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Exploring Best Practices for Onboarding in Distributed Software Development Teams

An explorative Delphi study

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Exploring Best Practices for Onboarding in Distributed Software Development Teams

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Rejo Alappat, BSc

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Rejo Alappat

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Kurzfassung

Bei der Integration von neuen Mitarbeitern und Mitarbeiterinnen in bestehende Teams spielt Onboarding eine wesentliche Rolle. Dabei ist zu berücksichtigen, dass die Literatur unter Teams ausschließlich traditionelle Teams, welche sich physisch an einem Standort befinden, versteht. Jedoch sind Teams, insbesondere jene in der Softwareentwicklungsbranche, aufgrund von Faktoren wie der Globalisierung, über mehrere Standorte verteilt. Obwohl diverse Onboarding-Praktiken, unabhängig von der geografischen Verteilung des Teams, angewandt werden können, sind einige davon möglicherweise effektiver als andere im Kontext von verteilten Sofwareentwicklungsteams.

Die bisherige Forschung zu Onboarding-Praktiken in verteilten Softwareentwicklungsteams hat sich in erster Linie auf Fallstudien in bestimmten Organisationen gestützt. In dieser Arbeit werden Best Practices für das Onboarding verteilter Softwareentwicklungsteams auf der Grundlage einer Delphistudie mit einem Expertengremium untersucht, das aus erfahrenen Teamleitern oder ähnlich qualifizierten Experten besteht. Von den 120 Best Practices, die während der Brainstorming-Phase gefunden wurden, konnten zehn bis elf Praktiken für jeden der vier Indikatoren für die Anpassung von neuen Mitarbeitern und Mitarbeiterinnen eingegrenzt und in weiterer Folge in eine Rangfolge gebracht werden.

Insgesamt zeigen die evaluierten Best Practices auf, dass eine Vielzahl der Onboarding-Praktiken, unabhängig von der geografischen Verteilung eines Softwareentwicklungsteams, eingesetzt werden können. Diese Studie zeigt auch, dass Onboarding-Praktiken, die zur sozialen Integration der neuen Mitarbeiter und Mitarbeiterinnen beitragen, bei der Erforschung oder Implementierung von Onboarding-Praktiken für verteilte Softwareentwicklungsteams besondere Aufmerksamkeit erfordern, da diese Praktiken die geografische Streuung am stärksten berücksichtigen.

Abstract

Onboarding plays an important role in integrating newly hired employees into existing teams. It should be taken into consideration, that most of the literature about onboarding is generally understanding a team as a traditional co-located team. However, due to factors such as globalization, teams, especially in the software development industry, are spread throughout the globe. Even though several onboarding practices which apply to co-located teams could be applied to globally distributed teams, some might be more effective than others.

Previous research in the area of onboarding in distributed software development teams has primarily relied on case studies in specific organizations. This thesis explores best practices in onboarding for distributed software development teams, based on a Ranking-type Delphi study with an expert panel consisting of highly experienced team leaders or similarly qualified experts. Out of 120 best practices found during the brainstorming phase, ten to eleven practices for each of the four newcomer adjustment indicators or proximal outcomes could be narrowed down and ranked subject to the perception of the Delphi panel.

Overall, the identified best practices show that the vast number of onboarding practices can be utilized by organizations regardless of the geographical dispersion of a software development team. This thesis also reveals that onboarding practices contributing to the proximal outcome "Acceptance by Insiders", which is seen as one of the most important adjustment outcomes by socialization researchers, need special attention when researching or implementing onboarding practices for distributed software development teams as these practices consider the geographic dispersion the most.

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CHAPTER 1

Introduction

1.1 Problem Statement

Onboarding, also called organizational socialization in literature, plays a vital part in integrating newly hired employees into an existing team or organization. It is also described frequently as "a process through which new employees move from being organizational outsiders to becoming organizational insiders" [BE12]. According to Klein and Polin [KP12], the benefits of effective organizational socialization are cost savings, retention, improved time to proficiency and facilitating organizational culture.

It must be pointed out that most of the existing literature generally understands a team as a traditional co-located team (e.g. [HB03] or [Ber11]). This also applies to the research in the field of organizational socialization [AG03].

However, due to factors such as globalization, organizations and teams, especially in larger organizations as well as in the software development industry, are spread throughout the globe [OKW07]. This kind of teams are called distributed teams or more frequently mentioned as virtual teams in the literature. Among other researchers, Gibson and Cohen [GC03] define virtual teams as a functioning team, where the members are geographically dispersed and rely on technology-mediated communication.

Even though several practices which apply to co-located teams could be applied to virtual teams, some might be more effective than others and some might be executed and perceived differently.

In a research study by Siebdrat et al. [SHE09], examining 80 software development teams showed that virtual teams are even able to outperform co-located teams when a high level of task-related processes is in place. On the other hand, it must be considered, that virtual teams with low level of task-related processes perform more ineffectively and inefficiently than co-located teams. Hence, implemented practices and processes are an

important factor in virtual team performance. To get acquainted with such practices and processes as a new team member of a virtual team, the process of organizational socialization is an important facilitator.

Furthermore, risk factors such as inexperience with the team and its processes, lack of team cohesion, cultural differences and inadequate technical resources have a significantly greater impact on project success for information technology practitioners in a virtual team compared to a co-located team [RK10].

Thus, it can be assumed that effective organizational socialization plays an even greater pivotal role in the context of distributed teams than in a co-located environment.

Though there is various literature on organizational socialization as well as on virtual teams, one can hardly find research on organizational socialization in distributed teams [PDLK04], despite the importance of this topic.

1.2 Expected Result

The expected result of this thesis is a set of best practices for organizational socialization in distributed software development teams based on the perception of team leaders. These best practices shall act as a guideline for practitioners to socialize newcomers in distributed teams effectively. To narrow down the field of research, the thesis will examine distributed teams in the area of software development. Here, the term distributed team shall be understood as a team consisting of geographically dispersed members only as well as a distributed hybrid team consisting of co-located as well as geographically dispersed members [BV09].

To evaluate these best practices, the following sub-questions shall be answered:

- RQ1: What are the expected outcomes of organizational socialization?
- RQ2: Which tactics are used in practice in organizational socialization in distributed software development teams?
- RQ3: What organizational socialization tactics are perceived by team leaders or similarly qualified experts as having the most contribution to the expected outcome of organizational socialization in distributed software development teams?

The first two research questions will help to have a better understanding of the main outcomes as well as tactics. The answers to these two questions will be used as core elements to resolve the third research question, which shall create the foundation for the best practices.

The expected result can be divided accordingly into the following three parts:

- Expected outcomes of organizational socialization in software development teams based on literature research, which leads to the answer to RQ1

- Organizational socialization tactics evaluated from team leaders or similarly qualified experts working in distributed software development teams, which leads to the answer to RQ2
- Contribution of each organizational socialization tactic to each of expected organizational socialization outcome, represented as a ranking, which leads to the answer to RQ3 and fulfils the overall objective of this thesis

1.3 Methodological Approach

The methodological approach to achieve the expected results, comprises the following parts:

1. In the beginning of the thesis, a literature research is carried out to understand organizational socialization. During the research, the expected outcomes of organizational socialization shall be identified along with the tactics which foster the outcomes. Then, research of existing literature about distributed teams is performed to explain the differences between co-located and distributed teams. Furthermore, the main factors which makes distributed teams effective and successful will be examined.
2. Once a common understanding of organizational socialization as well as distributed teams is built, a Ranking-type Delphi study will be designed and applied. The Ranking-type Delphi study comprises the following phases: (1) Research design as well as identification and selection of experts (2) Brainstorming (3) Narrowing down and (4) Ranking.
3. In the initial phase the study will be conceptualized and suitable experts in the software development industry identified and selected. This is the most critical part in a Delphi study as the results of the study are solely based on the group decision process of the participating experts [OP04].
4. In the Brainstorming phase the experts are requested individually, by having a questionnaire with open-ended questions, to provide a certain number of organizational socialization tactics they perceive as having a contribution towards each of the expected organizational socialization outcomes, evaluated during the literature review. These organizational socialization tactics will be consolidated by the researcher.
5. The main objective of the Narrowing-down phase in a Delphi study is to reduce the number of items, which have been identified during the Brainstorming phase, into a reasonable and manageable number. Thus, in the Narrowing-down phase the experts are requested to select (but not rank) a certain number of organizational socialization tactics for each expected organizational socialization outcome - again by individually answering a questionnaire. The tactics which have been chosen by

at least one third of the experts will be taken into consideration for the upcoming phase.

6. Finally in the last phase of the Delphi study, the organizational socialization tactics are ranked. The objective in this phase is to reach consensus among the experts on the ranking of the various organizational socialization tactics. The task of ranking will be executed individually by the experts in multiple iterations by answering questionnaires. In each iteration the researcher provides statistics (mean item ranking and Kendall's W coefficient of concordance according to Pare et al. [PCPNT13]) as well as relevant comments and justifications from other experts, to foster the consensus reaching process. The iteration will stop once consensus is reached or one of the stopping rules mentioned by Pare et al. applies.

1.4 State of the Art

There are a lot of studies on organizational socialization as well as on distributed teams, but only few on organizational socialization in distributed teams.

Existing literature on organizational socialization can be divided into four major sections according to Siebdrat et al. [SHE09] and Klein et al. [KPLS15]; these are socialization stages, actors, tactics and content. This thesis will have touch points with tactics (their outcome) as well as actors, which have been extensively studied in the last decades. Fang et al. [FDS11] summarizes these mentioned areas as "two particularly significant socialization factors, which are organizational tactics and newcomer proactivity".

Bauer et al. ([BE12] and [BBE+07]) defined and extended a model (see figure 1.1) to describe how organizational outcomes are derived from the factors organizational tactics and newcomer proactivity, reflecting both proximal and distal outcomes.

Bauer [BBE+07] uses six categories to cluster various organizational socialization tactics.

- Recruiting process
- Orientation forums
- Support tools and processes
- Feedback tools
- Training
- Coaching and support

In a case study conducted by Britto et al. [Bri17] about onboarding software developers and software development teams in globally distributed projects, the model of Bauer [BBE+07] has been utilized, to present the coverage of onboarding functions in three

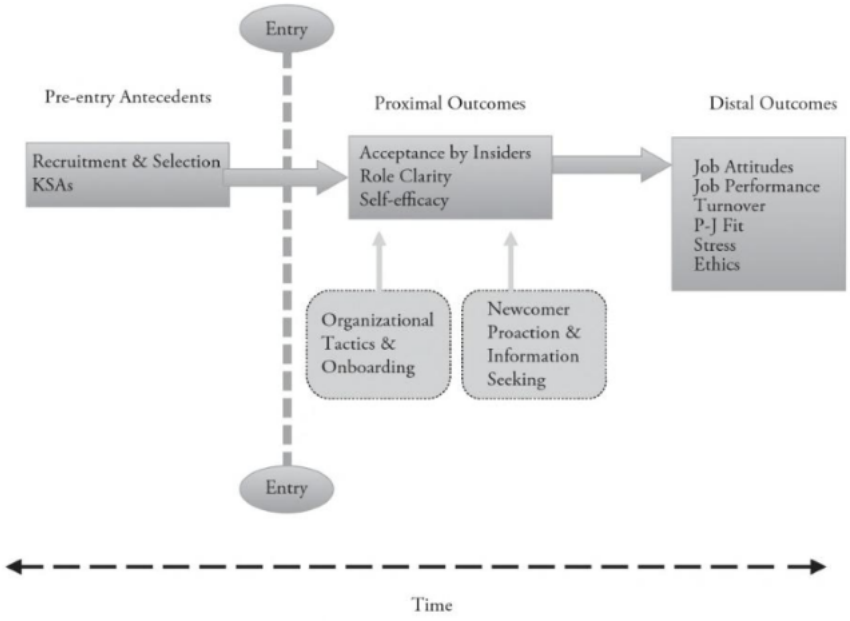

Figure 1.1: Model for organizational socialization by Bauer et al.

companies. In this study, the trade-off faced by mentors, who support newcomers, between mentoring and doing their own tasks is seen as one of the main challenges.

Based on a recent case study by Moe et al. [MSG20], studying onboarding in distributed software teams, it has been shown that the categories mentioned above in the model of Bauer [BBE+07], originally designed for co-located teams, also apply and correspond to virtual teams. The main challenge seen in the study when onboarding distributed software teams was the communication between team members, due to issues with technical equipment. Furthermore, it has been found that even in organizational socialization literature [BE12], where co-located teams are supposed as teams, statements like "[...] newcomers who attended an online orientation rather than one in person had less favorable socialization as reported by their supervisors" or "[...] losing employees because they feel alienated from their coworkers, are confused regarding their job tasks, and/or lack confidence in their ability to perform well [...]" show, that the factor of geographical dispersion of virtual teams plays a crucial role.

This thesis shall evaluate best practices for organizational socialization tactics based on a collective decision process with the participation of team leaders or similarly qualified expert from different organizations. The result, which is a list of evaluated best practices, shall act as a guideline for practitioners to integrate new team members in distributed software development teams successfully.

CHAPTER 2

What is Organizational Socialization?

This chapter describes, first of all, what onboarding is and how it is related to organizational socialization. To understand onboarding it is important having knowledge about organizational socialization, thus the sections below will elaborate what is organizational socialization, what outcomes it produces and how organizational socialization tactics can influence these outcomes. At the end of this chapter, the research-based model of Bauer for onboarding is discussed.

2.1 What is Onboarding?

As this thesis is focused on the process of onboarding in distributed teams, it is important to have a common understanding of onboarding.

