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Exploring Root Problems in Enterprise System Adoption From an Employee Age Perspective: A People-Process-Technology Framework

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ABSTRACT

This study investigates the role of employees' age in the perception of problems during enterprise systems (ES) adoption and use. The analysis of data gathered from Polish ES practitioners suggests that ability to perceive the broad impact of technology decreases with age. The findings also illustrate that younger employees recognize root problems among technical issues, while older practitioners focus on impediments associated with people and emphasize the role of competence and training as root causes.

Introduction

Enterprise systems (ES) are one of the most advanced IT systems widely used by various organizations. ES, having their roots in Materials Requirements Planning (MRP), Manufacturing Resource Planning (MRP II), and Enterprise Resource Planning (ERP) systems, are currently very complex systems that support the management and integration of the whole company and offer interorganizational integration with company's clients and suppliers (Volkoff, Strong, & Elmes, 2005). Although ES were originally used by manufacturing companies, they are now present in organizations from many different sectors, including universities, healthcare, and public sector organizations (e.g., Gable, Sedera, & Chan, 2008; Khoumbati, Themistocleous, & Irani, 2006).

ES implementation is a very complex and challenging process, which largely stems from a great number of stakeholders involved in or affected by the ES implementation process, such as employees of the adopting organization, system provider, and the organization's customers and providers (e.g., Soh, Chua, & Singh, 2011). ES adoption might bring many benefits to the adopting company (e.g., Soja & Paliwoda-Pękosz, 2013); however, prior research indicates that during ES implementation, a variety of problems may appear, and they may embrace various issues associated, among other things, with technology and involved or affected people (Kim, Lee, & Gosain, 2005; Soja, 2008).

Due to population ageing, organizations are expected to struggle with a workforce shortage. In addition, extending employees' professional activity on the labor market will result in an ageing workforce structure in organizations (e.g., Boersch-Supan, 2008). Prior research suggests that employees' work capacity changes with age. For instance, interpersonal skills develop with age; however, at the same time, older employees experience difficulties in adapting themselves to changed work conditions associated with new technology (e.g., Ilmarinen, 2001; Wagner, Hassanein, & Head, 2010).

In light of an ageing workforce, it is therefore interesting to investigate if impediments experienced during ES implementation projects are perceived differently depending on workers' age. This is mainly due to a growing ES adoption rate in various industries and a mandatory character of ES use in organizations (e.g., Keong, Ramayah, Kurnia, & Chiun, 2012). In consequence, many employees in diverse organizations could be affected by ES adoption projects and face the challenge of using ES at work. By taking into consideration employee age, it is likely to better recognize source problems occurring during ES implementation projects. In this context, we would like to investigate the following research questions:

- How does the perception of difficulties during ES adoption and use vary depending on employee age?
- What is the role of employee age in the perception of problem causes?

The current study is based on data gathered in Poland, an example of a transition economy, i.e., an economy

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being in transition from a centrally planned system to a free market system (Roztocki & Weistroffer, 2011). Poland, together with other transition economies, as explained later in more detail, will experience significant ageing of society and labor force in the future. Therefore, it appears especially beneficial to examine the role of employee age in such economic settings. The results of our study should be useful to better understand various considerations of human capital management in transition economies, which is an important foundation of a country's economic growth and competitiveness (e.g., Kowal & Roztocki, 2015).

An investigation of the perceptions of ES implementation root problems depending on age should allow us to formulate propositions with respect to effective ES implementation and selected approach to project and change management. Considering age-based perceptions of root problems should help ES practitioners to better address concern of employees in different age cohorts by adjusting preventative measures, such as training programs or customized system interface, to their work capacity. In general, we believe that the worked out recommendations might help older employees in overcoming fear and lack of acceptance of changes introduced by information and communication technology (ICT).

The remainder of the paper is organized as follows. In the next section, presenting research background, we focus on various implications of ageing and we outline the main problems in ES adoptions reported by prior research. Then we describe our research approach, which is followed by the presentation of results. We then discuss our findings and explain the implications for practice and research. Next, we provide the discussion of limitations and future research. Finally, the study ends with concluding remarks.

Research background

Nowadays, population ageing is a typical phenomenon of developed countries. According to demographic forecasts, the process of population ageing will deepen in time. This is due to change of basic demographic phenomena (fertility and mortality) in the past and the continuance of their course in the future (Basten, Lutz, & Scherbov, 2013; Coleman, 2001; McMichael, McKee, Shkolnikov, & Valkonen, 2004). Decrease in fertility and its values remaining below the replacement level leads to a decreasing number of people in younger age groups. At the same time, there are gains in life span related to decrease in mortality. This situation results in a change in the structure of the population in developed countries.

According to United Nations projections (2015, medium scenario), the percentage of people at age 65 and above

will increase, and the percentage of population aged 0–19 will decrease. The middle group in age 20–64 is of special importance as it defines the potential labor force. The share of the potential working age population in Europe will decrease by about 11 percentage points between 2015 and 2060. The forecasted decline for transition economies in Eastern Europe will be stronger (about 13 percentage points), and in Poland, the loss will be as high as 16 percentage points. At the same time, the labor force will gradually age. It is foreseen that the participation rate of older people (55–64) in the European Union (EU) will increase by about 15 percentage points between 2013 and 2060 due to the projected impact of pension reforms and societal trends affecting women participation rates (European Commission, 2015).

