

# **The Nerd Becomes the Softie: Non-Technical Skill Development Through Agile Practices and Crowdwork**

*Adeline Frenzel, University of Augsburg, adeline.frenzel@wiwi.uni-augsburg.de*

*Karoline Glaser, University of Mannheim, glaser@uni-mannheim.de*

*Jonas Toutaoui, TU Darmstadt, toutaoui@ise.tu-darmstadt.de*

## **Introduction**

Specific skill demands for ISD professionals by industry including the development of flexible skillsets in order to cope with changes in IT work has spurred debates in top IS journals for more than 25 years (Markus and Benjamin, 1996; Trauth et al., 1993) but has now gained new momentum. Artificial intelligence (AI) may take over repetitive tasks as they already do for highly skilled professions (e.g., AI-assisted cancer recognition for radiologists) (Rai et al., 2019). It is expected that skill needs are further shifted towards non-technical skills, including those of ISD professionals. The right work environment and work practices play a key role in obtaining the necessary non-technical skills for ISD professionals (Kaarst-Brown et al., 2018; Kaarst-Brown et al., 2019). Two trends in regard to the work environment shape ISD nowadays: On the one hand, there is a growing trend of crowdwork platforms (Gol et al., 2018). Companies may offer short ISD projects on those platforms (e.g. Upwork) to so-called crowdworkers and are therefore able to activate them as “hidden” source in the context of IT sourcing (Taylor and Joshi, 2019). On the other hand, agile transformation in organizations gives rise to agile work practices. However, it remains unclear whether these two trends can also be an answer to the development of non-technical skills.

Prior research identified required technical and non-technical skills in order to successfully complete agile ISD projects. However, the opposed effect of agile practices on certain skills and how they are developed remains unclear. Although research studies on individual ISD professionals using agile work practices have shed light on the impact of these methods on immediate characteristics necessary in the present like job satisfaction or energy depletion (Tripp et al., 2016; Fortmann, 2018), they ignored important outcomes necessary for the future of ISD professionals. Similar, studies on motivations of highly skilled workers on IT development platforms show that skills improvement and diversity in work are key factors for choosing this kind of work environment (Gol et al., 2018). Hence, highly skilled ISD professionals may choose whether they focus on work in organizations applying agile practices or focus on a career path as crowdworker. In order for ISD professionals to be prepared for the future of work, we argue that it is important to understand how these two approaches influence non-technical skill development. Thus, we pose our research question: *How do the work environment and the extent of agile practices impact non-technical skill development of ISD professionals?*

To respond to this research question, we perform a survey targeting ISD professionals with varying extents of experience in agile practices and different degrees of crowdwork on their individual work environment. We expect to contribute to research of agile practices

and crowdwork by complementing the view of the importance of non-technical skills, but rather as an outcome than as antecedent. For ISD professionals we expect to provide decision support in their career decisions in light of the changing nature of work.

## **Theoretical Background and Hypotheses**

### *Non-technical skills and Interdependence*

The possession of non-technical skills is associated with life and employment success (Gibb, 2013). In ISD, lack of them is associated with many ISD project failures (Kappelman et al., 2006; Schmidt et al., 2001) which explains why IS research emphasizes the importance of non-technical skills for more than 25 years by now (e.g., Trauth, 1993; Kaarst-Brown et al., 2019). Huang et al. (2009) synthesized non-technical skills into the following categories: (1) Communication skills (i.e., written and oral communication), (2) interpersonal skills (e.g., work in teams, negotiation skills), and (3) work skills (e.g., problem solving, understanding organizational culture and politics).

A central process in the development of non-technical skills is “imitation”. Skills are developed as a function “of observing the behavior of others and its response consequences without the observer’s performing any overt responses him- or herself” (Bandura and Walters, 1963, p.47). Hence, non-technical skills are best developed through social interactions, giving ISD professionals opportunities to observe non-technical skills of others (Johnson, 2003). One essential aspect of why social interaction occurs, is the interdependence of the interacting people, defined as the “process by which interacting people influence one another’s experiences” (Van Lange and Balliet, 2015, p.65). Interdependence theory, developed by Thibaut and Kelley (1959), discusses how interdependencies, namely on task, outcome, and reward level, affect outcomes during the course of an interaction between individuals or groups (Van Lange and Balliet, 2015). Greater interdependence results in greater interaction as ISD professionals need to collaborate and coordinate because changes in tasks, outcomes or goals of one individual may require some adjustment for the other individual (Tushman and Nadler, 1978). Moreover, the fundamental nature of such interactions is social and thus ISD professionals are led to an increased practice of non-technical skills, voluntary or not. More interaction also creates opportunities to (unconsciously) observe others to later imitate their non-technical behavior and thus develop one’s own non-technical skills (Bandura and Walters, 1963).