Bauer [Bau10] describes the term onboarding as a "process of helping new hires adjust to social and performance aspects of their new jobs quickly and smoothly". The faster a new hire gets acquainted with the expectations for the new role (role clarity) as well as the organizational culture (knowledge of culture), is able to quickly integrate socially into the organization (social integration) and feels comfortable in their current job (self-efficacy), the more successful is the new hire adjustment, according to Bauer [Bau10].

Another definition, made by Klein et al. [KPLS15], states onboarding is a process executed by organizations, which represents "the learning and adjustment process by which individuals assume an organizational role that fits the needs of both the individual and the organization".

2.2 Relation between Onboarding and Organizational Socialization

Onboarding is also often called organizational socialization in management literature as well as literature of applied psychology. Even though onboarding is highly related to the research of organizational socialization, these terms are different. Onboarding itself can be seen as a part of organizational socialization. Wanberg [Wan12] summarizes the term onboarding as "specific practices initiated by an organization or agents to facilitate employee adjustment to new roles", whereas the term organizational socialization has a more comprehensive view on how newcomers are socialized based on various factors, onboarding being one of those possible factors.

Klein et al. [KPLS15] elaborates the three main differences between onboarding and organizational socialization. The first difference is that organizational socialization is taking the individual as the key subject, whereas onboarding focuses on the practices and efforts made by an organization to socialize an individual. The second major difference is that onboarding is a process, which takes place when an individual enters an organization for the first time. This can be seen relatively as a short period compared to organizational socialization, representing a continuous process covering the entire organizational affiliation. Last but not least, organizational socialization can be referred also to proactive behavior of the individual to get socialized, which cannot be associated with onboarding, as onboarding refers to policies, practices and programs by an organization to facilitate socialization.

2.3 Definition of Organizational Socialization

As mentioned in the previous section, one needs to understand organizational socialization to understand onboarding.

Van Maanen and Schein [VMS77] define organizational socialization as "learning the ropes", where a person is taught and learns a particular organizational role. Similar to Van Maanen and Schein, Wanberg [Wan12] defines organizational socialization as "the process through which individuals acquire the knowledge, skills, attitudes, and behaviors required to adapt to a new work role". Another very common definition for organizational socialization is the process of an organizational outsider becoming an organizational insider [Wan77, Bul93, BBE+07].

The research on organizational socialization started back in the mid-1960s. Ashford and Nurmohamed [AN12] give an overview of the organizational socialization literature in their "Hitchhiker's Guide to the Socialization Literature". The guide divides the history of organizational socialization into three waves:

1. The first wave was mostly about what organizations do to socialize individuals. So the emphasis was on the organization and its socialization tactics. In this wave,

patterns of socialization tactics were evaluated and analyzed how newcomers get adjusted accordingly. This will be elaborated in more detail in chapter 2.4.

2. The second wave in organizational socialization arose when researchers took the individual into focus and analyzed socialization from the individual's perspective. Hence, the proaction of individuals has been studied extensively. Information seeking and feedback, as well as the relationship between newcomer and other agents in the organization, were some of the research interests in this wave. Further details about proactivity of individuals follow in chapter 2.5.

3. The last identified wave, the third wave, has an integrated approach, taking both organizational tactics, as well as individual proactivity, into account. This will be discussed more in detail in chapter 2.6.

Onboarding, seen as a process used by organizations to socialize individuals, can be categorized mostly into the first wave of organizational socialization research, which is also the focus of this thesis.

2.4 Organizational Socialization Tactics

Based on the model of Bauer et al. [BE12] the outcomes of organizational socialization can be influenced by organizational socialization tactics (onboarding), as well as newcomer proaction. In this chapter, the first part, the onboarding will be discussed.

One of the best developed models of socialization as mentioned by Ashforth and Saks [AS96], is Van Maanen and Schein's model about socialization tactics [VMS77]. They describe organizational socialization tactics as processes which "operate in a way that somewhat uniquely organizes the learning experiences of a newcomer to a particular role". These tactics can be selected by the management of an organization "consciously" or "unconsciously" and occur usually simultaneously according to Van Maanen and Schein. Their model of organizational socialization tactics is divided into six dimensions, each of these dimensions representing both ends of a dimension (tactic and opposing tactic).

1. Collective vs. individual socialization process
2. Formal vs. informal socialization process
3. Sequential vs. random steps in the socialization process
4. Fixed vs. variable socialization process
5. Serial vs. disjunctive socialization process
6. Investiture vs. divestiture socialization process

The definition of the different organizational socialization dimensions by Van Maanen and Schein [VMS77] has been taken by Jones [Jon86] to investigate the relationship between the tactics of organizational socialization and role, as well as personal outcomes. In the next few paragraphs the dimensions are explained, based on the interpretation of Jones [Jon86].

The first dimension describes, according to [Jon86], whether a newcomer is socialized within a group of other newcomers or individually. Socialization in groups is usually utilized when new skills have to be taught to a larger group of newcomers and if an organization wants newcomers to be oriented and/or trained before having first activities within the organization. Individual socialization is conducted when more complex learning of skills, attitudes and values is necessary, especially in crossing hierarchical boundaries. Furthermore, this kind of socialization is forseen for more complex roles and for few newcomers.

The second dimension distinguishes between whether a newcomer learns their role responsibilities separately from the members of the organization or within their team in the organization (on-the-job training). In a formal socialization context the newcomer will accept definitions given by the organization more likely. In contrast to this end of the dimension, newcomers socialized in a informal manner tend to make more "differentiated responses and innovative responses are a likely result" [Jon86].

Jones [Jon86] describes the next two dimensions, sequential vs. random and fixed vs. variable, in combination as both dimensions focus on the information content given to newcomers by the organization through the socialization process. As the name of the attribute implies, sequential socialization guides the newcomer with information about the sequence of activities as well as experiences. In contrast to this, the random socialization process does not give any information about the particular sequence. The dimension fixed vs. variable describes whether the newcomer gets information on the timeline of the socialization stages, as well as the completion of these stages or not.

Similar to the previous two described dimensions, the last two dimensions also relate to each other, according to Jones [Jon86], which are serial vs. disjunctive and investiture vs. divestiture. When a newcomer enters an organization and gets supports from the previous role incumbent or experienced organizational members, it is called serial socialization, whereas a disjunctive socialization can be seen when the newcomer has to create his or her "own definition of situations because no other or prior role models are available" [Jon86]. The last dimension, investiture vs. divestiture socialization, describes the range from positive to negative social support from other organizational members.

The socialization tactics mentioned in the paragraphs above have been grouped by Jones [Jon86] into two categories, which are institutionalized and individualized tactics. These categories and the dimensions of socialization tactics can be seen in figure 2.1. As Ashforth and Saks [AS96] describe, Jones states that "collective, formal, sequential, fixed, serial, and investiture tactics encourage newcomers to passively accept preset roles and thus maintain the status quo". These tactics, which represent one end of the

socialization tactics dimension, are grouped as institutionalized tactics. In contrast to institutionalized tactics, individualized tactics represent the other side of the dimension. Individual, informal, random, variable, disjunctive, and divestiture tactics lead newcomers to challenge the current situation and furthermore to role innovation. Ashforth and Saks [AS96] points out that a structured organizational socialization program applies to institutionalized tactics and an unstructured socialization process to individualized tactics.

Tactics concerned mainly with:	INSTITUTIONALIZED	INDIVIDUALIZED
CONTEXT	Collective Formal	Individual Informal
CONTENT	Sequential Fixed[b]	Random Variable
SOCIAL ASPECTS	Serial Investiture[b]	Disjunctive Divestiture

[a] Based on Van Maanen and Schein (1979: 232).
[b] Indicates reverse of effects hypothesized by Van Maanen and Schein (1979).

Figure 2.1: A classification of socialization tactics by Jones [Jon86], based on Van Maanen and Schein [VMS77]

The aforementioned socialization tactics are instruments for organizations to foster organizational socialization. But organizational socialization happens regardless of the fact if an organization forsees any socialization tactics to adjust newcomers behavior, which leads to individual proactivity in organizational socialization.

2.5 Individual Proactivity in Organizational Socialization

As mentioned by Klein, Polin and Sutton [KPLS15], organizational socialization "occurs within the individual, whereas onboarding refers to efforts by the organization to facilitate socialization". Furthermore, Klein, Polin and Sutton [KP12] mention that transition activities are initiated by the newcomer, which can be linked to individual proactivity in organizational socialization, and onboarding practices are designed and facilitated by the organization. The focus of this thesis is on the latter part, which has been discussed in the chapter organizational socialization tactics (see 2.4.

Nevertheless, individual proactivity will briefly be elaborated in this section, to limit the scope of the research.

Individual proactivity deals with the personality of the individual, how the personality influences proactive behavior and the impact of proactive behavior on organizational socialization outcomes [WKM00].

Ashford and Black [AB96] showed in their study that a newcomer with a personality that wants to obtain personal control during the organizational entry, leads to increased information and feedback seeking, relationship building, positive framing and negotiation of job changes. Wanberg and Kammeyer-Mueller [WKM00] extended these findings by stating that extraversion. as well as openness to experience, increases proactive socialization behavior. In particular, feedback seeking and relationship building were highly related to organizational socialization outcomes such as social integration, role clarity, job satisfaction and turnover.

The aforementioned organizational socialization outcomes have been studied in detail by various researchers and will be elaborated in the next section.

2.6 Outcomes of Organizational Socialization

Even though organizational socialization tactics and individual proactivity have been described separately above, as well as in the research of organizational socialization for many years, both factors jointly influence the organizational socialization process and its outcomes as stated by Ashforth, Sluss and Saks [ASS07] and narrated by Ashford and Nurmohamed [AN12].

In this section the outcomes of organizational socialization will be discussed. Outcomes of organizational socialization has been well studied in the past decades. Bauer and Erdogan [BE12] explain established organizational socialization outcomes based on figure 1.1, which illustrates the process of socialization and its proximal and distal outcomes.

2.6.1 Proximal Outcomes

Proximal outcomes, also called adjustment indicators, show “how well a newcomer is adjusting to his or her new position within the new organization” [BE12]. The adjustment indicators, which are acceptance by insiders, role clarity, self-efficacy and knowledge of organizational culture (not illustrated but mentioned by Bauer), will be discussed in the following subsections. These three indicators have been introduced by Feldman [Fel81] as process variables, each of them representing a major task of organizational socialization. Bauer et al. [BBE+07] also show general support towards the importance of these three indicators.

2.6.1.1 Acceptance by Insiders

Acceptance by insiders explains the social integration of a newcomer into the organization, meaning how well peers and managers accept the newcomer [BE12]. As Hurst et al. [HKML12] state, social acceptance is one of the most important adjustment outcomes seen by socialization researchers. When a newcomer is socially accepted, he or she is supported by peers and is part of social interactions. Hurst et al. [HKML12] explain three major influences on social acceptance within organizations, which are trust, interpersonal disclosure, as well as similarity to peers. Trust can be defined as the "willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" according to Mayer et al. [MDS95]. Colquitt et al. [CSL07] found that ability, benevolence, and integrity enable trust as all three traits highly correlate with trust. As Hurt et al. [HKML12] state, newcomers who are similar to their peers will receive more trust from them, due to the reasons that similar individuals can be associated with similar common values and members of a group are seen as more able due to in-group bias. Interpersonal disclosure is another factor that foster social acceptance among the newcomer and its peers and manager [HKML12]. Hurst et al. [HKML12] point out a study by Wanberg, Welsh and Kammeyer-Mueller [WWKM07] which shows, within a corporate context, that a self-disclosure of a newcomer (or called protégé in the study) "was related to mentoring received, relationship satisfaction and positive influence of mentoring". The similarity between newcomer and its peers and manager, which has also been mentioned when discussing trust as a factor, plays a general role in social acceptance. The dissimilarity of a newcomer to its work group in respect of age, education, and lifestyle means poorer work group fit [Kir95] and may lead to lower social acceptance. The result of lower social acceptance or in the extreme case social isolation for newcomers from their peers and manager, can be critical and may lead to turnover [HKML12].

2.6.1.2 Role Clarity

Role clarity can be defined as "understanding the tasks to perform for the job and understanding task priorities and time allocation" according to Bauer et al. [BBE+07], which has been adapted from Feldman [Fel81]. Kammeyer-Mueller and Wanberg [KMW03] describe role clarity as "having sufficient information about the responsibilities and objectives of one's job in the broader organization and having knowledge of behaviors considered appropriate for achieving these goals" based on the interpretation of Kahn et. al [KWQ+64]. Understanding and learning the role as a newcomer is a critical task of organizational socialization [Adk95]. Rizzo et al. [RHL70] mention in their research paper on the development of a questionnaire to measure role conflict and role ambiguity, that role ambiguity (or role clarity on the other side of the dimension) has been studied in classical organization theory as well as role theory. The authors state that in classical organization theory every position in an organization should be described by a specified set of tasks (what is expected to be accomplished) and responsibilities (what authority

to decide), with which management holds incumbents of these positions accountable to specific performance. In respect to role theory, Rizzo et al. [RHL70] refers to Kahn et al. [KWQ+64] stating that role ambiguity, which is caused by a lack of available information to a role, lead to increased dissatisfaction with the role, increased anxiety, increased distortion of reality and reduced performance.