Demographic changes will have a profound influence on the whole economy and, among other things, affect the labor force, whose size will significantly shrink (e.g., Boersch-Supan, 2008; McMorrow & Roeger, 2004). In consequence, an adaptation to new conditions will be the main challenge for all actors (i.e., organizations, employees, and employers) involved in economic processes. Prior research suggests that employers tend to associate an ageing staff with more experience and comprehensive knowledge, but also with higher costs and lower productivity levels (e.g., Conen, van Dalen, Henkens, & Schippers, 2011; van Dalen, Henkens, & Schippers, 2010). Researchers indicate that work capacity evolves along with employee age (i.e., Ilmarinen, 2001; Pinal, Zurrón, & Díaz, 2015; Skirbekk, 2008; Wagner et al., 2010). For example, with age, the so-called soft skills (interpersonal and communication skills) grow, but at the same time, reluctance to change and technology anxiety increases. In consequence, older people are less likely to use technology-based solutions such as internet or electronic government (Hill, Beynon-Davies, & Williams, 2008; Weerakkody, Dwivedi, El-Haddadeh, Almuwil, & Ghoneim, 2012).

The future success of organizations depends on abilities to adjust to demands of ageing societies. Thus, decision making in the field of operational and strategic management should take into consideration that workforce resources are ageing and getting smaller and smaller. In particular, it is important to create opportunity for older people (employees or customers) to adapt to the continuous changes in the contemporary economy in the context of the widespread use of ICT. Organizations have to work out solutions to deal with the necessity to constantly introduce technology-related changes. Special attention should be paid to older employees as they appear to have greater needs with respect to technology. In particular, Hill and colleagues (2008) emphasize that the internet engagement of older people often requires overcoming mental barriers, having clear motivations, and employing trainings adjusted

to their needs. In a similar vein, Ilmarinen (2001) points to the responsibility of employers to help older workers to adjust themselves to technological changes in a work organization. The author claims that the common need to blame the worker should be redirected toward those responsible for planning and carrying out changes at work, who overlook the need for adjustments.

In light of an ageing workforce, implementation of advanced ICT solutions might pose a major challenge to adopting organizations. This especially refers to the process of ES implementation in an organization, which is very complex, risky, and associated with numerous problems and barriers. The ES adoption process is a multifaceted endeavor and should be perceived within broader socio-economic contexts (Kaniadakis, 2012). The impediments reported by prior research refer to various aspects such as social, organizational, and technological considerations. Social problems, or in other words people-related considerations, are associated with people involved in and affected by the ES implementation project. Organizational problems refer to the adopting company and the ES implementation process organization and run. Technology-related considerations relate to the system being implemented and surrounding IT infrastructure.

People-related problems embrace various considerations mainly associated with people's limited competence and negative attitudes. The particular impediments refer to lack of users' acceptance and involvement (Kim et al., 2005; Wright & Wright, 2002), inadequate knowledge and competence of project participants (Kim et al., 2005; Lech, 2016; Soja, 2008), and people's reluctance or resistance to changes and the new system (Kim et al., 2005; Soja & Paliwoda-Pękosz, 2009).

Organizational problems referring to an adopting company include poor company organization and resources (Soja, 2008; Soja & Paliwoda-Pękosz, 2009), difficulties with business process reengineering (Hakim & Hakim, 2010; Kim et al., 2005; Wright & Wright, 2002), and interdepartmental conflicts (Kim et al., 2005). Difficulties related to an implementation process include first and foremost time overrun (Kremers & van Dissel, 2000; Themistocleous, Irani, O'Keefe, & Paul, 2001) and high implementation costs and cost overrun (Momoh, Roy, & Shehab, 2010; Soja, 2008; Themistocleous et al., 2001). Other process-related impediments comprise inadequate provider's competence and support (Soja, 2008) and difficulties with trainings (Hakim & Hakim, 2010; Wright & Wright, 2002).

Technology-related problems associated with the system solution being implemented boil down to system drawbacks and efficiency (Kremers & van Dissel, 2000; Soja, 2008; Wright & Wright, 2002) and difficulties with system customization (Markus, Axline, Petrie, & Tanis, 2000; Themistocleous et al., 2001) and system integration (Themistocleous et al., 2001). Technological problems associated with infrastructure include inadequate or missing hardware, software, or network infrastructure (Soja, 2008; Soja & Paliwoda-Pękosz, 2009). Technology-related problems may affect smaller companies to a greater extent than larger organizations (Awa & Ojiabo, 2016).

In prior research, problems concerning ES implementation were investigated from various stakeholder perspectives, e.g., adopters (Kim et al., 2005; Kremers & van Dissel, 2000; Themistocleous et al., 2001), representatives of ES system suppliers or consulting companies (e.g., Soja, 2008; Wright & Wright, 2002), and respondents from system providers and adopters (Markus et al., 2000; Soja & Paliwoda-Pękosz, 2009). Nevertheless, to the best of our knowledge, in ES implementation research, a gap still exists, associated with lack of in-depth investigations of employees' age and demographic background. Such an approach seems important and worth investigating in light of global demographic changes and an ageing labor force. Few studies in this area include the works exploring the role of age in the perception of impediments and related solutions during ES adoption projects (Soja, Paliwoda-Pękosz, & Soja, 2015; Soja, Soja, & Paliwoda-Pękosz, 2016).

