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Age stereotypes in distributed software development: The impact of culture on age-related performance expectations

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ABSTRACT

Context: Due to demographic changes in most developed countries, distributed software development (DSD) teams might suffer new barriers above and beyond the well-known cultural and distance-based challenges. Remarkably, six out of the twelve most important barriers for DSD are related to typical problems induced by both cultural *and* age diversity. Age stereotypes can hinder communication, trust, knowledge exchange and coordination in software development. They have been studied based on individual level whereas context-related factors such as culture have been less in focus yet.

Objective: We examine the effects of national and organizational culture on age stereotypes. Therein we explore the conditions and processes that might increase age stereotypes.

Method: We conducted a quantitative study with 457 employees in two software development companies in China, Germany, Poland and Bulgaria.

Results: Results show a significant bias in performance expectations favoring middle-aged employees over younger and older employees across national cultures. Stereotypes toward older employees are more negative in Eastern Europe and China than in Germany, while stereotypes toward younger employees are more negative in Germany than in China and Eastern Europe. Lower average team age and lower contact frequency foster stereotypes in China and Eastern Europe. Negative stereotypes can be buffered by an organizational culture which values team achievement and trust over individual performance and control.

Conclusions: The study advances the literature by integrating value- and schema-based approaches when examining cultural influences, extending the stereotype content model and the situated dynamics framework. Moreover, it may help finding new solutions for human-related problems in DSD based on intangible barriers that hinder development processes. Companies that use DSD might consider reducing age stereotypes in China and Eastern Europe by intensively increasing contact to older workers, including age stereotype aspects into cultural training or by increasing values of team achievement within their organizational culture.

1. Introduction

The software industry currently faces two important trends. First, many companies are offshoring and creating subsidiaries in emerging countries which results in the development of software in distributed teams around the globe [57,92]. This trend increases cultural diversity in the software development industry and there is a need to make extra efforts to address cross-cultural issues in distributed software development (DSD: [59]). Informal communication and coordination plays a critical role for successful collaboration in DSD [7,57]. In their extensive review, Mishra and Mishra [72] demonstrate that the most negative influences of national culture on DSD are problems in communication, collaboration and coordination, requirements engineering as well as knowledge management. In particular, they explain that employees in different national cultures have different communication and problem solving processes and consequently, problems in creating collective knowledge, a shared mental model, social ties and trust arise, which all negatively impact the quality of the products to be developed.

Second, the demographic change in industrialized countries increases age diversity in organizations [89,115], and age stereotypes will probably even increase in the future [114]. Stereotypes are beliefs about characteristics that are shared by all members of a certain group (c.f. [53,109]). Negative age stereotypes toward older employees exist across industries, based on the stereotype content model [36]. Stereotypes are especially strong in technology-related jobs [82,85]. In particular, older employees are seen as poorer performers, less adaptive to

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change and less innovative than younger employees [85]. Negative age stereotypes toward younger employees exist, too. For example, younger employees are seen as being disloyal to their employer, being less supportive to their colleagues than older employees and not willing to work with older employees [12,78,103]. Age stereotypes can hinder communication, respect, trust, decision making, cooperation and team identification [85,115].

Thus, distributed software development teams face diversity in two aspects, namely national culture and age, which might interact and create difficulties in work-related communication and cooperation. In their extensive review, da Silva and colleagues [30] found 30 barriers within DSD that were frequently reported in the literature. Remarkably, six out of the twelve most important barriers are related to typical problems induced by both, cultural and age differences between team members. These are problems with trust, different knowledge levels or knowledge transfer, communication, cooperation, coordination and people management with a focus on conflict resolution. Thus, culture-based difficulties, age stereotypes and problems induced by DSD aspects altogether can create considerable barriers to the complex task of software development.

Although valuing diversity has become a catchphrase, field research on the simultaneous impact of diversity in age and national culture on stereotypes is scarce. In general, information systems (IS) research primarily focuses on processes and technology-related aspects of software development (SD: [1]), despite the fact that performance in software development teams is strongly influenced by human and social factors [4,73,91]. In fact, team work processes and resistance from groups or individuals are two of the main factors for human-related failures in modern software development [23]. Thus, human and social factors affecting team processes should receive more attention [35,116]. This is even more important for DSD, because distributed teams face communication difficulties due to geographical and time zone dispersion as well as cultural differences that may include different languages, national work traditions, values and norms [18,93]. The relationship between members of teams in different locations is of key importance [59], and it is not enough to focus on tools that improve communication, coordination and collaboration, but also on the process [51]. In addition, the vast majority of studies on challenges and possibilities for improvement in DSD are qualitative in nature, and one aim of the present paper is to complement it with quantitative evidence (da [30]).

