ON ENTERPRISE INFORMATION SYSTEMS ADDRESSING THE DEMOGRAPHIC CHANGE

Silvia Schacht and Alexander Maedche

Enterprise Information Systems, University of Mannheim, L15 1-6, 68131 Mannheim, Germany

Abstract: The demographic change influences almost all area of life such as health care, education, social systems and productivity of companies. Therefore, appropriate adjustments to an aging society are necessary. To date, many studies have been carried out weighting the advantages and disadvantages of the various alternatives. The impact of an older workforce on productivity when using enterprise information systems was considered only sparsely. The following paper presents our research intention to design and develop EIS referring to the demographic change.

1 INTRODUCTION

If I had my way, I wouldn't have any engineers over 35 years old on my project." This kind of statements from managers reflects a growing concern about the aging workforce due to the demographic change taking place in each developed country. The reasons for these concerns are mostly negative stereotypes associated with elderly. For instance, it is often argued that older employees are disillusioned, discouraged and depressed, and have difficulties in understanding and using new information technologies and systems.

However, an older workforce may have some opportunities like company-wide networks and invaluable experience, which are rarely considered by the management. Today, employees with such skills are called knowledge workers. A workforce that consists in a large part of knowledge workers can form a significant competitive edge to companies because of their experiences and networking skills. This competitive advantage may be lost when the knowledge worker is leaving the organization by reason of a new job or even for retirement. Thus, companies have to face the challenges bred by the demographic change.

This paper provides an overview and a statement about our research on the impact of the demographic change and the needs to adapt and extend enterprise information systems (EIS) for elderly. The paper is structured as follows. Section 2 illustrates major changes on companies' environment in more detail.

The third section provides an overview on relevant related work. Section 4 outlines the primary research questions we identified. Finally, section 5 presents a summary of our future research activities.

2 MAJOR CHANGES

Since people are working together in organizations, working conditions are constantly changing. Main changes are the demographic change, the shift in type of work and the globalization driven by new technologies, information systems (IS) and Web 2.0 applications. The following section discusses these changes in more detail.

2.1 Demographic Change in Workforce

The current demographic change resulting in an aging population, presents a key challenge to societies and companies in many countries around the world. Between 2004 and 2050 the average age in the EU will increase from 39 to 49 years, while the number of people younger than 65 years will continue to decline. Therefore, in 2050 an old age-dependency ratio (number of people older than 65 divided by the number of people between 15 and 65) of 53% is anticipated.

Fertility, mortality, and migration are identified as the main drivers of the demographic change. In 2005, there was an average fertility rate of 1.5 births per women in the European countries. For a full

replacement of generations, however, a fertility rate of at least 2.1 is needed resulting in a shrinking population. The reduced mortality in early life will result in an increased life expectancy of about five years by 2050. The population is not only shrinking, but also aging. Migration is identified as the major determinant slowing the trend of demographic change. If the number of migrations will stay at the same level, a further increase of the working age population is expected until 2030. This growth will reach its peak in 2030 and thenceforward the number of working age people will decline (European Commission, 2007).

2.2 Changing Type of Work

Since industrial revolution the type of work in organizations is subject to many changes because of the continuous development of technologies like new machines, innovative ways of working and new demands on the workforce skills. At that the industrial revolution, work was characterized as repetitive, supervised, administrative and process driven (Erlich & Bichard, 2008). By excessive dividing tasks into sub-problems, employees could be encouraged to maximize the production speed by specialization. But the limits of productivity gains were achieved very quickly. Afterwards, the development of organizational psychology led to the realization of surplus value of an independent-minded employee, who analyzes and solves problems on their own initiative. These employees developed to experts in various fields producing, exchanging and using information to perform their work. They evolved to knowledge workers, whose type as well as their way of work are highly impacted by emerging information and communication technologies. Today the role and ratio of knowledge workers in relation to the manual workers becomes more and more vital for organizations (Erlich & Bichard, 2008).

2.3 Globalization

Globalization is a phenomenon that has been taking place more or less intensively since the age of exploration in the 15th century. Often, globalization is described as the integration of economies, societies and cultures through a globe-spanning network for trade, communication and execution of work. The last wave of globalization, which has been occurred in the 1990s, was affected by technological developments of the WWW, workflow software, supply chaining, etc. and enabled

individuals and groups to collaborate and compete globally (Friedman, 2005).