Another shortcoming of prior ES-related research is related to the relationships among the difficulties occurring during an ES implementation project. Prior studies mainly limit themselves to discovering difficulties, grouping them into categories, and eliciting the most important issues. In doing so, they rather do not investigate relationships among the discovered considerations and few studies focused on discovering causal relationships among problems. In particular, Nah, Tan, and Teh (2004) focused their investigation on issues influencing the lack of end-user acceptance and therefore tried to discover causal relationships among various considerations. Sammon and Adam (2010) investigated the causal relationship between one selected issue, i.e., the organization's preparedness, and the emergence of implementation problems. Finally, Soja and Paliwoda-Pękosz (2009) concentrated on discovering a range of source problems during ES implementation; however, their investigation is lacking in-depth stakeholder and age-related analysis.

The current study seeks to address the above discussed shortcomings of prior research associated with lack of an in-depth age-related analysis and scarcity of investigations exploring causal relationships among difficulties. In doing so, the current study builds upon the research by Soja and Paliwoda-Pękosz (2009) and extends their investigations of an in-depth age-related analysis. The authors believe that such an exploration should give more insight into the role of age during ES

implementation and should yield some recommendations for teamwork, knowledge transfer, and change management program depending on employee age.

Research method

In order to answer our research questions, we turned to practitioners to find out what are their views concerning impediments during enterprise system implementation and use. During the data gathering process, various employees from companies located in Poland were interviewed. In consequence, 187 opinions were gathered from respondents who expressed their thoughts about ES adoption projects which they experienced. The respondents represented various ES adopters and providers. In the case of ES adopters' representatives, the interviewees usually expressed their opinions on the basis of a single project introducing ES into their organization. The providers' representatives, in turn, formulated their views on the basis of a usually much broader experience of cooperating with several adopter organizations. In general, the respondents played diverse roles in ES implementations such as end user, member of the implementation team, project manager, or project supervisor. The organizational positions of the interviewed people also varied and included all levels of the organizational hierarchy, i.e., operational employees, managers, directors, and top management representatives.

In order to gather data on impediments, the respondents were asked an open-ended question associated with the most important problems they perceived during the ES adoption project and/or further system use. In addition, the respondents were asked to express their opinions regarding the causes of each problem enumerated. Such an approach served two purposes. First, it allowed us to increase the validity and credibility of data by the means of data triangulation (Denzin, 1978; Jick, 1979). Second, it provided data for analyzing relationships among the impediments, which, in consequence, allowed us to suggest some casual links among the investigated issues and candidates for root problems.

In consequence of the data gathering process, respondent opinions expressed in natural language have been collected. Such an approach was believed to help in gathering a broad range of respondent opinions allowing us to perform an in-depth investigation of impediments during ES adoption. The first step in data analysis was the categorization of respondent opinions about the difficulties. In doing so, we employed a "bottom-up" approach to coding data (Dey, 1993) and developed coding schemes inductively, grounding the examination of emerging issues in the data. It should be noted that during the process of

categorization, respondent declarations regarding problems and problem causes were analyzed jointly as a general pool of issues describing impediments experienced by practitioners during ES projects. The initial categorizations of impediments were prepared by each of the authors separately and were next agreed upon by the authors. This approach was believed to increase the robustness of data analysis by the means of investigator triangulation (Denzin, 1978).

In the next step of the data analysis process, the distribution of problems and problem categories across different respondent age ranges has been elaborated. Such an examination was performed in order to investigate the role of employee age in perceiving impediments occurring during ES adoption and use. The analysis was performed for the following datasets: the whole set of issues (i.e., problems and problems causes), problems only, and problem causes only. In addition, respondent declarations regarding causes of problems have been analyzed and set against the problems identified. In the subsequent sections, some more details about the performed analyses have been provided.

The data analysis was supported by several software tools. The data including interviews transcripts and details regarding the respondents were stored in an MS Access database. The analysis process was supported by various queries and reports using the SAP Crystal Reports reporting package. MS Excel was also used to gather and compare the individual analysis made by the researchers, providing a platform to discuss the agreements and disagreements, thus supporting investor triangulation.

As mentioned earlier, in order to investigate the role of age in the perception of problems, we divided respondents into groups on the basis of their age. In doing so, we adopted the definition of older employees from demographic research, where the starting age for this group of people is often defined as 50 years (e.g., Conen et al., 2011; Soja et al., 2016). In consequence, the following age groups were defined: Age1—less than 35 years (Younger), Age2—between 35 and 49 years (Middle-aged), and Age3—50+ years (Older). In total, 187 respondents expressed their opinions as regards impediments perceived during ES adoption and use. The distribution of respondents by age groups is presented in Table 1.

Table 1. Respondents by age group.

Age group	Number of respondents
Age1 (Younger)	102
Age2 (Middle-aged)	60
Age3 (Older)	25

Data analysis and results

Problems and problem categories

The use of qualitative approach for the empirical data analysis allowed us to identify three main impediments categories perceived by respondents during ES implementation. They include problems associated with technology (category "Technology"), reported difficulties associated with implementation process run (category "Process"), and problems related to people involved in or affected by the implementation project (category "People"). Technology-related issues were reported by 68% of respondents, impediments associated with implementation process run were indicated by 62% of responding practitioners, and people-related problems attracted attention of 53% of respondents.