2.6.1.3 Self-Efficacy

Jones [Jon86] describes self-efficacy as a factor, which influences the expectation of a newcomer about the abilities to succeed in new situations. Similarly, Bauer and Erdogan [BE12] mention that self-efficacy shows the confidence of a newcomer regarding his or her own abilities to do the job. The most relevant definition of self-efficacy is made by Bandura and has been explained in "The Corsini Encyclopedia of Psychology" [Ban10]. Bandura states that self-efficacy in its core is about a person's belief in his or her ability to influence events that affect his or her life or in other words "about the core belief that one can make a difference by one's action". This belief is developed from four major sources, according to Bandura [Ban10]: (1) mastery experiences, meaning success nurtures a strong belief in personal efficacy and failure weakens it; (2) social modelling, meaning a person identifying him- or herself to other people who are achieving goals and succeeding by resilient effort makes this person believe in his or her own abilities; (3) social persuasion, meaning motivation can increase the effort put into an activity by a person, which leads to a higher success rate; (4) enhance physical strength and stamina, which may seem less relevant in the context of an organization, and reduce stress and depression.

2.6.1.4 Knowledge of Organizational Culture

Although not illustrated in figure 1.1, Bauer and Erdogan [BE11] do also mention knowledge of organizational culture as another fourth important indicator of newcomer adjustment. It has been shown that employees who attend an orientation training program, which explains mission, principles, values, and goals of the organization, are more likely to understand and, to a certain extent accept the organizational culture than those who did not and become socialized earlier [KW00].

2.6.2 Distal Outcomes

As illustrated in figure 1.1, outcomes are separated into proximal and distal outcomes. Proximal outcomes have been discussed in the previous subsection. Distal outcomes indicate the extent to which organizational socialization of newcomers influences the ultimate outcomes, such as job attitudes and newcomer behavior [BE12]. These distal outcomes will be explained in the remainder of this subsection.

2.6.2.1 Job Attitudes

Bauer and Erdogan [BE12] state that job attitudes in the context of organizational socialization include job satisfaction, organizational commitment and turnover intentions. All three job attitudes mentioned can be influenced by some factors, such as engagement [BE12].

Locke [Loc69] defines job satisfaction and dissatisfaction as "a function of the perceived relationship between what one wants from one's job and what one perceives it as offering or entailing". Job satisfaction may relate to overall job satisfaction or satisfaction to certain aspects of the job [TM93]. The second job attitude, organizational commitment, has been defined by Porter et al. [PSMB74] as "the strength of an individual's identification with and involvement in a particular organization". It is an important factor to understand the work behavior of an employee in an organization, and additionally, it is an indicator of certain employee behaviors such as turnover [MSP79]. Last but not least, the job attitude turnover intention, is described by Tett and Meyer [TM93] as "conscious and deliberate willfulness to leave the organization".

2.6.2.2 Job Performance

Job performance can be described as the result of "scalable actions, behavior and outcomes that employees engage in or bring about that are linked with and contribute to organizational goals" [VO00]. According to Bauer [BE12], job performance is an important outcome in organizational socialization and competence is one of the important dimensions which describe job performance. Thus, gaining competence, knowledge and skills is a critical part in the organizational socialization process to increase performance proficiency [Fel81, BE12].

2.6.2.3 Turnover

Turnover happens when an employee leaves the organization voluntarily. Bauer et al. [BE12] emphasize that poor organizational socialization is one of the main causes of turnover in organizations. Employees who feel alienated from colleagues, existing role and task ambiguity, as well as lack in self-efficacy, show a lack of or inadequate socialization [BE12]. For organizations, turnover is a huge cost factor and organizational socialization is a proper counter measure to reduce turnover, as stated by Bauer and Erdogan [BE12].

2.6.2.4 Additional Distal Outcomes

In addition to the mentioned distal outcomes, which are job satisfaction, organizational commitment, turnover intentions, job performance, and turnover, there are further distal outcomes such as person-job fit, person-organization fit, stress, and ethics [BE12]. In this thesis, we do not elaborate on these additional distal outcomes, as the main focus is put on newcomer adjustment indicators or proximal outcomes.

2.7 Relation between Tactics, Proximal Outcomes and Distal Outcomes

The importance of the indicators of newcomer adjustment in organizational socialization and their relation to distal outcomes has been stated by numerous researchers [Fel81, SA97, KMW03, BBE+07]. Bauer et al. [BBE+07] analyzed the relationships between socialization tactics, information seeking, distal outcomes, and proximal outcomes (see figure 2.2). They state that organizational socialization tactics relate to all three proximal outcomes and information seeking significantly relates to role clarity and social acceptance. Looking at the outcomes of the newcomer adjustments, which are represented by the distal outcomes, Bauer et al. [BBE+07] explain that social acceptance relates to all distal outcomes mentioned above, self-efficacy relates to all distal outcomes except job satisfaction and organizational commitment and role clarity relate to all distal outcomes except turnover (additional distal outcomes not included). Knowledge of organizational culture, the fourth adjustment indicator, relates to organizational commitment, job satisfaction, and turnover, as stated by Bauer and Erdogan [BE11].

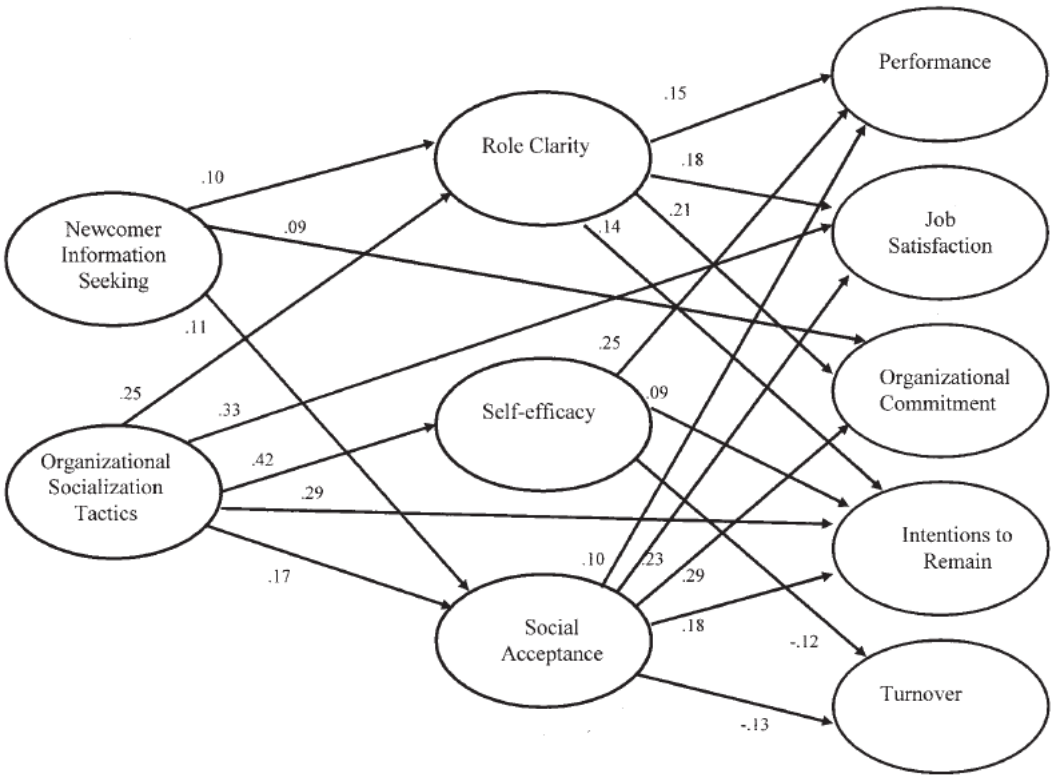

Figure 2.2: Relationship between Socialization Tactics, Proximal Outcomes and Distal Outcomes by Bauer et al. [BBE+07]

2.8 Bauer's Research Based Model for Onboarding

Based on the background learned in the previous sections, a research-based model for the onboarding of newcomers, developed by Bauer [Bau10], can be introduced.

Bauer [Bau10] defines first of all four levels of onboarding, which are also called the "Four C's".

1. **Compliance**, makes up the fundament of the "Four C's" and is intended that newcomers learn as well as understand legal and policy-related rules and regulations. This level can be referred to as the proximal outcome knowledge of company culture.

2. **Clarification**, is the second level and shall help newcomers to understand their new jobs, related job tasks and the expectation of the organization towards them. Clarification can be linked to the proximal outcome role clarity.

3. **Culture**, represents the third level, which can also be referred to the newcomer adjustment knowledge of company culture. In this level newcomers shall learn the organizational norms (formal and informal).

4. **Connection**, the final and the highest level of the "Four C's", which can be linked to the proximal outcome social acceptance, shall help newcomers to build up vital interpersonal relationships as well as an information network.

In figure 2.3 the model is illustrated. It consists not only of the core newcomer adjustments or proximal outcomes explained in the previous sections, but also includes practical factors, such as orientation forums and feedback tools, which influence the adjustment of newcomers and eventually leads to successful onboarding.

In the following subsections each of the influencing factors will be described.

2.8.1 Recruiting

As Bauer [Bau10] mentions, onboarding and recruiting are studied and discussed separately, but to maximize the success of onboarding, these two processes must work seamlessly. Onboarding shall already start during the recruitment process, by giving newcomers realistic job previews (RJP) to clarify the job role, job tasks, as well as expectations of the organization towards the newcomer [Bau10]. Furthermore, the early involvement of stakeholders, such as the hiring manager, co-workers, and management will help candidates during the recruiting process to get a first picture of the organizational environment, as well as the insiders, which fosters the understanding of the values, goals, and culture of the organization [Bau10].

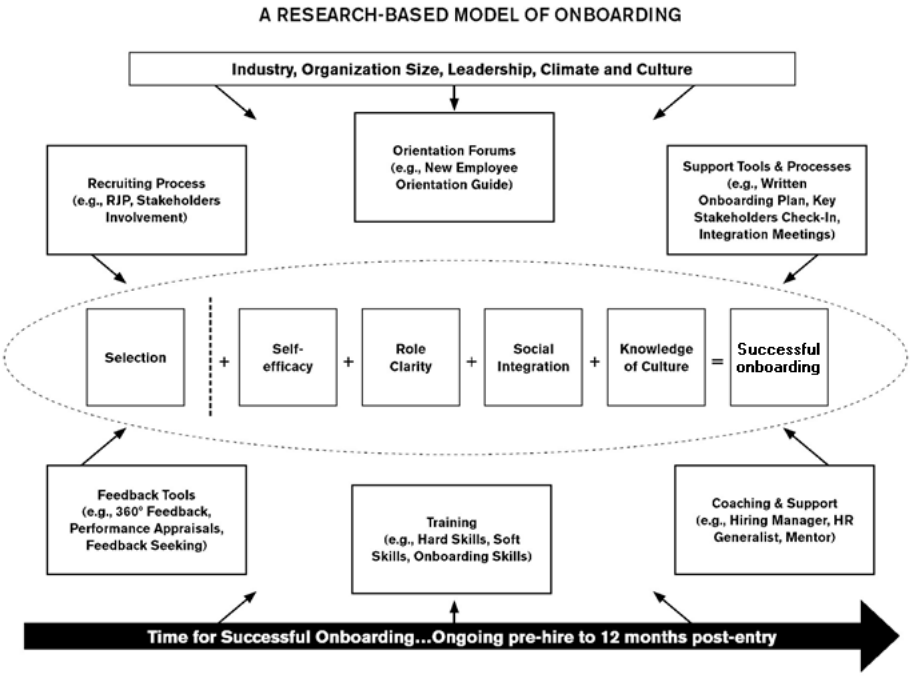

Figure 2.3: A research-based model of onboarding by Bauer et al. [Bau10]

2.8.2 Formal Orientation

Formal orientation programs support newcomers in increasing their knowledge in the organizations values, goals, history, culture and its power structure, according to Bauer [Bau10]. The structure and content of an orientation program can vary a lot from organization to organization. It may take a few hours or even a few months, it may take place face-to-face or computer-based [BE11]. Klein and Weaver [KW00] found in a field study, that newcomers attending a voluntary orientation training "were significantly more socialized on three of the six socialization content dimensions (goals/values, history, and people) than employees who did not attend the training".

2.8.3 Support Tools and Processes

Support tools and processes are another key to success in onboarding. A written onboarding plan including a timeline, milestones, responsibilities, and support available is very helpful to newcomers [Bau10]. Bauer and Erdogan [BE11] add, that effective onboarding trainings are formally documented, communicated to all stakeholders, consistent in its application, and continuously monitored. Another effective way to support newcomers during the onboarding process is to have regular check-in meetings, which shall foster the information exchange between the newcomer and the relevant stakeholders in the organization [Bau10].

2.8.4 Coaching and Support

When thinking of coaching and the support of newcomers, mentorship plays a key role. Mentoring programs are very helpful for newcomers to adjust faster to the new work environment [Bau10]. Anderson and Shannon [AS88] define mentoring in its core as "an ongoing, caring relationship", which consists of five functions: teaching, sponsoring, encouraging, counseling, and befriending. But mentoring is not the only instrument for coaching and support which can be provided by an organization. Organizations that provide the opportunity for information interaction with co-workers to the newcomer, foster an easier adjustment to the new work environment as well [Bau10].

2.8.5 Training

As mentioned previously, an important factor of newcomer adjustment is self-efficacy. To raise a newcomer's self-efficacy it is necessary that the newcomer undergoes trainings, which includes training of hard skills, soft skills, and onboarding skills [Bau10].

2.8.6 Feedback

Next to onboarding practices facilitated by an organization, there is also the perspective of proactive behavior of the newcomer, as illustrated in figure 2.2. This behavior includes seeking information and feedback by asking direct and indirect questions. Feedback, a message comprising information about the newcomer's own behavior and performance according to Ashford and Cummings [AC83], is valuable to the newcomer to adjust according to the expectation of the organization and supervisor. Bauer [Bau10] points out and suggests, that organizations give feedback proactively to newcomers by approaches such as performance appraisals and 360-degree feedback during the onboarding process. Also formal onboarding, including help desks and online information centers, are a valuable source of feedback for newcomers [Bau10].