Together with the adoption of new information technologies (ITs), ISs developed from loosely interfaced "islands of automation" to a competitive edge of companies. This introduction of corporate technologies represents the first wave of productivity increase driven by technological developments. The second wave of productivity enhancement is promoted by new collaboration and communication systems that enable the knowledge sharing and cooperation between people all over the world. Therefore, companies are increasingly aware of their significance, today (Chui et al., 2009).

3 RELATED WORK

For a long time companies ignored the consequences of the demographic change despite many statistics from researchers and governmental institutions. But assuming older employees were really less productive, companies have to face the challenge of an aging workforce, now.

There are many studies from several disciplines like social psychology or medical science, which examined how performance differs by age. In their meta-analysis (Waldman & Avolio, 1986) figure out, that there is only a slightly negative impact of age on job performance. In fact, they reveal a performance increment with increasing age. However, other researchers like (Crépon et al., 2002) or (Dalton & Thompson, 1971) discover an inverted u-shaped curve of employees' performance in relation to their age. Furthermore, there is done much work ((Goudswaard, & deNanteuil, 2000), (Drucker & Berki, 1992)) in understanding the impact of different requirements for working and employment conditions on the productivity of company's workers. But, these studies were very general referring to various types of employees without considering their usage of ISs or new technologies.

With regard to new technologies and ISs, there are several studies ((Aula & Käki, 2002), (Meyer et al., 1997), (Stronge et al, 2006)), which analyze the usage behavior of older people in dealing with internet search engines. They figure out that older people have more difficulties and need more time to fulfill search tasks than younger participants. But the participants of such studies are mostly older than 65 years and usually have little or no experience in dealing with computers or software applications.

There is little work investigating the usage

behavior of older employees in using ISs. (Chadwick-Dias et al., 2002) analyze the overall performance of users based on various measurement categories considering the different web experiences of older employees. The researchers examined a positive correlation between age and overall performance. Often older people need more time and are less successful in task completion than their younger counterparts. Experience has also a positive correlation on the user performance. The more experienced the people are the higher is their performance. However, the size of the text has no significant effect on the performance of all participants.

4 RESEARCH ISSUES

Due to an aging workforce companies are forced to significant adjustments to their corporate culture and personnel management. Not only strategic changes such as support of the elderly through training or new personnel and wage policies are necessary. There also has to be conducted an adaptation on ISs to the needs of the new "old workforce".

We divided our research into two major streams: Firstly, we start with an examination of the needs of older workers in their working environment, where we try to understand real-world demands of elderly regarding ISs by running field studies including interviews and observations. Secondly, we will create design-driven solutions by customizing EISs to the needs of elderly and developing next-generation platforms to involve former employees and retirees into the day-to-day business of companies.

4.1 Understanding the Needs and the Work Style of Elderly

There are many rumors and realities about older workers in the literature. Often, phrases are mentioned like "older employees are less productive" or "older employees have difficulties to understand and to learn the use of new ISs". Because of these statements, elderly are discriminated or even not considered in engagements and the allocation to trainings.

According to (Liu & Fidel, 2000) older employees seem to have more difficulties than younger ones when dealing with complex EIS. In a study, the researchers evaluate the role of advanced

technological tools to share information between employees by rolling out a knowledge sharing system. Mostly older employees had difficulties in using the system. Other researchers assume that the usage of emerging technologies or ISs by elderly highly depends on their "perceived usefulness" (Morris & Venkatesh, 2000). Based on these findings we want to conduct surveys to examine the demands and behavior of elderly by using IS.

4.2 Designing Systems for Elderly

Today, ISs are used to fulfill an enormous amount of tasks. They are growing, interlinked and mutually integrated. Thus, they result in highly complex applications, whose usage is difficult to learn – not only for older employees. To increase the productivity of especially older workers in the use of EISs, we have identified following three approaches:

a) **Elderly-focused EIS.** Designing user-centered interfaces of EISs is widely examined by many researchers and programmers. Making EIS easier to use for elderly can have positive side effects to each employee of a company. In our research work, we want to detect these effects and define correlations between the several factors of influence.

b) **Providing Knowledge Management Systems for Elderly.** Today, there is a variety of EIS which support operational, tactical, and strategic processes. One group of ISs gained importance due to the high number of knowledge workers: knowledge sharing applications. These applications facilitate the externalization of employees' knowledge and its provision to the whole workforce of the company. Often, this workforce is highly heterogeneous consisting of traditional full-time employees, temporaries or part-timers. Therefore, knowledge and experience are as volatile as companies' employees. With an aging workforce, the risk of knowledge loss is increasing due to early retirement and pension. In order to keep the knowledge its boundaries, companies have to face the challenge of knowledge capturing. Thus, new models of knowledge sharing adapted to the needs of elderly, are needed. In our ongoing research, we want to analyze different established information exchange systems used in companies and identify best practices in knowledge sharing between employees and retired people.

c) Developing New Kinds of Demographic-centric ISs. The productivity of enterprises can be enhanced not only by adapting existing ISs to the demographic change and the needs of older employees. The introduction of next-generation platforms focusing on elderly, may also achieve a significant added value to companies.