It should be emphasized that some considerations pointed out by the respondents have a multifaceted character and may span across several categories. For such potentially ambiguous issues, we made an attempt to distinguish the leading category capturing the predominant meaning of the respondent opinions. A good example is a problem "communication," which generally might be treated as a people-related consideration, but has been assigned to the category "Process" in our analysis. The reason behind such a decision was that the above-mentioned problem "communication" captures the respondents opinion associated with various communication-related issues perceived during the implementation project run, such as lack of communication between the project management personnel and various departments of the company.

Category "Technology"

This category includes four impediments related to the system solution being introduced into the organization. The first problem emphasizes problems associated with system quality such as errors, inadequate efficiency, lack of integrity, and deficient user interface. The second problem, fit, refers to the relationship between the characteristics of the new enterprise system and company expectations. Particular issues indicated by the respondents embrace lacking system functionality, lack of fit to company and its needs, and lack of compliance with legal regulations. The third problem emphasizes difficulties associated with infrastructure such as inadequate network, hardware, and technical issues. The last problem is associated with data quality. The respondents indicate here first and foremost difficulties with data transfer from legacy systems to the new ES and, to a much lesser extent, problems with entering data into the new ES.

Category "Process"

The category associated with the implementation process run includes seven problems. The most frequently indicated problems include impediments associated with the project definition such as inadequate needs and requirements analysis, insufficient preparation, and faulty planning. The second problem refers to company organization and condition. Particular issues here include difficulties with carrying out changes, inadequate company organization, and insufficient interdepartmental cooperation. The third problem relates to trainings and issues associated with time, quality, and scope of trainings. The fourth group of impediments refers to the provider and includes problems with consultants and their inadequate experience and competence, insufficient provider's resources, and poor cooperation with the provider. The next group of difficulties relates to the project schedule and includes such issues as delays, too short time, and lack of time for carrying out implementation tasks. Then, difficulties with company's finances were reported, such as limited or exceeded budget and high project cost. The process-related category is concluded by reported difficulties with communication during the project run.

Category "People"

The category associated with people involved in or affected by the implementation process includes five main problems. The first group of difficulties relates to employees' competence and includes such issues as inability to operate the system, lack of competent employees, inadequate skills, and mistakes in system operation. The second group of problems refers to people's negative attitudes such as reluctance, lack of system acceptance, resistance, and fear. The third group of difficulties touches upon people's habits and adaptation to the new system and company organization. Particular issues here refer to employees accustomed to legacy systems/organization and difficulties in adapting oneself to new processes. The next group of difficulties refers to managerial staff and their lack of involvement and awareness. The last group of problems, named "people," embraces general declarations of occurrences of difficulties with employees. In these opinions, the respondents mentioned problems with employees or people in general, without indicating any details about the character of these difficulties.

Perceptions of problems by age

The outcomes of data analysis from the employee age perspective are presented in Table 2. The table presents the distribution of reported problems across the three age groups. The bullets in the table were defined on the basis of the percentage of responses provided by the

Table 2. Impediments by respondent age group.

Impediment / Category	Younger	Middle-aged	Older
Technology			
system quality	●	●	●
fit	●	◕	◑
infrastructure	◕	◕	◕
data quality	◕	◑	○
Process			
project definition	◕	●	◕
company organization and condition	◕	●	◑
training	◑	◑	◕
schedule	◑	◑	◑
provider	○	◑	◑
finance	◑	◑	○
communication	○	○	
People			
competence	◕	●	◕
attitudes	◕	◑	●
adaptation and habits	○	◑	○
managerial staff	○	○	○
people	○	○	○

respondents from an individual age group reporting a given impediment. This approach allowed us to mitigate the effect of disproportionate age subsamples.

Problems from the category "Technology" are the most emphasized by younger respondents (groups Younger and Middle-aged). The perception of impediments associated with system fit to the company's needs and problems related to the system quality clearly decreases with age.

In the case of the category "Process," we can notice that the perception of all subcategories except "training" and "schedule" is a little higher among middle-aged respondents as compared to younger or older

respondents. It should also be added that the oldest respondents most often reported the problems associated with training.

In the case of the last category "People," the oldest respondents most strongly emphasize the problems with attitudes, and then difficulties associated with competences of the employees. In turn, respondents from the middle-aged group most frequently point at problems with competence and in the second place at problems with attitudes and difficulties with adaptation and habits. The youngest respondents with the same intensity report subcategories related to competence and attitudes.

Problems and problem causes

In the next step of our analysis, we investigated the relationships among reported problems and their direct causes reported by the respondents. During the analysis, we took into consideration respondents' age. The results are displayed in Table 3. In order to evaluate the strength of the relationships, we took into consideration the following criteria: the number of resulting problem categories which were brought about by a single problem cause (number of bullets at the row level for a given age group) and the intensity of the reported problems capturing the effect of a selected cause (expressed by the bullet types at the row level). While evaluating the intensity of problem perceptions by age groups, we took into account different group sizes and we calculated percentages of responses provided by the respondents from corresponding age cohorts.

Table 3. Problem causes and problem categories by respondent age group.