*H1*: Interdependence between ISD professionals will have positive effects on non-technical skills.

### *Task characteristics*

Task characteristics involve the job autonomy, the variety of tasks, the task significance and the task clarity of the work ISD professionals conduct (Deng and Joshi, 2016). The job autonomy is defined as “the degree to which the job provides substantial freedom, independence, and discretion to the individual scheduling” (Hackman and Oldham 1980,

p. 79). The variety of tasks comes along with different skills which are required to complete a certain work task (Tripp et al., 2016). Task significance incorporates the meaningfulness and significance that completing a certain task entails (Hackman and Oldham, 1980). Task clarity describes the degree of clarity of the instructions and procedures for performing a task (Kirkpatrick and Locke, 1996). A high task clarity enables the ISD professional to easily and independently pursue the task. Summarizing these task characteristics describe to which degree a task can be completed independently, thus without or with low interdependence, by an individual ISD professional.

*H2:* The task characteristics will negatively affect the interdependence between ISD professionals.

### *Crowdwork and ISD professionals*

Crowdwork comprises different types of paid, online work which are completed as tasks by crowdworkers. They are organized, evaluated, and paid by an online crowdwork platform on which requesters (organizations, individuals, groups) may offer those tasks (Kittur et al., 2013). Highly skilled ISD professionals belong to the targeted, high-end niche crowd which can be recruited on specialized ISD crowdwork platforms. Here, skill requirements for completing tasks are comparably high. Since those competent, creative workers are in high demand, prior research shows that skill development is one of the major drivers for ISD professionals to participate in crowdwork instead of choosing the certainty of traditional work arrangements (Gol et al., 2018). However, it remains unclear if and how (specific) non-technical skills can be developed in this work environment.

Therefore, work environment describes the degree to which an ISD professional works in a crowdwork environment. In a setting of low task characteristics for example (e.g., unclear tasks) the level of interdependence is increased as postulated in H2. However, in a crowdwork environment, the main dependency lies only between the crowdworker and the requester (i.e., the client). The requester decides on the financial reward for the work and whether the work was accomplished as requested (Deng and Joshi, 2016; Deng et al., 2016). Hence, ISD professionals working in a crowdwork environment face a non-mutual dependence, especially as the requester can often choose between various crowdworkers (Taylor and Joshi, 2018). Such non-mutual dependence leads to lower levels of interdependence (McDonell et al., 2006). Therefore, the work environment, meaning the degree of work completed in a crowdwork environment, will amplify the negative effect of task characteristics on interdependence.

*H3:* The effect between the task characteristics and the interdependence between ISD professionals will be positively moderated by the work environment.

### *Agile information systems development and the individual ISD professional*

Organizing ISD according to agile principles based on the Agile Manifesto (Beck et al., 2001) is widespread nowadays. The associated agile practices build upon the common core of ISD agility, which is “the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while

contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment” (Conboy, 2009, p. 340). Consequently, the direct collaboration between the IT professionals of either one or different teams is enabled by agile practices, which has also been often studied in the context of non-technical skills.

ISD professionals using agile practices typically work in agile teams. However, also in a crowdwork environment agile practices can be adopted as it is the case for some globally distributed ISD teams (Sarker and Sarker, 2009). Such teams comprise diverse roles with different backgrounds in order to attain their goals (Cao et al., 2009). Hence, many interactions (due to interdependence) between ISD professionals applying agile practices automatically involve the whole agile team, several individuals with diverse backgrounds. As such, one individual practices its non-technical skills with even more ISD professionals and non-technical behavior of even more ISD professionals can be observed and imitated to foster own non-technical skills.

*H4:* The effect between interdependence between ISD professionals and non-technical skills will be positively moderated by the extent of experiences with agile practices.