In companies, there is a wide variety of activities, which fit to different types of employees. Because retired persons possess valuable skills, which may boost the competitiveness of the company, they should also be involved in the fulfillment of various tasks. Therefore, we plan to implement a private platform for companies to outsource tasks to its retirees according to the principle of crowdsourcing. Anyone of the former employees in the community who is interested in completing a task for the company can register to this platform and submit a solution. From all the submitted solutions the company evaluates their quality and rewards all of them or only single solutions. Therefore, such a platform may help companies not only to access the knowledge and experience of older employees and retired people, but also to save costs and drive innovation. After implementing the platform in a company an extensive study to verify the productivity enhancement should be carried out.

5 SUMMARY

The demographic change does not only entail an aging society, but also an aging workforce. To improve the performance of older employees, companies have to carry out many changes. Especially, in the field of EIS adjustments have to be conducted to leverage the potential benefits of elderly. In this paper we provided a statement about our research on adapting EIS to the challenge of an aging workforce.

We have identified two main research streams: Firstly, we will run an empirical study to understand the needs and work style of older workers in their real working environment and conditions. Secondly, we will design ISs for elderly. For this purpose, we will follow a design science driven approach and develop concrete software artefacts which then will be evaluated by elderly.

REFERENCES

Aula, A , & Käki, M. (2005). Less is more in Web search interfaces for older adults. *First Monday*, 10(7).

Chadwick-Dias, A., McNulty, M., & Tullis, T. (2002). Web usability and age: how design changes can improve performance. In *SIGCAPH Comput. Phys. Handicap.*, (73-74), 30-37.

Chui, M., Miller, A., & Roberts, R. P. (2009). Six Ways to make Web 2.0 work. In *The McKinsey Quartely*.

Crépon, B., Deniau N. & Pérez-Duarte, S.. (2002). *Wages, Productivity and Worker Characteristics : A French Perspective*. Mimeo, INSEE.

Dalton, G. W., & Thompson, P. H. (1971). Accelerating obsolescence of older engineers. In *Harvard Business Review*, 49(5), 57-66.

Drucker, P. F., & Berki, S. (1992). Incentives for Productivity Improvement. In Health care finance: economic incentives and productivity enhancement. Auburn House.

Erlich, A., & Bichard, J. (2008). The Welcoming Workplace: designing for ageing knowledge workers. In *Journal of Corporate Real Estate*, 10(4), 273-285.

European Commission. (2007). *Europe's Demographic Future: Facts and Figures on Challenges and Opportunities*. European Communities. Retrieved from http://ec.europa.eu/employment_social/spsi/docs/social_situation/demo_report_2007_en.pdf

Friedman, T.L. (2005). The World is Flat (1st Edition). Farrer, Straus and Giroux.

Goudswaard, A., & de Nanteuil, M. (2000). *Flexibility and Working Conditions: A Qualitative and Comparative Study in Seven EU Member States*. Dublin, Ireland.

Liu S., & Fidel, R. (2007). Managing aging workforce: filling the gap between what we know and what is in the system. In *Proceedings of the 1st ICEGOV* (S. 121-128). Macao, China: ACM.

Meyer, B., Sit, R. A., Spaulding, V. A., Mead, S. E., & Walker, N. (1997). Age group differences in world wide web navigation. In *CHI '97 extended abstracts on Human factors in computing systems: looking to the future* (S. 295-296). Atlanta, Georgia: ACM.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. In *Personnel Psychology*, 375-403.

Stewart, O., Huerta, J. M., & Sader, M. (2009). Designing crowdsourcing community for the enterprise. In *Proceedings of the ACM SIGKDD Workshop on Human Computation* (S. 50-53). Paris, France: ACM.

Stronge, A. J., Rogers, W. A., & Fisk, A. D. (2006). Web-Based Information Search and Retrieval: Effects of Strategy Use and Age on Search Success. In *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 48(3), 434-446.

Waldman, D. A., & Avolio, B. J. (1986). A Meta-Analysis of Age Differences in Job Performance. In *Journal of Applied Psychology*, 71(1), 33-38.