Problem cause	Technology-related problems			Process-related problems			People-related problems		
	Younger	Middle-aged	Older	Younger	Middle-aged	Older	Younger	Middle-aged	Older
Technology									
system quality	●	◕	●	○	○		○	○	○
fit	●	◑	○	○	○	○			
infrastructure	◑	●	●	○					
data quality	◑	○				○			
Process									
project definition	○	○	○	○	●	○	○		○
company organization and condition	○	○	○	◑	◑	○	○	○	○
training	○	◑		○	○	●	○	○	○
provider	○	◑	○	○	○		○		
schedule	○			○	○	○	○	○	
finance	○			○	○				
communication				○				○	
People									
competence	○	○		○	◑	◑	◑	◑	●
attitudes	○			○	○	○	◕	◑	●
adaptation and habits	○	○	○	○	○		○	◑	
managerial staff	○			○	○	○	○		○
people							○		

For instance, respondents from the Younger group indicate that problems associated with schedule (row "schedule" in the group "Process") generate to a small extent problems in all problem categories (i.e., Technology, Process, and People), which is indicated by ↺ in columns "Younger" in all categories. Although the intensity of reported problems in individual categories is rather small, they occur for all problem categories and hence the problems associated with schedule were recognized as important problem causes.

In the case of problem causes related to infrastructure (row "infrastructure" in the group "Technology"), reported mainly by the middle-aged respondents, the situation is opposite. We deal here with a very strong intensity but the range of influence is limited to one category (Technology). In this case, the criterion associated with the intensity of perceived relationships allowed us to recognize infrastructure-related difficulties as important causes of other problems.

Taking into consideration the above-defined criteria, we achieved some suggestions for causal relationships, which are briefly explained below.

Category "Technology"

We discovered three main problem causes: system quality, fit, and infrastructure. Problem causes related to system quality were generally reported regardless of respondent age and they seem to affect all problem categories. Nevertheless, they have the strongest influence on technology-related problems. Problem causes related to fit mainly have an impact on technology-related problems and, to a lesser extent, on problems from the category Process. These problem causes were mainly reported by the younger respondent. Finally, problem causes related to infrastructure are mainly in relationship with technological problems. They are somewhat more strongly emphasized by middle-aged respondents.

Category "Process"

In this category, we distinguished five main problem causes: project definition, company organization and condition, training, provider, and schedule. Problem causes related to project definition generate problems in all the three problem categories and are reported regardless of respondent age. Nonetheless, the middle-aged respondents greatly emphasize the impact of these causes on process-related problems. Problem causes related to company organization and condition are perceived as factors influencing all problem categories and are mainly indicated by the younger respondents (groups Younger and Middle-aged). Shortcomings related to trainings are perceived as causes of all problem categories regardless of

respondent age. However, the oldest respondents strongly emphasize the influence of training-related problems on difficulties associated with the implementation process. The last two groups of problem causes, related to provider and schedule, have a small impact on all problem categories. The first group (i.e., provider) is mainly noticed by the middle-aged respondents, while the second (i.e., schedule) is indicated by the youngest group.

Category "People"

In general, all causes belonging to the category People, except for the last impediment capturing general employee-related difficulties, have an impact on at least two problem categories. The causes related to competence impact to a greatest extent on problems from categories People and Process. These relationships are perceived to a greatest extent by older respondents from the groups Middle-aged and Older. The attitude-related problem causes seem to have the strongest influence on problems associated with people and next, with a somewhat smaller intensity, on process-related difficulties. The problem causes associated with people's attitudes were reported with the greatest intensity by the youngest and the oldest respondents. The middle-aged respondents, in turn, most often indicate a moderate influence of problem causes associated with people's adaptation and habits on problems from all categories, with a special emphasis on people-related difficulties.

Discussion

Relationships among problem categories

Taking into consideration relationships among problem causes and problems (see Table 3), we notice some diversity in the perceptions of these relationships depending on respondent age. These perceptions for individual age groups have been depicted in Figures 1–3. The arrows in
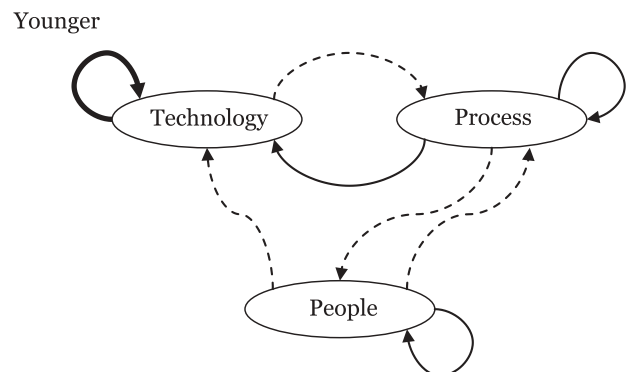

Figure 1. Causal relationships among problem categories perceived by younger respondents.
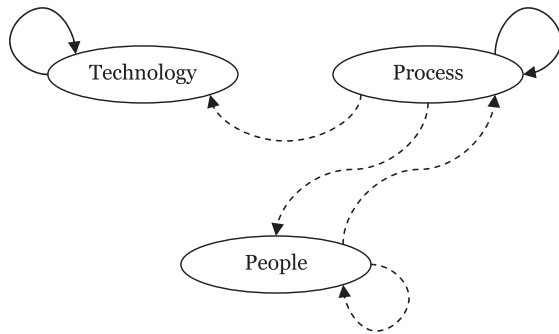
Middle-aged

Figure 2. Causal relationships among problem categories perceived by middle-aged respondents.
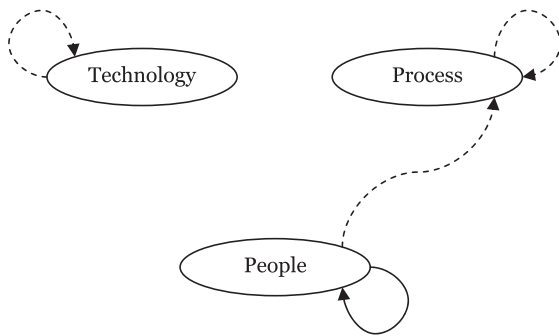
Older

Figure 3. Causal relationships among problem categories perceived by older respondents.

the pictures illustrate the direction of the relationships, and the style of line demonstrates the strength of the relationships. The solid bold line shows the strongest relationship, regular solid line illustrates a moderate association, while dotted line shows a weak relationship.