CHAPTER 3

What is a Distributed Team?

This chapter shall elaborate on what distributed teams are, how they differ from traditional co-located teams, and how these distributed teams work. Furthermore, challenges of distributed teams as well as factors making distributed teams effective and successful, have been reviewed.

In this thesis and especially in the following sections of this chapter, the term 'Virtual' may be used interchangeably with 'Distributed', as they are synonymous in the context of distributed teams. As Connaughton and Shuffler [CS07] recognized in their study, these terms have to be used to locate research papers on distributed teams.

3.1 Definition of Distributed Teams

Townsend et al. [TDH98] define distributed teams as "groups of geographically and/or organizationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task". These teams may form a temporary or permanent structure and the team membership is often loosely coupled [TDH98].

Likewise, Lipnack and Stamps [LS00] define distributed teams as "teams with a common purpose that use technology to cross time zones, distance, and the boundaries of organizations".

In summary, the following three attributes characterize a distributed team, according to Cohen and Gibson [GC03].

- Functioning team, which can be defined as "a group of people who are interdependent with respect to information, resources, knowledge and skills who seek to combine their efforts to achieve a common goal" [TT08]

- Members of the team are geographically dispersed
- Team relies on technology-mediated communications rather than face-to-face interaction to accomplish tasks

All previously mentioned definitions and attributions related to distributed teams can be summarized in a multi-dimensional illustration as shown in figure 3.1.

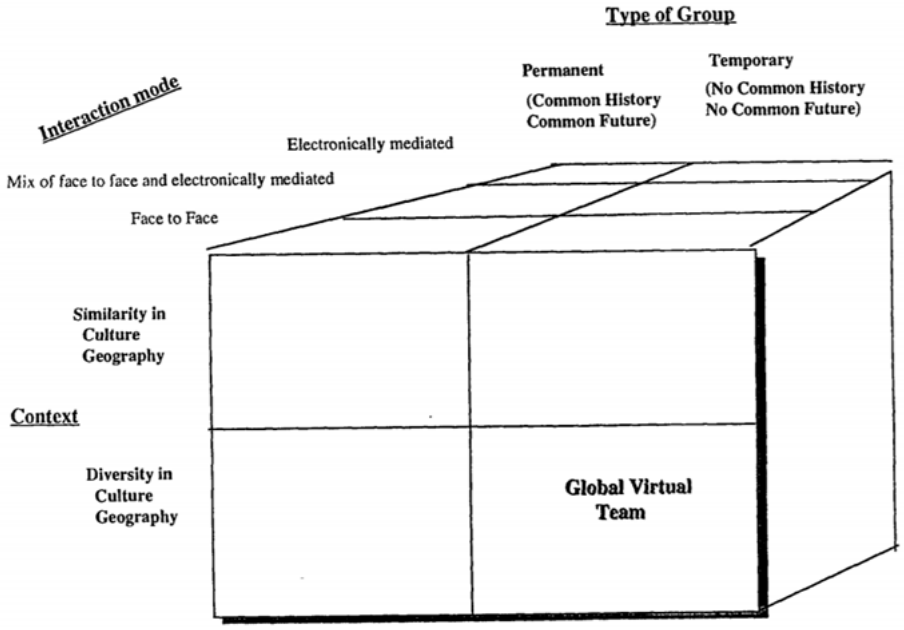

Figure 3.1: Definition of Global Virtual Team by Jarvenpaa and Leidner [JL99]

According to Kirkman et al. [KGS01], distributed teams started to develop by the mid-1990s when US companies started to use the concept of teams in other geographically distant regions of the organization, such as Asia, Europe, and Latin America to integrate global human resource practices.

There are various reasons for establishing and working in distributed teams. Some of these reasons are listed below, which are based on a list of factors supporting the trend in the early 2000s in the growth of distributed teams, by Herbsleb and Moitra [HM01].

- The concept of distributed teams capitalizes on the global resource and talent pool on one hand, and being cost-competitive on the other hand [HM01]. These teams can have members from all around the world to solve business problems, service customers, and create new products [GC03].

- Local resources are aware of the local market, customers, and policies, which can contribute to different views on the task to be accomplished [HM01]. Hinds and Kiesler [HKK02] refers to the example of LM Ericsson, who were able to achieve a more global product by having a distributed product development team sitting on multiple continents and collaborating together.
- Distributed teams can be set up quickly to make use of market opportunities [HM01].
- Using resources in various time zones around the globe to work "round-the-clock" and improve time-to-market [HM01]. An example by Pape [Pap97], which has been referred to by Hinds and Kiesler [HKK02], illustrates the advantage of a distributed team, which solves a customer problem and delivers a solution within twenty-four hours by utilizing the capacity of team members in San Fransisco, Singapore and Greece.
- Need for and demand in flexibility on merger and acquisition opportunities to quickly build functioning cross-organization teams [HM01].

In the past decades, organizations adopted distributed teams increasingly to organize work and this trend is expected to continue in the future [DH17]. Especially because of events such as the COVID-19 pandemic, which will continue to reduce business travel and optimize virtual working according to [CDCM+20], the number of distributed teams in organizations will likely grow.

3.2 Differences between Distributed and Co-Located Teams

Even though the core purpose of distributed and co-located teams is equal, the differences in the characteristics of distributed and co-located teams lead to different challenges. In this section of the thesis, some of the major differences between both types of teams are explained. The outline of this section is based on attributes studied by Pawar and Sharifi [PS97], which can be summarized as geographical dispersion, flow and exchange of information, utilization of resources, observation and awareness of team members, cultural and educational background, and technological compatibility.

3.2.1 Geographical Dispersion

The most obvious difference is the geographical dispersion or proximity of team members. Distributed team members are geographically dispersed whereas co-located team members are physically close to each other. The effect of geographical dispersion may even start with smaller distances such as working in the same building but on different floors as Siebdrat et al. [SHE09] states. According to the aforementioned authors, even these small distances may have a large impact on the quality of collaboration.

In the research conducted by Siebdrat et al. [SHE09] it has been found that these small distances matter with regard to the quality of the team output, as well as with regard to time and cost, which have been illustrated in figure 3.2.

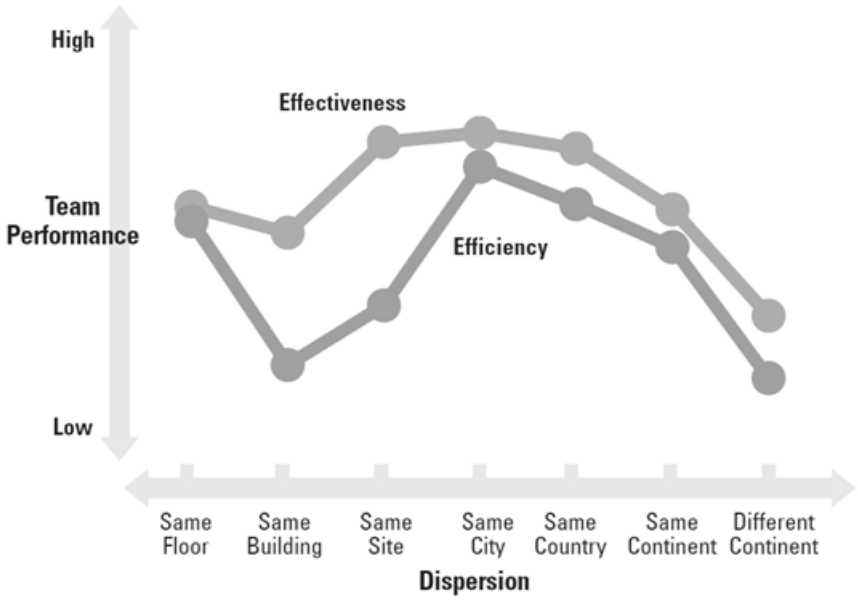

Figure 3.2: Significance of Small Distances by Siebdrat et al. [SHE09]

3.2.2 Flow and Exchange of Information

Another characteristic that differentiates distributed teams from co-located teams is the flow and exchange of information. Pawar and Sharifi [PS97] explains this characteristic by comparing the steady flow of information in Cookwell Ltd., where members were physically co-located, with the case study project PACE, where distributed team members were communicating in a cyclic pattern, based on the given meeting structure. According to the case study referred by Pawar and Sharifi [PS97], the information exchange between geographically dispersed team members significantly increased as the meeting approached.

In the examples given by Pawar and Sharifi [PS97], the co-located team was able to have a working environment where team members were easily accessible. In contrast to the co-located team, the members of the distributed team were not able to easily share ideas or dilemmas with colleagues. An interesting issue, found by both aforementioned authors, was that the co-located team had issues interacting with actors outside of the co-located team within the company.

3.2.3 Utilization of Resources

The utilization of resources also differs between a co-located and a distributed team. In a co-located team, members most commonly have access to and share the same technical, human and financial resources, whereas distributed teams need to manage the resource allocation differently [PS97]. In the context of distributed software development teams, this factor may be neglected, as most resources are only virtually available.

3.2.4 Observation and Awareness of Team Members

In co-located teams supervisors or project managers are able to monitor the team closely due to the proximity of all team members [PS97]. In a distributed environment the observation of the behavior of team members is hardly possible, and supervisors and project managers rely on regular status updates, as well as the review of results.

3.2.5 Cultural and Educational Background

Cultural and educational background was also a major element which was differentiating in the composition between the co-located team within the organization Cookwell Ltd. and the distributed team of the PACE project. In a co-located team where members are recruited and selected by the same procedures within an organization, the chosen members will have similar cultural and educational background [PS97]. This most commonly will not be the case in a distributed team, as team members are located in various cities or countries with different cultural and educational influences. Even if HR recruiting and selection practices are globally harmonized and implemented, the cultural and educational background will vary. The paper of Pawar and Sharifi [PS97] even mentions that besides PACE project team members having different education, culture, language, time orientation and expertize, there were also conflicting organizational and personal objectives among the distributed team members.

3.2.6 Technological Compatibility

The last differentiation mentioned by Pawar and Sharifi [PS97] between a co-located team and a distributed team is the technological compatibility. A co-located team will have minimal incompatibility, whereas a distributed team will face some difficulties. The distributed team mentioned by Pawar and Sharifi [PS97] had to agree right from the beginning on what systems (e.g. for communication) have to be used to achieve the objectives in time. While this topic may seem less important nowadays, there are still constraints and issues in the means of connectivity and restricted access.

3.3 Challenges of Distributed Teams

Due to the geographical dispersion, as well as the technology-mediated communication, distributed teams face various challenges in addition to those which co-located teams

face already.

Kayworth and Leidner [KL02] enlist four major challenges within distributed team environments, compared to traditional co-located team environments, which are represented in the table 3.1.

Type of challenge	**Description**
Communications	Traditional social mechanisms are lost or distorted; Communication dynamics such as facial expressions, vocal inflections, verbal cues, and gestures are altered; Distinctions among member's social and expert status lost or distorted; Inhibition in building trust; Communication process dysfunction
Culture	Potential for multiple cultures requires greater communication skills; Unrealistic cultural expectations; Communication may be distorted through cultural misunderstandings/biases
Logistics	Multiple time zones make scheduling meetings, as well as travel, very difficult
Technology	Technophobia; Need for proficiency across a wide range of technologies; Team membership bias toward individuals skilled at learning new technologies

Table 3.1: Challenges of distributed teams according to Kayworth and Leidner [KL02]

Furthermore, Kirkman et al. [KRG+02] identified five major challenges, which have been experienced in a case study at Sabre Inc. while building and managing distributed teams, and which will be explained in the following subsections to elaborate on additional challenges faced by distributed teams.

3.3.1 Trust

A major challenge for a distributed team is to build trust among the team members [KRG+02]. Based on the lessons learned at Sabre Inc., trust is built by team member reliability, consistency and responsiveness, which means, in practice, a trusted team member provides fast responses to electronic communications from other team members, demonstrates reliable performance and is doing consistent follow-through [KRG+02].

As Jarvenpaa et al. [JKL98] mention, trust is important in any form of team but especially in the form of geographically dispersed teams. Furthermore, it is pointed out that due to the distributed context, supervision is hardly possible and factors contributing to trust such as "geographical proximity, similarity in backgrounds, and experience, are often absent" [JKL98].

Building trust quickly is possible in face-to-face communication but not in the context of geographical dispersion [LS00].

3.3.2 Group-Process Losses

The second challenge mentioned by Kirkman et. al [KRG+02] is the overcoming of potential group process losses in a distributed team. Such teams may have difficulties in creating positive synergies, as the team members rarely interact face-to-face or rarely have day-to-day physical encounters. Additionally, distributed teams with few face-to-face meetings have a higher risk of process losses and performance problems [KRTG04].

These aforementioned day-to-day encounters are relevant for gaining informal information on work-related subjects, which increase in relevance "in organizations with rapidly changing environments and 'unstable' projects" as formal communication takes too much time [HM03]. Herbsleb and Mockus [HM03] refer to two studies, where it has been shown that software developers spend a relatively long time on informal communication. One of these studies was conducted in a large software engineering company, where the average time developers spend on informal communication on a day was about 75 minutes [PSV94]. This kind of communication is difficult in a distributed context, as face-to-face or physical encounters rarely happen [KRG+02].

3.3.3 Isolation and Detachment

The isolation and detachment of team members in distributed teams is a major issue [KRG+02]. As Casico [Cas00] states, all employees need social interaction with their colleagues and managers, to a certain extent. Without social interaction, employees "feel isolated and out of the loop" [Cas00].

