are noted

but rather as bureaucracy and unnecessary additional work in the organization (Schneier, Shaw, & Beatty, 1991). If these are not used consistently and kept up to date they appear rightly often considered irrelevant and the results will not be useful (Perrin, 1998). Prominent examples are the models of Employee Lifetime Value (ELTV) (Mulhern & Moiseyev, 2007) or the People Capability Maturity Modell (PCMM) (Curtis, Hefley, & Miller, 2009).

Finally, the SLR shows, that there are different solutions for the several scientific areas. The problem is, that there are not linked together to a holistic model. As long as that is the case, companies, which are using these solutions, can only cure symptoms but not the problem itself.

6. Discussion

Companies are subjects to a stronger change, they have to face new challenges faster and more target orientated, adapt to new circumstances and maintain a high level of productivity. The requirements on companies will increase in the coming years due to the scarcity of various goods and resources. Statistics prove that in the coming decades the aging population will have profound effects. IT skills shortage is not only an European, but a global problem, (van der Merwe & Barry, 2010). But, 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).

For example, in 2030 36% of the population in Germany will be aged 60 or older and only 47% will be aged between 20 and 60 years. This represents a decrease of 8.2 million people compared to 2012. (Federal Statistical Office Germany, 2009). Therefore, companies have to counteract a significant resource problem on the labour level. Professionals will be hard to find not only in specialist positions, but in all areas of the organization. According to (Thompson, 2010) there are two sides which support the outcome of skill shortage. On the one side, only an insufficient number of students are entering the relevant programs and those who graduate are lacking in important industrial skills. On the other side, there is also a general decline in the application numbers in STEM programs

so universities tend to enrol less qualified students who then have problems to maintain the academic standard and drop out.

Also, the psychological developments of employees in times of scarce resources are undiscovered yet. There are studies which examine the behaviour and mental illness of employees in general but not in relation to the scarcity of resources. Furthermore, the perceptions of the new Generation Y rapidly change the demands of these employees on their organization and its leadership. Understanding this trend is the key to adapt to the critical changes within organizations and IT-departments in times of scarce resources.

Because the publications do not link the high demands on and psychological development of IT-personnel, the ever increasing demands on productivity of the IT department and the more and more diminishing resources in one holistic model or consideration, they can only solve a part of the problem but not the problem in whole. It is therefore essential to derive a combination of disciplines and possibly models combining the performance management, cultural and psychological aspects of the future to conduct a practical approach for companies.

The conducted SLR showed that the research community currently does not provide satisfactory answers for the problem of scarcity of talent and skill shortage in IT-Departments. Further research could build on existing knowledge, here the results of the SLR can be summarized as a possible starting point and then supplemented with the aforementioned sources outside the SLRs.

7. Conclusions

There are several scientific papers on the subject of skill shortage and their implications for the society and companies. A large part is an analysis of the causes of the present situation and the associated implications for the future. Another part deals with the organization of companies and explains their advantages and disadvantages. In addition, there are many journals about human resources management, -service, training and promotion.

It became apparent during the research, that there are hardly any works that link these three issues together, to develop unified strategies and solutions for businesses.

The solutions presented by the literature are generally difficult to use in practice since they are too theoretical and therefore hardly applicable. The research of the impact of demographic changes on labour especially with reference to the productiveness of IT departments is still low. Further research is recommended. To develop models which can be used in praxis, it is also necessary to collect more data to describe the problem more detailed. Examples for studies could be:

1. Execution of an analysis of the academic output in STEM graduates of the society and a survey of the demands of the IT departments regarding the hard- and softskills of their future employees.
2. Execution of a survey with IT-graduates from different universities to find out the expectations of these upcoming IT-employees.

Due to a linkage of the results, a statistical analysis can show the gaps between the companies and employees perceptions. It is also possible to derive the mistakes of organizations and its leadership with reference to psychological stress, unmotivation and unproductiveness of employees. After analyzing this data, it should be possible to construct a model that will take the positions and perceptions of both parties, employees and companies, into account and show, where the best balance for IT-departments, regarding managing human resources in times of scarcity of talent, exists.

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