The youngest respondents perceive the greatest number of mutual relationships among problem categories. They report to the greatest extent associations among problems within category Technology. The youngest respondents also perceive at a moderate level mutual relationships among difficulties within categories People and Process. With respect to cross-category relationships, the youngest respondents perceive at a moderate level the influence of process-related difficulties on problems associated with technology. The middle-aged respondents emphasize to the greatest extent mutual relationships among problems within the category Process and difficulties within the category People. In the case of the oldest respondents, moderate relationships were noticed only among problems within the category People.

Taking into considerations the intensity of associations among problem categories (People, Process, and Technology) and perceptions from the perspective of respondent age groups, we proposed a framework describing a preliminary model of causal relationships among difficulties capturing age, problems, and problem causes (see Figure 4).

The proposed model illustrates first and foremost relationships among difficulties belonging to the same problem
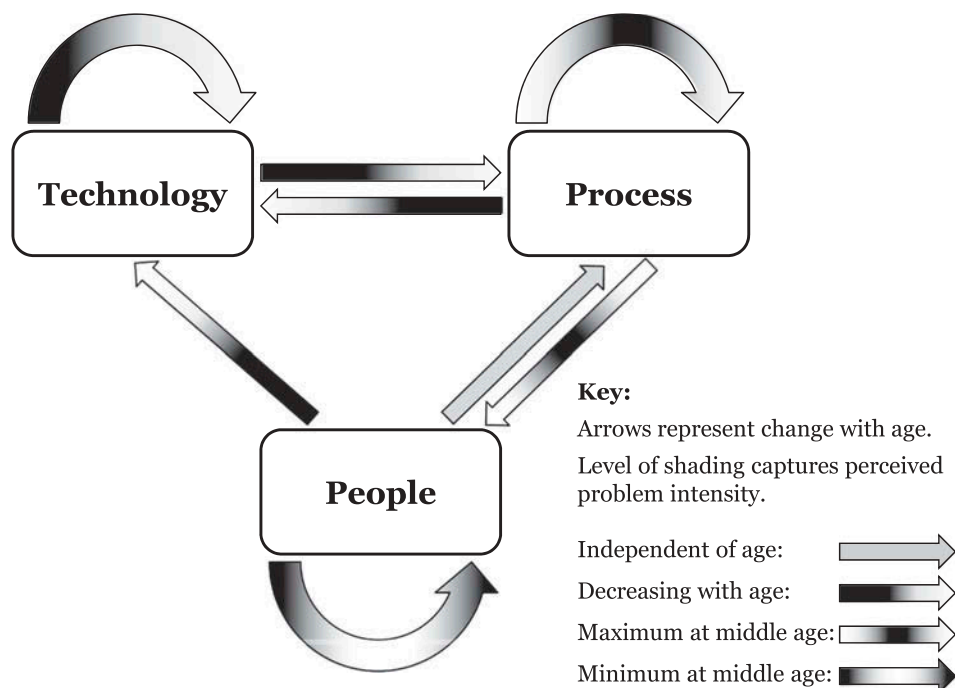

Figure 4. Perceived causal relationships among problem categories depending on age: A people-process-technology framework.

category and these associations refer to all categories, i.e., People, Process, and Technology. Within-category associations are definitely stronger than cross-category relationships. Nevertheless, their intensity is diverse with respect to age. In particular, the perception of mutual relationships among technology-related problems decreases with age. In the case of people-related difficulties, within-category relationships are perceived to the smallest extent by the middle-aged respondents. At the same time, this group of respondents seems to perceive to the greatest extent mutual associations among difficulties from the category Process.

The second group of relationships depicted by the proposed model refers to directed cross-category relationships which involve difficulties from different problem categories. Such relationships allow us to distinguish problem categories which might capture the potentially most important source difficulties. Such categories might be discerned taking into consideration the number of outgoing cross-category arrows. Taking into consideration this regularity, we might notice that categories Process and People represent domains with potentially the greatest difficulties. In addition, the category People might be perceived as the source problem category to a greater extent because the reported relationships are more often independent of age. This is especially emphasized by a relationship describing an impact of people-related difficulties on problems associated with process. The remaining cross-category relationships are diverse with respect to age.

Mutual relationships among categories Technology and Process are of moderate intensity and their perceptions decrease with age. Relationships between the category Process and problems from the category People are also of moderate intensity and, in this case, are mostly perceived by the middle-aged respondents. However, the opposite relationship, as mentioned earlier, is independent of age. The last cross-category associations refer to the influence of people-related problems on difficulties from the category Technology. We might notice that such an influence is moderate and decreasing with age.