Even though distributed teams have the advantage of autonomy, it has the disadvantage of social isolation. Isolation may be due to various reasons such as multicultural issues (language barriers), social dimension differences, political or cross-boundary challenges, or timing of meetings (time zone) [Lee21].

Creating an inclusive working environment, where involvement of members is desired, depicts a challenge in distributed teams [KRG+02].

3.3.4 Balance of Technical and Interpersonal Competencies

Another challenge presented by Kirkman et al. [KRG+02] is the ability of an organization to identify future team members, who have a proper balance of technical and interpersonal competencies. Due to the nature of distributed teams, organizations may underestimate the importance of interpersonal skills, as distributed teams mostly do not communicate face-to-face.

As Townsend et al. [TDH98] state, the way of working and interacting is different in the context of distributed teams, compared to traditional co-located teams. Both interpersonal and technical competencies are required to overcome the challenges of distributed teams. On the one hand, distributed team members need to learn how to express themselves and understand other members of the team virtually, as well as have superior team participation skills, and on the other hand, have to be proficient with

various computer-based technologies which supports the communication and collaboration within the team [TDH98]. In the context of distributed software development teams the usage of computer-based technologies may be considered as proficient.

3.3.5 Assessment and Recognition

The fifth and last challenge mentioned by Kirkman et al. [KRG+02] is the assessment and recognition of team and team members individual performance. Managers who are not able to observe the action of their team members won't be able to develop weaknesses and improve strengths properly.

It is of importance to communicate clear expectations towards the team members regarding goals, measures and assessment, especially in distributed teams [Cas00], as the geographical dispersion as well as technology-mediated communication may lead to misunderstandings.

3.4 Factors for Effective and Successful Distributed Teams

To ensure distributed teams are effective as well as successful and overcome the challenges mentioned above, various factors have been studied ([JL99, LR01, MGM04, GC03, FPF17]). Most of these factors can be summarized into three enabling conditions which have been discussed by Cohen and Gibson [GC03]. The authors mention that these enabling conditions can't be created by giving instructions but it can be achieved by seeing it as a cyclic process, which is ongoing. These conditions will be elaborated in the subsequent subsections.

3.4.1 Mutual Trust

Trust plays a vital role in all forms of teams, but especially in distributed teams where trust building behavior is not easily observable. According to Cohen and Gibson [GC03], people trust those who are similar to themselves, which is not the case for a geographically dispersed team with different cultures, experiences and backgrounds.

Handy [Han95] enlists "seven cardinal principles of trust" which are important to build trust in organizations, particularly in distributed teams:

- It is difficult to trust people whose actions weren't observed by us for a certain time and who do not follow the same goals. Thus, smaller groups are better for observing each other than larger groups.
- Trust can be translated in organizations as confidence in someones competence and commitment to a goal. Based on a given goal, which is the boundary set by the organization, the individual or the team has the freedom to work towards this

particular goals on their own. The assessment of the results happens after the goal has been accomplished or the due date reached.

- Trust is possible in organizations where change and learning is part of the organizational culture.
- An organization must be able to separate from employees if "they don't live up to expectations or cannot be relied on to do what is needed".
- Organizations' goals must be in alignment with the goals of smaller units within the organization. The vision and mission statement of the organization plays a key role for goal integration and, to build trust, it is vital that these statements must be personal.
- Handy [Han95] states that "the more virtual an organization becomes, the more its people need to meet in person". These meetings should be used to get to know each other and focus on processes rather than on tasks.
- Trust-based organizations need leaders rather than managers, as units within the organization are very well able to manage themselves.

Furthermore, Jarvenpaa et al. [JL99] mention specific behaviors on communication, as well as actions, that facilitate trust in distributed teams. Both factors are grouped into early stage and advanced stage of a team life. Social communication, communication of enthusiasm, coping with technical and task uncertainty, as well as individual initiative, will foster trust in the beginning of a team life. Maintaining trust within a team over a period will be supported by a predictable way of communication, substantial and timely responses but also positive leadership and calm responses to crises. Another key element to maintaining trust is to successfully transition from social focus to procedural focus and then to task focus.

3.4.2 Shared Understanding

Distributed teams consist of people with different backgrounds, which leads to "different ways of perceiving their tasks, key issues and making sense of their situation" [GC03]. To enable the necessary conditions for distributed teams, a distributed team needs a common understanding of their goals, work and group processes, their tasks, as well as member knowledge, skills, and abilities [GC03].

Cuevas et al. [CFSB04] mention that shared understanding or shared mental model is a concept that improves teams decision-making. Especially in a distributed team setting, there is a higher coordination and communication overhead [HM03]. By having a shared mental model within the team, the efforts to coordinate, the adaptability to changing demands, and the understanding of the needs of other team members, as well as task expectations, will improve [CFSB04].

A shared understanding supports the shift from explicit coordination to implicit coordination, which reduces the overhead in coordination and communication but also plays a role in building trust and interpersonal relationships [CFSB04].

Also in the area of socialization in the context of organizational knowledge creation, the concept of shared mental models is relevant and the tacit knowledge is gained mainly through observation, imitation and practice.

3.4.3 Integration

The required systems, policies, and structures in organizations, that make distributed teams work and create value, are another enabling factor listed by Gibson and Cohen [GC03].

As distributed team members are geographically dispersed and thus the systems, policies, and structures may vary to a certain extent between these members, integration is important to make a distributed team work. As an example, Cohen and Gibson [GC03] mention network connectivity as a problem due to different information technology infrastructures in different locations. Any policy, structure or system may influence members of a distributed team towards a certain behavior. To conclude, "the greater the degree of differentiation in an organization, the greater is the need for integration" [GC03].

3.5 Leadership in Distributed Teams

Overcoming the challenges in distributed teams needs special attention of team leaders and thus this section shall give some insight into leadership practices for distributed teams.

The outline of the section is based on practices identified by Malhotra et al. [MMR07] based on observations, interviews, and survey data.

As already mentioned in the challenges of distributed teams and in the factors for effective and successful distributed teams, the building and maintaining of trust through the use of communication technology is a crucial activity for team leaders. As a team leader of a distributed team, it is vital to establish the necessary norms in communication of information as one of the first steps, to avoid misleading communication among team members with different communication behaviors [MMR07]. Malhotra et al. [MMR07] cites a team leader of a distributed team saying that the quickest way to build trust is to play fair and keep promises, which applies to the team leader as well as to the team members.

Another important function of a leader in a distributed team is to ensure cultural awareness and appreciation within the team. A very simple approach mentioned by Malhotra et al. [MMR07] is to create a directory including all team members with information such as photo, training, experience, and previous assignments, which is

available to the entire team. Making pairs with two geographically dispersed as well as functionally diverse team members, and assigning them to execute a task, is a more sophisticated approach to foster cultural awareness and tackle communication issues by a close collaboration [MMR07].

By setting up a suitable meeting structure, a distributed team leader ensures that all members are engaged and aligned [MMR07]. As virtual meetings with all team members have the tendency to get "out of control", it is important that these have a clear agenda and are well managed.

Successful team leaders monitor the progress of the team by reviewing synchronous and asynchronous communication channels to understand who is actively participating and who needs support [MMR07]. Reviews may range from checking the usage of repository log data, to checking work deadlines.

Team leaders need to focus on team building but also have to report to the stakeholders regarding the results of the activities of the distributed team. Malhotra et al. [MMR07] points out that distributed team members have, in addition to their distributed team leader a local manager, who has also expectations towards the team member and it is one of the responsibilities of the distributed team leader to align these expectations and goals with the local manager. A balance scorecard for alignment with the local manager is a useful instrument according to the authors.

Last but not least, distributed team leaders need to make sure that each team member "has an opportunity to learn, grow, contribute, and feel an integral part of the team" [MMR07].

As team leaders play a pivotal role in managing distributed software development teams successfully, this thesis is considering the perception of team leaders or similarly qualified experts as base for the Delphi study.

CHAPTER 4

Socialization Tactics in Distributed Teams

The research literature on onboarding practices focused on co-located teams and thus there is not much research on onboarding practices for distributed teams ([AG03, PDLK04]).

Ahuja and Galvin [AG03] analyzed e-mails within a time frame of three months of socialized and not yet socialized distributed team members. The membership status, whether the team member is socialized or not, has been derived simply by categorizing them in team members with less than one year and more than one year of seniority. They found, similar to traditional co-located teams, that newcomers in distributed teams seek information and established team members provide information. However, in co-located teams, newcomers passively acquire information by observing, whereas members of a distributed team need to take an active approach to gain information. As an implication for practice, Ahuja and Galvin found out that the active approach to gain information can be fostered by linking newcomers directly with established members, which allows newcomers to easily ask questions about expected behaviors and attitudes. It has to be mentioned that the findings of this research paper are not state-of-the-art, as it relies solely on information of e-mail exchange, which has changed nowadays when video conferencing is already a standard, especially since the COVID-19 pandemic made knowledge workers move into home office and forced remote work.

Similar to Ahuja and Galvin, Picherit et al. [PDLK04] also acknowledge that, to a certain extent, socialization of newcomers in distributed teams is similar to traditional co-located teams. However, communication and relationships are a challenge to organizations with distributed teams. Miller and Jablin [MJ91] elaborate that newcomers in traditional co-located teams use a variety of ways to seek information during the organizational entry by communication (e.g. observing, testing limits) and rely on multiple information sources based on relationships with co-workers (peers) and supervisors. Even though

organizational relationships are comparable between traditional co-located and distributed teams, they are not identical, as the entire communication and relationship building of distributed teams are mediated by information technology, which has an impact on various factors such as trust, openness, and supportiveness [PDLK04].

Picherit et al. [PDLK04] examine three important areas of relationship building in distributed teams, namely peer relationships, supervisor relationships, and mentoring relationships.

Peer relationship is an important factor in organizational socialization, as peers provide support during the organizational entry of a newcomer. According to a study by Nelson and Quick [NQ91], the most available and helpful resource for newcomer adjustment is provided by peers during daily interactions. But especially factors such as "physical proximity, life events outside of the workplace and similarity in attitudes and beliefs", which are important for developing relationships with peers, are affected by the characteristics of distributed teams [PDLK04].

The supervisor-subordinate relationship is also important for the organizational socialization of newcomers, as supervisors "help build a shared interpretive system" [PDLK04]. In contrast to traditional co-located teams, Pichert et al. [PDLK04] see "loosening of the rules and responsibilities in the supervisor-subordinate relationship" in distributed teams. Furthermore, due to the context of distributed teams, the supervisor-subordinate relationship focuses more on "co-orientation, facilitating and supporting the socialization process" as status and hierarchical position of distributed team members are less relevant [PDLK04].

According to Picherit et al. [PDLK04], similar to traditional co-located teams, distributed teams may also profit from formal and informal mentoring. The authors assume that, due to the context of distributed teams, formal mentoring is more helpful for newcomers than informal training as distributed team members have less opportunities to informally interact with their team. If the life span of a distributed team is not limited or is planned for long-term, informal mentoring may be more helpful than formal mentoring.

As an implication of their research, Picherit et al. [PDLK04] recommend organizations introduce a formal mentoring program, change the role of managers towards a facilitating role, and help newcomers in having a proactive behavior.

4.1 Socialization Tactics in Distributed Software Development Teams

Independent of the industry or area, Bauer [Bau10] states that among other, best practices for onboarding are "implementing the basic paper-work before the first day, making the first day on the job feel special to the newcomer, having formal orientation programs, developing a written onboarding plan, making onboarding participatory, running the program consistently, monitoring onboarding over time, using technology to help facilitate

the process, engaging stakeholders, and being clear on objectives, timelines, roles, and responsibilities" [BE12].

While many onboarding practices can be applied regardless of the industry or area, there is little dedicated research available for organizational socialization in distributed software development teams ([HB11, MSG20, Bri17, BCSS18, BSDB19, BSDB20, OKW07]).

4.1.1 Case study by Hemphill and Begel

Hemphill and Begel [HB11] conducted a study, analyzing five software companies, which onboarded a newly hired remote team member. As already mentioned previously and mentioned by the aforementioned authors, communication between but also visibility of distributed team members are influential for the onboarding of newcomers. Especially in situations where remote newcomers are joining an existing team of co-located team members, it may lead to isolation, as the newcomers are not able to participate in informal communications and not able to build social relationships. Newcomers have difficulties in understanding the experiences and expectations of team members, which in turn may cause anxiety about lacking performance expectations. In contrast, team members, who were able to see their co-workers and were included in informal communication, had less anxiety and insecurity. The key finding of Hemphill and Begel [HB11] is that the "frequency and nature of team interactions strongly influence the effectiveness and pace of onboarding" in distributed teams. Thus, it is recommended that leaders of distributed teams implement structured processes and foster frequent interactions among team members. Furthermore, onboarding activities, which are applied by distributed team leaders, such as implementing a curriculum, setting and aligning goals, as well as expectations about time-to-productivity, will help newcomers to onboard effectively to the team. Generally, newcomers who are highly self-monitoring and proactive will more effectively gain valuable information from existing team members by information communication. A team leader of a distributed team may actively moderate communication among the team to foster participation of newcomers. Routinely asking and answering questions is another way to encourage communication and build empathy among team members.