Age stereotypes have been studied on the individual level, while the contextual level, including cultural, has been neglected so far [85]. In particular, there are very few papers that directly compare work aspects in several countries in order to examine cultural differences [51,70]. Cultural influences are complex, they are not only based on different values due to national culture, but also on situational factors (including the organizational culture and team properties) which might all mesh [105], as the situated dynamics framework [62] proposes. But this framework has rarely been tested empirically and has not been used for research on combined effects of culture and age stereotypes. In addition, research on the impact of organizational culture on age stereotypes has been neglected and should be enhanced [33]. One result so far was that the formality of the job career ladder and organizational values of creativity or flexibility can affect age stereotypes [82].

Thus, the goal of our study is to answer the following research question: *How do national and organizational culture influence age stereotypes concerning performance expectations in DSD?*

Our study extends previous research in several ways. First, it advances research on age stereotypes by considering context-related factors, namely the national culture and the organizational culture, as requested by Posthuma and Campion [[85]; see also [86]]. To the best of our knowledge, this will be the first study aiming to explain (1) under which conditions age stereotypes are particularly strong in specific cultures, and (2) the process how age stereotypes can arise in DSD in different cultures. Thereby, it conceptually extends and empirically tests the situated dynamics framework [62]. Second, our results extend the pan-culturalism of stereotypes within the stereotype content model [29] to the workplace and to developing countries that are not collectivistic. In addition, we extend the theory by considering not only stereotypes towards older, but also younger and middle-aged employees. Third, our results contribute to the literature by examining an under-observed antecedent for numerous reported problems in DSD, namely stereotypes. It helps finding new solutions for human-related problems in DSD. The study contributes to practice in that it proposes three ways to enhance DSD processes by reducing age stereotypes in DSD.

Section 2 explains related research on age stereotypes, DSD and organizational culture. Section 3 develops our research model and derives four main hypotheses, which are more deeply explained by three mediation hypotheses. Section 4 explains the research method which contains a quantitative study and Section 6 and 7 conclude with a discussion of our results, theoretical and practical contributions as well as proposals for future work.

2. Related work

This chapter explains and integrates previous research in psychology and IS on age stereotypes, DSD, national and organizational culture, in order to create a basis for our hypotheses.

2.1. Age stereotypes and distributed software development

Age stereotypes are socially shared beliefs concerning the attributes, characteristics and behaviors that members of a specific age group have in common [37,63]. They can be positive or negative. Stereotypes are often learned through socialization and might be activated even in people who deem themselves tolerant and free of discriminating tendencies [31]. In fact, stereotypes can be held and can impact our behavior even on a pre-conscious level [52]. They shape social behavior considerably, for example when it comes to discrimination of older employees in the workplace [85].

The *stereotype content model* [36] has shown that elderly people are seen as low in competence. The model has been confirmed by many studies [28]. It posits that elderly people are seen as warm but incompetent. This is the case especially for older employees [58], and a key element of stereotypes towards older workers is the belief that they are less effective than younger employees [65]. In particular, expectations of little competence can imply less respect and more social exclusion [28].

Research has found many negative age stereotypes toward older employees. They are viewed as being less productive, less creative, more resistant to change, less able to learn, less receptive to new technologies, less willing to attend training sessions or take risks, and having slower cognitive abilities [77,85,112]. All of these aspects are seen as important barriers for high performance in the software development process [98]. Negative stereotypes seem to exit in software companies of all sizes. Comeau and Kemp [25] found age stereotypes in small software companies and Schloegel and colleagues [97] in big software companies.

In general, IT-related jobs are considered as being less suited for older than for younger employees [25]. Nevertheless, some positive age stereotypes for older employees have been reported, too, such as better self-regulation, reliability, loyalty toward the employer, support of colleagues, know-how, customer orientation, communication and conflict capabilities [58,85]. However, they do not counterbalance the negative ones. In addition, age stereotypes do not correspond to reality. Posthuma and Campion [85] in their broad review of the literature identified 24 articles reporting negative age stereotypes toward older employees concerning performance but they also found 24 articles showing that older employees' objective performance is *not* lower than that of younger employees.

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