Perceptions of root problems

The following section includes the description of problems which might be defined as root problems. We distinguished candidates for root problems employing two criteria. The first criterion captures the breadth of cross-category influence of given problems and the intensity of the perceived impact. The second criterion refers to the investigation if a given problem was reported more often as a problem cause than as a regular difficulty. If an element satisfies this

Table 4. Candidates for root problems by respondent age.

Impediment /Category	Younger	Middle-aged	Older
Technology			
system quality	✓	✓	✓
fit	☑	✓	
infrastructure	✓	☑	
data quality			□
Process			
project definition	✓	☑	✓
company organization and condition	✓	✓	
training	✓	✓	✓
provider	□	✓	
schedule	✓		
finance			
communication	□		
People			
competence	✓	✓	☑
attitudes	✓	✓	✓
adaptation and habits	✓	✓	□
managerial staff	✓		□
people			

Notes:

Issues having essential within-category impact or important cross-category impact marked with ✓

Issues reported more often as problem causes than problems marked with □ (and marked in bold when the difference is considerable).

criterion, we might hypothesize that it captures the fundamental difficulties being often a source of other problems. The results of the analysis are presented in Table 4.

The two above-defined criteria were satisfied to the greatest extent by two issues: (1) technical problems related to infrastructure perceived by the middle-aged respondents and (2) difficulties associated with people's competence indicated by the oldest respondents. The criteria were to a moderate extent satisfied by problems related to fit and difficulties associated with project definition. The former were mostly reported by the younger respondents, while the latter by the middle-aged. Examples of root problems related to infrastructure include inadequate network infrastructure, while with respect to people's competence, sample root problems involve lack of skills and experience needed for enterprise system use. The fit-related root problems include difficulties with system customization and problems with integration with legacy systems. The sample root problems related to project definition include lack of an in-depth preimplementation analysis.

Recap: Age groups characteristics and problems

Taking into consideration the perceived impediments during ES implementation projects and perceived causal relationship among the problems, we can try to define some characteristics of the age groups analyzed in the study and discuss some relationships among them. The age-related analysis allowed us to formulate some

observations and explanations, which are provided in the following paragraphs.

The youngest respondents are generally believed to possess up-to-date knowledge of state-of-the-art IT solutions. Compared to older people, they reveal the greatest proficiency and ease in using current IT-related devices and applications. Therefore, it is not surprising that they notice first and foremost technical problems and also perceive technology-related difficulties as source of other problems. Nevertheless, the younger respondents also perceive to a large extent difficulties associated with people. This might be understood in the light of an ageing workforce and inevitable cooperation between young and old employees. The young might notice the contrast between their own easiness in using technology and some incompetence of older workmates.

The middle-aged respondents appear to be in the most productive stage of their professional careers. They reveal reasonable job experience and also possess a decent current knowledge and skills. The middle-aged employees seem to focus on operation and perceive to a large extent difficulties associated with a company's organization. They emphasize process-related impediments and recognize among them some root problems. They also notice people-related impediments, such as competence. In addition, the middle-aged employees perceive people-related issues associated with their habits and resulting problems in adapting to the new system and organization of work. The middle-aged respondents are more likely to supplement their education and adapt themselves to a changing environment. In consequence, they might have difficulties in understanding their older workmates and age-imposed restrictions. At the same time, the middle-aged respondents recognize the critical role of technology and perceive some root problems among technical issues, such as infrastructure.

The older respondents generally focus on people and problems associated with people. They reveal substantial professional experience and interpersonal skills; however, they seem to experience major difficulties with technology. In their perception of technology-related impediments, older employees appear to emphasize the role of competence and training as root causes. They perceive the shortcomings of available human capital and acknowledge the need to supplement IT-related skills and knowledge. With respect to employees' education, older workers seem to acknowledge the responsibility of management personnel and their important role in the organization of trainings, which are perceived as a potential solution to the competence-related problems.

Implications and future research

Implications for practice

Problem solving

The current study's results illustrate some important implications with respect to problem solving and the role of age in this process. The findings suggest that young employees might be especially valuable when the company has to deal with detailed technical problems, as they are able to comprehend the multifaceted impact of technology. Young employees in their perception of technical problems are accompanied by the middle-aged workmates who are also able to comprehend technological considerations. In addition, the middle-aged employees do not underestimate people-related problems; however, they might not be able to indicate the best solutions related to people's attitudes and competence. The middle-aged workers tend to have a general and holistic perception of the situation; nevertheless, they need younger workmates to recognize technical problems at a detailed level and older colleagues to better understand people-related considerations. In particular, older employees might be helpful in understanding the importance of ICT-related trainings and other measures needed to help older people to overcome fear of change. Older employees are generally less focused on competition and development of their professional careers. In consequence, they might reveal a greater willingness to cooperate with other employees. If they supplement their IT knowledge, they might have a disposition to become consultants or trainers, which is essential in organizations characterized by an ageing workforce.

Change management and trainings

Enterprise system implementation requires a well-thought-out change management program in order to help employees to accept changes imposed by the new ES. In doing so, as suggested by the current study's findings, it appears beneficial to take into consideration employee age. Trainings are an important tool in change management as they help employees to gain knowledge and skills necessary to work in changed organizational processes and new enterprise system. The results suggest that older and middle-aged employees might require supplementary training on basic computer and new technology-related skills organized before the actual ES implementation project. Such trainings should help them to achieve a reasonable IT proficiency and create a good basis for the future ES-specific trainings and system acceptance.