4.1.2 Case study by Britto et al.

Another study in the area of onboarding in software development teams was conducted by Britto et al. [BSDB20], who conducted a case study to understand the relationship between onboarding strategies and performance evolution in the context of a large-scale globally distributed project. The authors identified, through the course of the case study, four onboarding factors, as well as various practices that had an impact on the performance evolution, which are mentioned subsequently. In the aforementioned globally distributed project, newcomers could either utilize existing documentation or seek guidance of software architects to gain knowledge about the product and methodologies. On the one hand, the documentation was not complete and the search for required knowledge was difficult. On the other hand, mentoring was challenging as the software

architects, who were mentoring the newcomers, were sitting on another continent and this in turn caused communication issues. Over the course of time, mentoring was reduced to communication through code reviews, which was helpful for newcomers but it took quite a long time until the reviews were given to the newcomers. Video conferences, which should have been held more frequently accorording to the newcomers, were used for critical tasks and phases only. These issues and challenges implied, according to the case study, that remote mentoring negatively impacted the productivity of the newcomers. Furthermore, the case sudy has shown that formal training plays an important part in the onboarding of newcomers. However, the social-cultural fit of formal training shall not be neglected, as this may have a big impact on the outcome of the formal training. In the case study, the newcomers, who where located in India, received a formal training, but the onboarding was mainly focused on autonomous learning. Nevertheless, due to the educational background of the newcomers, the required learning approach should have been based on a higher degree of formal training, as the authors assume. This was not the case in the onboarding of the distributed team. Another factor that has an impact on the performance evolution is the kind of task that newcomers are assigned to in the beginning of their onboarding journey. Britto et al. [BSDB20] do not recommend the assignment of large complex distributed tasks in the early onboarding stage for on-the-job training. As a final factor, it is mentioned that team stability is important for the performance of a distributed team. In the case study, there was no task which has been accomplished by the same group of software developers, which affected the performance evolution of the newcomers. Thus, the authors recommend to keep the distributed team stable over time.

Britto et al. [BSDB20] summarizes and identifies onboarding practices, most of them based on Bauers research-based onboarding model, which are listed below:

- Recruiting and onboarding is an integrated process where key stakeholders are involved early on
- Realistic job preview is provided during the recruitment and an onboarding plan is created
- Provide formal orientation for newcomers
- Provide mentoring for newcomers
- Evaluate the progress of newcomers
- Take into account cultural differences when developing learning process
- Ensure co-located mentoring to support the learning process of remote teams when there is not enough competence locally
- Facilitate group learning
- Use code reviews to support learning

4.1.3 Case study by Moe et al.

Similar to the case study by Britto et al. [BSDB20], a case study has been conducted by Moe et al. [MSG20]. The case study took place in a Norwegian bank, which integrated a Portuguese distributed software development team into two existing Norwegian co-located teams. Also, similiar to the case study elaborated earlier, the authors based their research on Bauer's research-based onboarding model. They found that the model is also applicable for globally distributed teams. The bank covered to a certain extent all aspects defined in the research-based onboarding model by Bauer, from recruitment to coaching and support. The Portuguese team was recruited almost all at once. While the search for candidates and the first interviews were conducted by an external agency, the second and third interviews were held by the Norwegian bank including the stakeholders (e.g. developers from the existing team). Thus, early involvement of the stakeholders has been achieved. Furthermore, as the distributed team was hired almost at once, all newcomers received a formal orientation programm of three weeks on site, face-to-face with the Norwegian teams. The formal orientation program, which helped all team members to gain knowledge as well as build relationships, has been seen as very successful. Yet, the orientation program could be shortened to two weeks, according to the newcomers, as it was a lot of new technical knowledge and domain knowledge within a short time frame and they were not able to put the newly acquired knowledge into practice. Moe et al. [MSG20] refer to mentoring as a tool and process to coach as well as support newcomers. The Norwegian bank coupled one Norwegian developer with one or two Portuguese developers to support newcomers with training, knowledge and feedback, as well as delegate and follow-up on tasks. Besides mentoring as a way of giving feedback to the newcomers, the Norwegian bank applied various methods ("Improvement Friday", retrospectives, monthly one-on-one sessions) to provide feedback to as well as receive feedback from newcomers to improve the work environment and work processes. As training is a continuous process Norwegian developers and software architects visited the Portuguese site several times after the orientation program to train the newcomers. Another successful method of training, which was also mentioned positively by Britto et al. [BSDB20], was code reviews. Eventually, the case study revealed some challenges in the onboarding of a globally distributed team. Moe et al. [MSG20] lists the most frequently mentionend challenges the teams were facing: (1) missing domain knowledge, (2) problems with communication tools, (3) unclear tasks and (4) language barriers.

4.1.4 Research study by Rodeghero et al.

Most recently, during the writing of this thesis and due to the COVID-19 pandemic, a research study by Rodeghero et al. [RZHF21] was published, involving 267 new hires at Microsoft who have been onboarded remotely during the pandemic. In the following list the recommendations from this particular study, which shall help organizations to successfully onboard new hires remotely, are reflected.

- The first recommendation based on the research study of Rodeghero et al. [RZHF21]

is to promote communication and encourage newcomers to ask questions or ask for help. Managers of such teams can guide the newcomers with best practices such as daily meetings.

- Another important factor that helps bonding and forming connections with colleagues, is to turn on the camera during meetings or calls. Newcomers, but also all other team members must be encouraged to turn on their cameras, including the manager him- or herself.

- Having 1:1 meetings with the newcomer is also a recommendation found in the study, which should not be limited only to 1:1 meetings between the newcomer and manager, but include individual meetings between newcomer and other team members. By having multiple 1:1 meetings throughout the week with different people, the newcomers "feel more comfortable asking for help and feel more part of the team" [RZHF21].

- As knowledge about the organization, which includes among other things norms and policies, is very important for newcomers to understand the business context, managers shall provide organizational information early on to newcomers.

- To establish strong social bonds within the team, it is recommended to conduct virtual team building events, such as "happy hours, a workout class such as yoga, coffee chats, or playing other games together". [RZHF21].

- An onboarding buddy for a newcomer is a helpful guide, to make sure that the onboarding process runs smoothly and the newcomer feels comfortable. The onboarding buddy supports the newcomer with activities, such as providing useful information and introducing people from the organization to the newcomer. The onboarding buddy could be someone from outside the team as well, which is even recommended by the authors of the research study.

- In addition to the onboarding buddy, it is also recommended to have a technical mentor during the onboarding of the newcomer. This technical mentor, who is part of the team, supports the newcomer on a very detailed and technical level (e.g.technical questions and code issues). Thus, the technical mentor should be very well aware of the coding that the newcomer is working on or shall work on.

- As people, and therefore newcomers are different, they also prefer different paces of onboarding. This recommendation suggests having multiple tracks with different onboarding paces, so newcomers can choose the track based on their pace, which leads finally to greater job satisfaction.

- It is recommended to start with a first simple task as a newcomer. The first task should be as easy as possible, so the newcomer has the possibility to go through all development steps (such as build project, pull request, submission, review) already at an early stage.

- An up-to-date documentation, which is not overwhelming, easily accessible and also give context to the newcomers role, is highly recommended. Newcomers have difficulties, especially due to the distributed environment, getting quick answers from other team members as these team members might not be immediately available. Thus, easily accessible and up-to-date documentation can reduce the number of questions.

4.1.5 Summary of State-of-the-Art

The number of distributed software development teams is steadily increasing, and events such as the COVID-19 pandemic are forcing organizations to implement distributed teams throughout the whole organization in no time.

As elaborated in this section, case studies by Hemphill and Begel [HB11], Britto et al. [BCSS18], and Moe et al. [MSG20] were analyzed and discussed. Furthermore a research study by Rodeghero et al. [RZHF21] was included in the analysis of the State-of-the-Art literature.

Certain commonalities could be identified, such as regular interactions between team leaders and newcomers (e.g. one-on-ones), formal orientation programs, code reviews by senior colleagues, regular feedback sessions, and onboarding buddy or mentor for newcomers.

This thesis differentiates itself by arguing that a Rankingtype-Delphi study, with a Delphi expert panel consisting of highly experienced team leaders or similarly qualified experts, might lead to more generalizable findings in contrast to the aforementioned case studies and add value by providing a ranking of onboarding practices for distributed software development teams.

In the next chapter of this thesis, the research method and design to explore best practices for onboarding in distributed software development teams are elaborated.

CHAPTER 5

Research Method and Design

5.1 The Delphi Method

To choose the right method for evaluating the set of onboarding best practices in distributed software development teams. it is necessary to discuss the relevant research questions in the thesis.

To evaluate the best practices, the following research questions have to be answered:

- RQ1: What are the expected outcomes of organizational socialization?
- RQ2: Which tactics are used in practice in organizational socialization in distributed software development teams?
- RQ3: What organizational socialization tactics are perceived by team leaders as having the most contribution to the expected outcome of organizational socialization in distributed software development teams?

To solve the first research question, a background research will be conducted. The choice for background research has been made as the expected outcomes of organizational socialization have been well studied in the past by Bauer et al. [BBE+07, BE12]. Furthermore, the background review shall impart knowledge of organizational socialization and distributed teams.

The second research question is defined to explore the variety of practices used for onboarding in distributed software development teams. Even though there are few case studies available [HB11, MSG20] where onboarding practices have been observed and evaluated in distributed software development teams, each case study investigated one particular organization, which makes it difficult to generalize the practices found. A similar study by Buchan et al. [BMY19] about onboarding in agile software development

teams had its focus on agile software development teams, whereas the particular thesis is focusing on distributed software development teams. Last but not least, a study by Britto et al. [BCSS18] analyzed the onboarding of software developers in three globally distributed legacy projects. As the authors of the study suggests, more empirical studies investigating onboarding in a holistic way should be handled in future research. The practices found in the study by Britto et al. will be used to validate the answers of the second research question in the thesis.

The third and final research question explores which of the onboarding practices in distributed software development teams contributes most to the expected outcomes in organizational socialization. This kind of ranking of tactics in the field of distributed software development teams has not been studied so far. An approach towards such a ranking or rating has been made by Buchan et al. [BMY19], but focuses on agile software development teams, as previously mentioned.

To answer the second and third research question, the thesis will apply the Delphi method. The core idea of the Delphi method can simply be expressed by the principle in the book "The Wisdom of the Crowd" by James Surowiecki [Sur05], which states "why the many are smarter than the few" and "how collective wisdom shapes business, economics and nations".

The Delphi method shall help to explore the variety of onboarding practices from a view point of an expert panel in this field (answer to second research question), and subsequently rank these tactics in an iterative and a collective manner by the same expert panel (answer to third research question).

5.1.1 Introduction to Delphi Method

The Delphi method was invented by the Rand corporation in the beginning of 1950's [LT+75, OP04]. In a project memorandum of the Rand corporation, which was published many years later, in 1963, by Dalkey and Helmer [DH63] it is summarized that the objective of the method is to "obtain the most reliable consensus of opinion of a group of experts [...] by a series of intensive questionnaires interspersed with controlled opinion feedback".

While the primary utilization of the Delphi method was in the area of forecasting, the Delphi method has also frequently been utilized for issue identification and prioritization as well as for concept and framework development [PCPNT13]. The method itself has been applied to a wide range of research areas, such as engineering education, health care, economics, as well as computer science [Sch97, SHK07, PCPNT13].

The Delphi method has evolved in the last decades, with a number of different variants being actively used, which are Classical Delphi, Policy Delphi, Decision Delphi and Ranking-type Delphi - all of these "share some fundamental characteristics (e.g. feedback, iterative process)" [PCPNT13]. Given that the thesis is focusing on exploring onboarding practices and ranking these practices, the most suitable variant is the Ranking-type

Delphi. This is also the most frequently used Delphi method variant in the computer science field [PCPNT13].

5.1.2 Motivation for Application of Delphi Method

Generally, besides the core idea that "the many are smarter than the few", the following strengths of the Delphi method, which have been listed among others by Skinner et al. [SNCL15], have been taken into consideration when Delphi has been chosen as the preferred method:

- Consensus building
- Limited time required for respondents to complete surveys
- Quiet, thoughtful consideration
- Validity, as the content is driven by panelist
- Applicable where there is uncertainty or imperfect knowledge

Before the Delphi method was selected as the research method of choice, the repertory grid method which is based on the personal construct theory by George Kelly was reviewed. The repertory grid method was used in a similar study to evaluate onboarding practices in agile software development teams [BMY19]. A repertory grid consists of elements, constructs and links. In the paper the elements represented the expected onboarding outcomes, the constructs represented onboarding practices elicited by the subjects and the links represented the rating of each construct in regards to the expected onboarding outcomes, given by the subject. However, it has been found during the review that the way the repertory grid has been applied in the particular paper is not according to the guidelines of the repertory grid method. The repertory grid method actually requires bi-polar constructs to get an in-depth understanding of the personal construct (e.g. [TH02, Bel03, FBB04]) and evaluating these extremes with respect to each onboarding practice by the participants of the study is cumbersome.

As an alternative to the Delphi method one could also conduct a traditional survey. A traditional survey collects information from a random sample of the population of interest. In table 5.1 the motivation for favouring the Delphi method over traditional surveys is described based on the different characteristics between these methods according to Okoli and Pawlowski [OP04].

Besides the characteristics listed in table 5.1 there are other characteristics such as reliability and response revision or construct validity which are important differentiators but not elaborated more in detail as it can be found in the mentioned paper.