Agile ISD can be described as socio-technical process (Hoda et al., 2013) as it does not only involve pure technical but additionally social aspects, including the reliance on non-technical skills (Conboy et al., 2011). Generally, agile practices involve two main aspects: the agile project-management practices (e.g. daily stand-up meetings) and the agile software development approach practices (e.g. pair programming) (Tripp et al., 2016). Hence, they prescribe many regular interactions with the diverse roles in the agile team, thus many social interactions (Cao et al., 2009). Such social interactions foster the development of non-technical skills. If the extent of experience with agile practices within ISD is higher, the non-technical skills of ISD professionals are expected to grow as they are forced to directly interact with others.

*H5:* The extent of experiences with agile practices will have positive effects on non-technical skills.

Figure 1 summarizes our conceptual model.

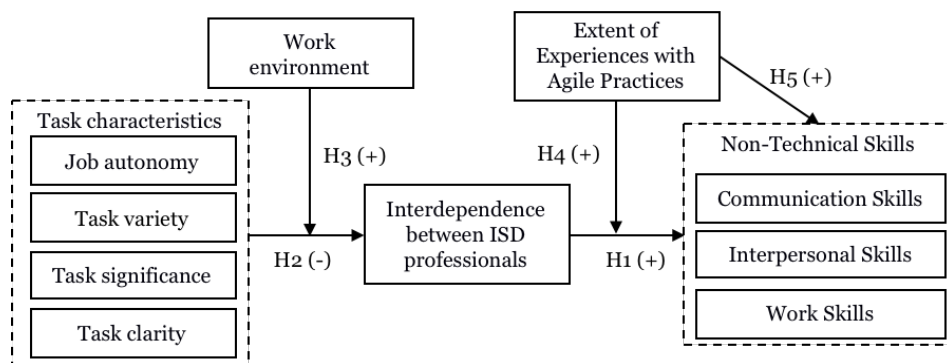


Figure 1. Conceptual model

## Research Design

In order to test our hypotheses and answer our research question an assessment of ISD professionals' non-technical skills is crucial. Self-assessments have proven their reliability and validity in the past while being cheaper and less time consuming than other methods (Riggio, 1986). We intend to survey ISD professionals in different work environments, similar to previous IS research (e.g., Fortmann, 2018). Drawing on Watson et al. (1998), we plan to conduct a within-subject design with the same participants surveyed every 6 months (t1, t2, t3) over one year for a total of three surveys. Surveyed ISD professionals outside the crowdwork environment can then serve as benchmark sample. Items and their sources can be taken from the table 1. Further control variables are Age and Gender.

Construct		Source
Interdependence between ISD professionals		adapted from Gattiker and Goodhue (2005)
Extent of Experience with Agile Practices		Tripp et al. (2006)
Task Characteristics		Hackman and Oldham (1980); Kirkpatrick and Locke (1996)
Skill self-assessment		Huang et al. (2009); Riggio (1986)
Individual's subjective conception of personal efficacy		Bandura, (1977); McDonnell et al. (2006)
Control Variables	IT (Non)-Technical Skills Self-Efficacy; IT Skills Importance; Intention to Pursue an IT career	Joshi et al. (2010)

Table 1. Survey items

## Next Steps and Expected Contributions

This research is currently in the first phase of its research design. The survey will be pre-tested before the finalized version will be published inter alia on crowdwork platforms. In that way we hope to reach ISD professionals who currently work as crowdworkers. Further ISD professionals, without crowdwork experience, are contacted via market research institutes.

We expect to theoretically contribute with this research endeavor to extent literature in two ways. First, we want to contextualize the interplay between the way work is done (agile organization) and the environment in which work is done (crowdwork). Second, we focus on the impact of the crowdwork environment on the development of particularly non-technical skills as opposed to examine skills in general. From a practical perspective, we aim to show that the adoption of agile practices has a substantial advantage for the ISD professionals and enables them to flexibly adapt to ongoing trends regarding the future of ISD. Practitioners in companies can be more open toward organizational changes (i.e. agile transformation) and also toward alternative ways of work (i.e. crowdwork environment). ISD professionals will understand that changes in the nature of the work environment and practices foster the development of non-technical skills.

## References available upon request