Trainings organized during the ES project and related to new processes and system operation might benefit from the age-balanced organization. Trainings content and time should be adjusted to participants' age and

related cognitive abilities. In particular, when dealing with older workforce, the trainers have to assure that training content is understandable for the older trainees and should allocate more time for training sessions. A useful solution for trainings might be the "train-the-trainers" approach, a well-known method in the ES domain, but adopted from the employee age perspective emphasizing cooperation between the younger and older workers. In particular, younger trainers might instruct the group of prospective older trainers who, in turn, will deliver training sessions to older workmates possibly assisted by younger consultants. Such an approach should help employees to learn and understand each other's concerns and attitudes.

Team building and teamwork

The above-mentioned issues related to problem solving and change management refer to a general issue associated with team building and teamwork in the light of an ageing workforce in organizations. It appears that organizations might benefit from the project teams who are age-balanced and aligned with the age structure of their workforce. Project teams should include both younger and older workers and cooperation within such teams should help them in knowledge exchange and working out solutions satisfying all parts. Age-diverse collaboration might result in building younger employees' knowledge about management and company processes, while older workers might increase their awareness about new technologies. In addition, younger employees might have opportunities to build interpersonal skills.

The recommendation about balancing project team with respect to age and aligning the training time with workforce age structure also applies to the system and implementation services provider. For instance, in the case of older workforce at the client side, the provider might consider employing older consultants in order to assure good understanding and cooperation with the client's employees.

Preimplementation diagnosis

The current study findings suggest a number of recommendations regarding the diagnosis prior to the actual ES implementation project start. Drawing from the respondent perceptions of difficulties and root problems, we can conclude that such a diagnosis should be multifaceted and cover various organizational, technical, and people-related considerations. It might be advised that people working on such a diagnosis should represent various age groups.

With respect to technology-related and organizational considerations, infrastructure seems to be one of the most important issues. The evaluation of the quality of infrastructure and its fit to the enterprise system requirements

requires both in-depth IT expertise and knowledge about an organization and its needs. It therefore appears that the middle-aged employees, supported by their younger workmates, may play a leading role in this process.

Regarding people-related considerations, as suggested earlier, it is advised that a company should have a well-thought-out change management strategy. If there are many older workers within an organization, it is advised to evaluate employees' IT proficiency and their ability to operate a modern enterprise system. Such an evaluation should be performed before the start of the actual ES implementation project in order to have time to organize a preparatory training on IT skills. As a result, older workers might reveal better performance during regular implementation duties and better accept the system.

Implications for research

The current study's results indicate that there is a need for the incorporation of the viewpoints of multiple age groups in order to gain full insight into ES adoption considerations. This seems especially important in the light of an ageing society and workforce. The researchers are encouraged to assure multiple stakeholder perspective and age diversity in their investigations. Incorporating various age groups in data gathering approach and further analysis should help in getting greater insight into the investigated issues and minimizing the risk of overlooking important considerations.

Limitations and future research

The main limitation of the current study is related to the scope of its findings, which is due to the fact that the research was based on the data gathered in one country, i.e., Poland. As a result, the scope of research findings and recommendations refers first and foremost to Polish practitioners. Nevertheless, as suggested by demographic forecasts, similar changes in workforce structure occur in other EU countries (United Nations, 2015). Therefore, the current study's results might be applied to other countries within the EU. However, we should bear in mind that Poland is a transition economy and prior research suggests that transition economies might experience different ES-related considerations than well-developed economies (e.g. Soja, Themistocleous, Cunha, & Silva, 2015). Therefore, the application of the current study's findings to more developed economic settings should be done with caution.

An interesting direction of future research might be associated with an in-depth examination of roles and responsibilities carried by respondents from individual age groups during the implementation projects. This

issue is related to employees' skills, prior work experience, and position held with an organization. In our study, we grouped employees into age cohorts regardless of their professional and educational background. Meanwhile, the intensity of a problem perceived by an employee might be different depending on his/her expertise or academic qualifications. Therefore, incorporating employee characteristics in an age-related analysis should yield more reliable findings and appears an important avenue for future research. The outcome of such investigations should help in better understanding respondent perceptions of ES considerations and working out change management strategies adjusted to employees' age groups.

The results of the current study can be perceived as a diagnosis of ES adoption considerations in light of an ageing workforce and society. Nevertheless, a follow-up study seems recommended to further verify the suggested issues and causal relationships in a real-life setting. The results of such research would be helpful in building an age-related model of ES acceptance.

Conclusion

The current study examined the role of employee age in perceiving impediments during ES adoption projects and built on the experience of ES practitioners from Poland. Using a data-driven approach, the discovered problems were presented within a framework including three main categories: People, Process, and Technology. In order to investigate the role of respondent age in the perception of difficulties during ES adoptions, we identified the following age groups: Younger, Middle-aged, and Older. The age-based analysis of perceived problems and problem causes allowed us to suggest some candidate items for root problems in ES adoptions. The authors believe that the current study is one of the first investigations into the role of employee age in ES implementation projects. The proposed recommendations might foster use of employees' potential and be helpful in working out change management programs depending on the workforce age structure in the organization. Such an approach might help older workers to overcome mental barriers and achieve greater system acceptance, which seems especially important in the light of population ageing.

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