Characteristic	Motivation for application of Delphi method
Representativeness of sample	The Delphi method utilizes a group of experts to gather the required information and rate it collectively in an iterative process whereas traditional surveys collect information from a sample of the population of interest once. To explore and rank onboarding practices the collective and iterative process is more suitable.
Individual vs. group response	Studies have shown that for complex questions where the judgement of experts is required, "the average responses produced by group decision processes is superior to the average of individual responses." In the context of the thesis, this characteristic leads to the Delphi method as well.
Anonymity	In contrast to the most cases of traditional surveys, the researcher knows the participants of the Delphi study and thus is able to give controlled feedback during the Delphi iterations on the one hand and follow-up for clarifications or further information on the other hand. Especially when exploring the various onboarding practices a follow-up might be required to get an in-depth understanding of the practice before categorizing it for the next Delphi iteration.
Non-response issue and attrition effects	Non-response issue and attrition rate is very low when using the Delphi method as the experts are usually recruited and selected personally by the researcher and have some assurance regarding the participation by the expert.
Richness of data	It is in the nature of the Delphi method that richer data can be gathered as multiple iterations are conducted and revisions made due to the controlled feedback given by the researcher.

Table 5.1: Motivation for applying Delphi method in the thesis

5.1.3 Process Steps to Apply Delphi Method

The Delphi method can be divided into multiple phases or process steps. According to the literature, three to four distinct phases can be identified [OP04, HS07, SHK07, PCPNT13, SNCL15].

As an overview of the overall research study, one can take figure 5.1 by Skulmoski et al. for a better understanding. In this overview it can be seen that, after an initial phase of knowledge acquisition, as well as research planning and design, three iterations of Delphi survey rounds (each of them consisting of design, survey, and analysis) are applied. Finally, the results are documented, verified and generalized.

The three iterations of Delphi surveys illustrated in figure 5.1 can be described more in-depth by defining these iterations as brainstorming, narrowing-down, and ranking when applying the Ranking-type Delphi method. This Delphi process, illustrated in figure 5.2, has been utilized by Okoli and Pawlowski [OP04] in a research study which

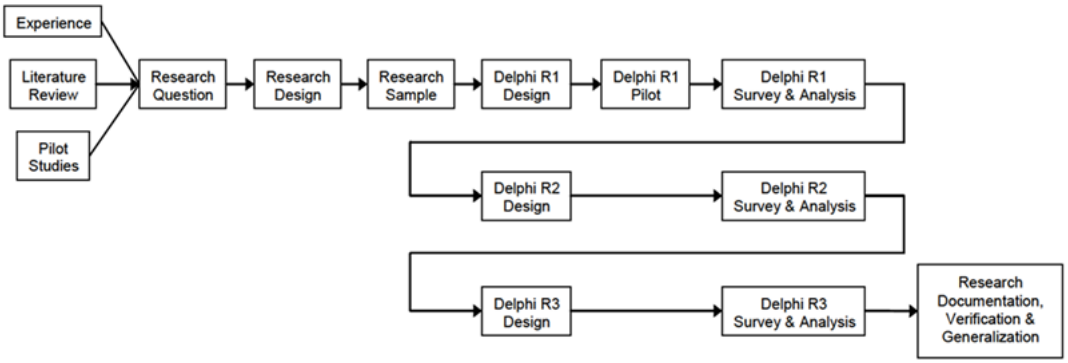

Figure 5.1: Delphi method for graduate research by Skulmoski et al. [SHK07]

investigated factors that would support e-commerce in Sub-Saharan Africa. This process was originally adopted from Schmidt et al. [SLKC01].

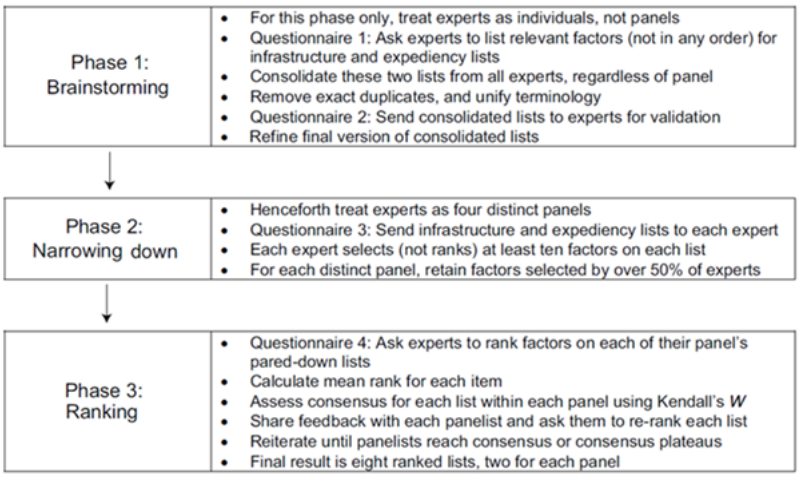

Figure 5.2: Delphi study administration process by Okoli and Pawlowski [OP04]

5.1.3.1 Initial Phase

The initial phase is needed to plan and design the research study. It concentrates, as Skinner et al. [SNCL15] elaborate, on defining and precising the research question as well as on identification and selection of the experts, which is the most critical part in a Delphi study as the results of the study are solely based on their group decision [OP04]. In this thesis a background research is conducted in the beginning to have a in-depth understanding of organizational socialization as well as distributed teams to re-fine the research question and use this knowledge in the design of the first questionnaire, which takes place in the second phase of the Delphi method.

Most importantly the identification and selection of experts take place in this phase. As stated by Okoli and Pawlowski [OP04], Delbecq et al. developed a process for the nominal group method to identify and select experts, which can also be applied for the Delphi method. This process, illustrated in the paper of Okoli and Pawlowski [OP04], comprises five steps: (1) Prepare a Knowledge Resource Nomination Worksheet, which identifies relevant disciplines and skills as well as relevant organizations (2) Supply names to the Knowledge Resource Nomination Worksheet (3) Ask already identified experts to supply other experts known to them (4) Categorize and rank experts based on disciplines, skills and organization (5) Invite experts one by one based on their ranking.

In respect to the disciplines, skills, and organization necessary for the Knowledge Resource Nomination Worksheet in context of the thesis, the following class of expert will be considered: Managers or team leaders who lead or have led distributed software development teams, facilitated the onboarding of several software developers, have experienced how onboarding practices impact new team members and are able to subjectively weigh or rate these practices based on his or her own experience.

The previously mentioned paper [OP04] also indicates that first the personal contact list will be reviewed before further sources will be searched. In this thesis, first of all a LinkedIn search based on the attributes in the Knowledge Resource Nomination Worksheet will be conducted before the personal contact list of the university institute (personal contact) will be taken into consideration. Afterwards the identified and selected experts shall nominate an expert they know in the field of distributed software development teams.

5.1.3.2 Brainstorming

The Brainstorming phase "traditionally begins with an open-ended questionnaire" as stated by Hsu and Sandford [HS07]. Experts should be motivated to answer this open-ended questionnaire with as many as possible items - in the context of the master thesis onboarding, practices shall be provided by the experts. Schmidt [Sch97] encourages researchers to request at least six items from each expert and ask to describe these items as well. This will help to have a high number of items and to be able to consolidate these individual items proposed by each expert into a common list of items with shared terminology which is necessary for the upcoming phase. It is of importance that the items, which have been proposed by the expert, are properly "translated" into the shared terminology by the researcher. Before the next phase starts, it is highly recommended to ask the experts to validate the mapping from the individual item list to the consolidated list [PCPNT13]. This ensures that the researchers' understanding about the items is valid according to the expert.

The first questionnaire, which will be sent to the expert panel in the Brainstorming phase, must be well designed and understandable for the experts, as all subsequent phases will build up on the answers of the first questionnaire. In the context of the master thesis, open-ended questions will be used in the first questionnaire. These questions will be categorized into the expected organizational socialization outcomes. The intention of

this kind of categorization is to evaluate the onboarding practices which contribute most (i.e. ranked by experts) to the expected outcomes. By applying this categorization every expert will provide a list containing onboarding practices for each expected organizational socialization outcome.

5.1.3.3 Narrowing-down

The idea behind the Narrowing-down phase is to reduce the number of consolidated onboarding practices into a reasonable and manageable number of tactics, which can be used for ranking in the next Delphi phase. The reduction is conducted by having another questionnaire which is based on the results of the previous phase. The approach of reducing the number of items in the list varies. Schmidt [Sch97] suggests that experts should "independently select at least 10%". Okoli and Pawlowski [OP04] used in their example the statement "select (not rank) at least 10 factors [...] they consider important". Regardless of the absolute or relative number of the target list size, the consensus on the most relevant items among the experts must be given. This can be achieved by e.g. selecting only items which have been selected by over 50% of experts [OP04].

5.1.3.4 Ranking

The objective of the last phase is to reach consensus among the experts on the ranking of the onboarding practices. The consensus can be reached easier when homogeneity in the panel of experts is given [OP04]. This also implies that reaching consensus is based on an iterative process.

As in the previous phases, the task of ranking will be executed by the experts individually answering the questionnaire during the Ranking phase. In the context of the thesis, there will be multiple lists which have to be ranked, each list representing onboarding practices impacting the respective expected organizational socialization outcome. The questionnaire shall not only ask the experts to rank the items but also to justify their rankings. Pare et al. [PCPNT13] mention in their paper that only less than half of the information system Delphi studies analyzed asked for ranking justification.

Once the answers are collected, statistical analysis can be applied. Okoli and Pawlowski [OP04] points out that Schmidt [Sch97] provides an "excellent and detailed guideline of principles to follow" which has also been applied in that particular paper. Pare et al. [PCPNT13] also refers to Schmidt, stating that the "main statistics for the Ranking phase include the mean item ranking, percent of experts placing an item on top half of their list, and Kendall's W coefficient of concordance".

Each iteration in the Ranking phase comprises (1) Providing to each of the experts the ranking questionnaire (2) Collecting the answers of the experts (3) Applying statistical methods (4) Analyzing the statistics (5) Providing the experts the results of this iteration including statistics, which have been mentioned previously, as well as relevant comments or justifications from other experts for more transparency in the consensus making process.

In the best case the aforementioned iterations stop once consensus is reached. Pare et al. [PCPNT13] mentions that it has been suggested that these iterations should stop once one of the following three criteria is fulfilled:

- Kendall's W greater than 0.7, indicating strong consensus
- Ranking iteration has been finished three times
- Mean rankings for two subsequently executed iterations are not significantly different based on McNemar test

5.1.3.5 Other Factors to be considered when applying Delphi Method

The design of questionnaires can implicitly or explicitly contain bias. Thus, to reduce biases Skinner et al. proposes to apply counter measures [SNCL15]. These counter measures are for example randomly ordering questions in each round and for each expert or asking for justifications from the experts when re-ranking items.

Another topic which shall not be neglected, is the time frame needed for Delphi surveys. Generally speaking, it can be said that for each survey of a Delphi study approximately two days should be planned, so participants can answer the questionnaire properly [HS07].

5.2 Research Design

This section describes the specific research design of the Delphi research study which will be conducted in the subsequent chapter 6.

5.2.1 Recruiting and Selection of Experts

As Okoli and Pawlowski [OP04] pointed out, a Delphi study supports a group decision process which requires "qualified experts who have deep understanding of the issues". As mentioned previously and suggested by Okoli and Pawlowski [OP04], five steps have to be conducted to select qualified experts, which will be applied in this Delphi study as well. These five steps are described in the subsections below.

5.2.1.1 Knowledge Resource Nomination Worksheet

As a first step a Knowledge Resource Nomination Worksheet must be prepared. This shall help to not overlook important classes of experts. Therefore disciplines, skills, and experiences related to experts shall be identified. Related academic literature will not be chosen as a criteria for the Knowledge Resource Nomination Worksheet, as only practitioners will be included in the Delphi study. Table 5.2 lists the relevant disciplines, skills, and experiences, which qualify an expert as a panelist.

Disciplines, Skills & Experiences	Description and Motivation
Team leader in distributed software development team	Potential participants have been team leaders for distributed software development teams or are similarly qualified experts. Team leaders have the capability to drive the performance of their distributed team (see 3.5).
Head of software development department	The study also considers potential participants who lead software development departments, assuming that these persons are managing team leads who are concerned with the onboarding of members in distributed teams. Despite having a more high-level view on the subject, department heads require a wellfunctioning onboarding throughout all teams in their area of responsibility.
10+ years of experience in software development	The potential expert panelist shall have vast experience in software development and in software development organizations. Thus, the person of interest has at least ten or more years of experience in software development.
Experience in onboarding distributed team members	The potential participant must have experience in onboarding newlyhired software developers into a team of distributed team members.
Experience with multicultural teams	By adding this trait to the Knowledge Resource Nomination Worksheet, it can be assumed that a potential participant was managing not only a geographically distributed team but also had team members with different cultural backgrounds, which should be taken into account when evaluating onboarding best practices.

Table 5.2: Knowledge Resource Nomination Worksheet: Disciplines, Skills & Experiences

5.2.1.2 Knowledge Resource Nomination Worksheet populated with Names

Based on the disciplines, skills and experiences listed in table 5.2, a research was made to find practitioners, which resulted in a list of 266 practitioners. Most of the practitioners (264 potential participants) were found by executing multiple LinkedIn SalesNavigator searches throughout a period of two months (March and April 2022), which included at least one of the following search terms: software development, software engineering, geographically distributed team, virtual team, distributed team, virtual team, remote team, team lead, head. Furthermore, the found LinkedIn profiles found were screened

to ensure that the persons found fulfil the criterias regarding experience and role. The LinkedIn search also included experts found in blogs and articles about globally distributed software development teams.

5.2.1.3 Contact and Nominate Additional Experts

As most of the persons found have a LinkedIn account, the persons were invited through LinkedIn private message to take part in the Delphi study. The private message briefly describes the Delphi study and includes a research study information sheet, as well as a data protection statement. Furthermore, the invited persons are asked to nominate an additional expert to expand the number of potential Delphi study panelists.

Out of 264 contacted potential participants contacted, 21 persons gave a response to the invitation to the Delphi study. Of these 21 persons, seven rejected the invitation and 14 gave a positive response and asked for further information. In the end, eight from 14 potential participants, who responded positively, were willing to participate in the study and provided their e-mail addresses to be able to take part in the Delphi study. None of the contacted potential participants nominated an additional expert.

Due to the low number of acceptance during the recruitment and selection phase, which resulted in a total of eight experts, the institute of Industrial Software (INSO) at the Technical University of Vienna was requested to provide further experts. The institute was able to provide two experts, who met the criteria in the Knowledge Resource Nomination Worksheet. As the minimum recommended size for a Delphi panel was achieved, the contact and nomination phase could be completed successfully.

In total, ten experts were found and also accepted the participation in this Delphi study. This number is also within the range of the recommended number of participants in an expert panel by Okoli and Pawlowski [OP04], which is between 10 to 18.

5.2.1.4 Rank Experts

As the number of persons found and accepted the participation in this Delphi study totalled to ten experts, the ranking of experts by qualification has been omitted.

5.2.1.5 Invite Experts

The final invitation to the Delphi study was sent out by e-mail, which contained a brief description of the overall Delphi study, the explanation of the brainstorming phase, as well as the link to the respective questionnaire.

5.2.2 Tool for Delphi Study Execution

Delphi research studies are nowadays usually conducted by e-mail or by using specific online tools.

The requirement for the online tool was to implement open-ended questionnaire elements in the Brainstorming phase, selection of items in the Narrowing-down phase, and ranking of items in the Ranking phase.

In this research study, the tool Qualtrics was utilized. Qualtrics allows the creation of multiple surveys with different questionnaire elements, which are necessary to conduct each step of a Delphi study. Thus, three surveys are required and were implemented in Qualtrics for this Delphi study. Each survey represents one of the phases, which are brainstorming, narrowing-down and ranking.

5.2.3 Brainstorming

The first phase, Brainstorming, is designed to evaluate all onboarding practices which are valuable and contribute most towards the proximal outcomes of organizational socialization, according to the Delphi study expert panelists. These proximal outcomes have been discussed previously in section 2.6.1:

- Acceptance by Insiders
- Role Clarity
- Self-Efficacy
- Knowledge of Organizational Culture

Furthermore, this phase is utilized to re-evaluate demographic data of the Delphi study expert panel.

Both information, onboarding practices as well as demographic data of the Delphi expert panel, have been evaluated by conducting an online survey via Qualtrics. The Delphi expert panelists were informed about the online survey by e-mail, which contained once again a brief description of the Delphi study as well as more details about the current phase. It also contained the URL to the online survey.

The survey itself is split up into multiple sections. The first section contains an introduction to the Delphi study. Besides general information about the study, the introduction also informs participants that the study defines the time frame of onboarding from pre-hire to twelve months post-hire. The evaluation of the demographic information has been implemented as the second section of the survey. Afterwards, the survey leads to the four major sections, each representing one of the proximal outcomes of organizational socialization. In all four sections, the panelists are requested to provide a minimum of five onboarding practices which contribute most to the respective proximal outcome of organizational socialization in distributed software development teams. The online survey itself allows the experts to provide a maximum of eight onboarding practices. Each onboarding practice shall be described with at least three sentences to have a better understanding of the onboarding practice and to distinguish practices properly.

Both requirements towards the Brainstorming phase, giving precise instructions to the participants as well as asking them to describe the items, are also frequently used in other Delphi studies [PCPNT13]. Okoli and Pawlowski [OP04] took a similar approach and requested for at least six items as well as asking for a description of these items with two to three sentences.

5.2.4 Narrowing-down

According to Pare et al. [PCPNT13], there are certain recommendations that help to facilitate the Narrowing-down phase. These recommendations have been applied to this study and elaborated subsequently.

As in the first phase, the second phase has been conducted by executing a Qualtrics survey. The survey consisted of clear instructions to the participants, which asked the participants to choose five onboarding practices within each of the four lists, each list representing one proximal onboarding outcome and totalling 120 onboarding practices.

Before the onboarding practices were sent out to the participants, the four consolidated lists of practices were randomly sorted by assigning each practice a randomized number and sorting them from the lowest to highest number.

As an item selection rule, it was defined that at least one third of the participants must choose an item, for the item to be considered in the final Delphi round. As eight experts were participating during the first as well as the second phase of this Delphi study, the minimum number to be considered as a onboarding practice in the final phase is three.

5.2.5 Ranking

5.2.5.1 Measuring Non-Parametric Statistical Rankings

As Okoli and Pawlowski [OP04] pointed out, "there are a number of different metrics for measuring non-parametric rankings, but Kendall's W coefficient of concordance is widely recognized as the best."

As already described previously, Kendall's coefficient of concordance (W) is also used in this study to measure the agreement of the ranking rounds. The equation of the calculation of Kendall's W is formulated in 5.1. The result of this calculation can be interpreted according to the table 5.3 provided by Schmidt [Sch97].

$$Kendall'sW = \frac{12 * \sum_{i=1}^{n}(t_i - \bar{t})^2}{m^2 * (n^3 - n)} \tag{5.1}$$

where:

t_i = Sum of ranking of onboarding practice i
$\bar{t}$ = Average of sum of rankings
m = Number of responded participants
n = Number of practices

W	Interpretation	Confidence in ranks
.1	Very weak agreement	None
.3	Weak agreement	Low
.5	Moderate agreement	Fair
.7	Strong agreement	High
.9	Unusually strong agreement	Very high

Table 5.3: Interpretation of Kendall's W provided by Schmidt [Sch97]

In this Delphi study an averaged Kendall's W for all four categories (proximal outcomes) above 0.7 will be considered as a sufficient group consensus.

5.2.5.2 Initial Ranking

To conduct the initial ranking the narrowed-down onboarding practices have been summarized in a Qualtrics survey and split into the four proximal onboarding outcomes. The survey was distributed among the eight participants of the Delphi study with the instruction to rank each of the practices within the four groups of onboarding practices. The ranking instruction asks the participants to rank the practices by their importance and value. The expert panel is also informed, that the first item in the ranked list shall represent the most valuable onboarding practice, according to the perception of the expert.

5.2.5.3 Subsequent Iterative Rankings

As long as none of the three stopping rules mentioned in 5.1.3.4 are met, the iterations will continue. Each subsequent ranking iteration utilizes the mean rank calculated previously and distributes sorted lists of onboarding practices, grouped by the four proximal outcomes. The sorting of the lists is based on the mean ranking. The four sorted lists will be sent to the remaining seven participants, with the request to re-rank the onboarding practices with the goal to have an agreement on the ranking by all participants. The mean rank of each onboarding practice, as well as the Kendall's W (indicating consensus among the group of experts) is provided to the participants. Furthermore, participants are asked to optionally add feedback to their new ranking. This shall help other participants during the ranking round to understand why certain onboarding practices are ranked higher or lower by an expert.

5.2.6 Delphi Test Round

To verify the Delphi research study process technically and avoid errors during the process while the selected experts are participating, the Delphi study was conducted with a group of test participants.

CHAPTER 6

Data Collection and Analysis

The data collection and analysis is based on the Ranking-type Delphi method, which has been previously explained in chapter 5. In the following sections the execution of each phase of the Delphi study, i.e. brainstorming, narrowing-down and iterative ranking, is described in detail.

6.1 Brainstorming

The survey took place within a time frame of three weeks and eight out of ten Delphi panel participants took part in the online survey. The remaining two participants of the panel were not able to make time due to unforseeable issues in private life and/or at work.

6.1.1 Evaluation of Demographic Information

The Brainstorming phase also included the re-evaluation of the demographic information, which has been incorporated to ensure the data found during the recruiting and selection of the experts is valid.

The following demographic information was asked of the expert panelist during the online survey:

- Gender (Male, Female, Other)
- Age range (18-24, 25-34, 35-44, 45-54, 55-64, 65-74, 76-85, 85 or older)
- Country of residence
- Highest education level (Bachelor, Master, Doctorate, other)

- Current role at work
- Years of experience in Software Development (0-30 years)
- Years of experience as Team Lead / Head of Department / Leadership (0-30 years)
- Years of experience in Globally Distributed Software Development Teams (0-30 years)

In table 6.1 the overview of all study participants' demographic information is shown.

ID	Current role	HC[1]	Age	Country	Education	Years of experience ...		
						in SD[2]	as Leader	in GDSDT[3]
A	Senior Director	1400	45-54	USA	Master	22	15	15
B	Chief Technology Officer	n/a	45-54	USA	Bachelors	26	25	13
C	Software Engineering Lead	900	35-44	Austria	Master	23	3	15
D	Engineering Manager	6000	25-34	Canada	Bachelor	12	9	7
E	Agile Coach and Researcher	n/a	35-44	Austria	Doctorate	17	10	10
F	Engineering Manager	180000	45-54	Norway	Master	12	8	15
G	Chief Technology Officer	n/a	25-34	Germany	Master	15	7	7
H	Project Manager	300	45-54	Austria	Master	20	12	2

Table 6.1: Demographical information of expert panel

6.1.2 Collection of Onboarding Practices

A very critical part, which builds the foundation of this Delphi study, is the evaluation of the onboarding practices. In the following subsections the onboarding practices, grouped by the proximal outcomes, are listed.

6.1.2.1 Onboarding Practices contributing to Proximal Outcome "Acceptance by Insiders"

In table 1 the onboarding practices contributing to proximal onboarding outcome "Acceptance by Insiders" are listed. The first letter in the column 'Practice' represents the participant.

6.1.2.2 Onboarding Practices contributing to Proximal Outcome "Role Clarity"

In table 2, the onboarding practices contributing to proximal onboarding outcome "Role Clarity" are listed. The first letter in the column 'Practice' represents the participant.

[1]Headcount in current company
[2]Software Development
[3]Globally Distributed Software Development Teams

6.1.2.3 Onboarding Practices contributing to Proximal Outcome "Self-Efficacy"

In table 3, the onboarding practices contributing to proximal onboarding outcome "Self-Efficacy" are listed. The first letter in the column 'Practice' represents the participant.

6.1.2.4 Onboarding Practices contributing to Proximal Outcome "Knowledge of Organizational Culture"

In table 4, the onboarding practices contributing to proximal onboarding outcome "Knowledge of Organizational Culture" are listed. The first letter in the column 'Practice' represents the participant.

6.1.3 Consolidation of Onboarding Practices

The overall collection of the onboarding practices during the Brainstorming phase resulted in 168 practices. At the end of the Brainstorming phase, duplicate practices were removed and similar practices were combined to a consolidated list of practices for each proximal onboarding outcome. This combined list of practices will be used as the basis for the next phase of the Delphi study. The process of consolidation turned the initial list with 168 onboarding practices into a consolidated list of 120 onboarding practices.

6.1.3.1 Consolidated Onboarding Practices contributing to "Acceptance by Insiders"

In table 5, onboarding practices contributing to proximal onboarding outcome "Acceptance by Insiders", which are duplicate or similar, have been consolidated. The first column 'Consolidated Practices' includes all practices which have been consolidated and the description represents the newly harmonized description.

6.1.3.2 Consolidated Onboarding Practices contributing to "Role Clarity"

In table 6, onboarding practices contributing to proximal onboarding outcome "Role Clarity", which are duplicate or similar have been consolidated. The first column 'Consolidated Practices' includes all practices which have been consolidated and the description represents the newly harmonized description.

6.1.3.3 Consolidated Onboarding Practices contributing to "Self-Efficacy"

In table 7, onboarding practices contributing to proximal onboarding outcome "Self-Efficacy", which are duplicate or similar, have been consolidated. The first column 'Consolidated Practices' includes all practices which have been consolidated and the description represents the newly harmonized description.

6.1.3.4 Consolidated Onboarding Practices contributing to "Knowledge of Organizational Culture"

In table 8, onboarding practices contributing to proximal onboarding outcome "Knowledge of Organizational Culture", which are duplicate or similar have been consolidated. The first column 'Consolidated Practices' includes all practices which have been consolidated and the description represents the newly harmonized description.

6.2 Narrowing-down

The Narrowing-down phase reduces the number of the consolidated onboarding practices into a reasonable and manageable number which shall be used to rank these practices in the third and final phase of this Delphi study.

6.2.1 Narrowed-down Onboarding Practices contributing to "Acceptance by Insiders"

In figure 6.1, consolidated onboarding practices contributing to proximal onboarding outcome "Acceptance by Insiders" have been narrowed-down by the expert panel. Based on the item selection rule definition, all onboarding practices chosen by at least three participants will be considered in the final Delphi phase. Thus, from a total of 31 onboarding practices the expert panel narrowed-down the list to ten practices.

6.2.2 Narrowed-down Onboarding Practices contributing to "Role Clarity"

In figure 6.2, consolidated onboarding practices contributing to proximal onboarding outcome "Role Clarity" have been narrowed-down by the expert panel. Based on the item selection rule definition, all onboarding practices chosen by at least three participants will be considered in the final Delphi phase. Thus, from a total of 29 onboarding practices the expert panel narrowed-down the list to ten practices.

6.2.3 Narrowed-down Onboarding Practices contributing to "Self-Efficacy"

In figure 6.3, consolidated onboarding practices contributing to proximal onboarding outcome "Self-Efficacy" have been narrowed-down by the expert panel. Based on the item selection rule definition, all onboarding practices chosen by at least three participants will be considered in the final Delphi phase. Thus, from a total of 30 onboarding practices the expert panel narrowed-down the list to eleven practices.

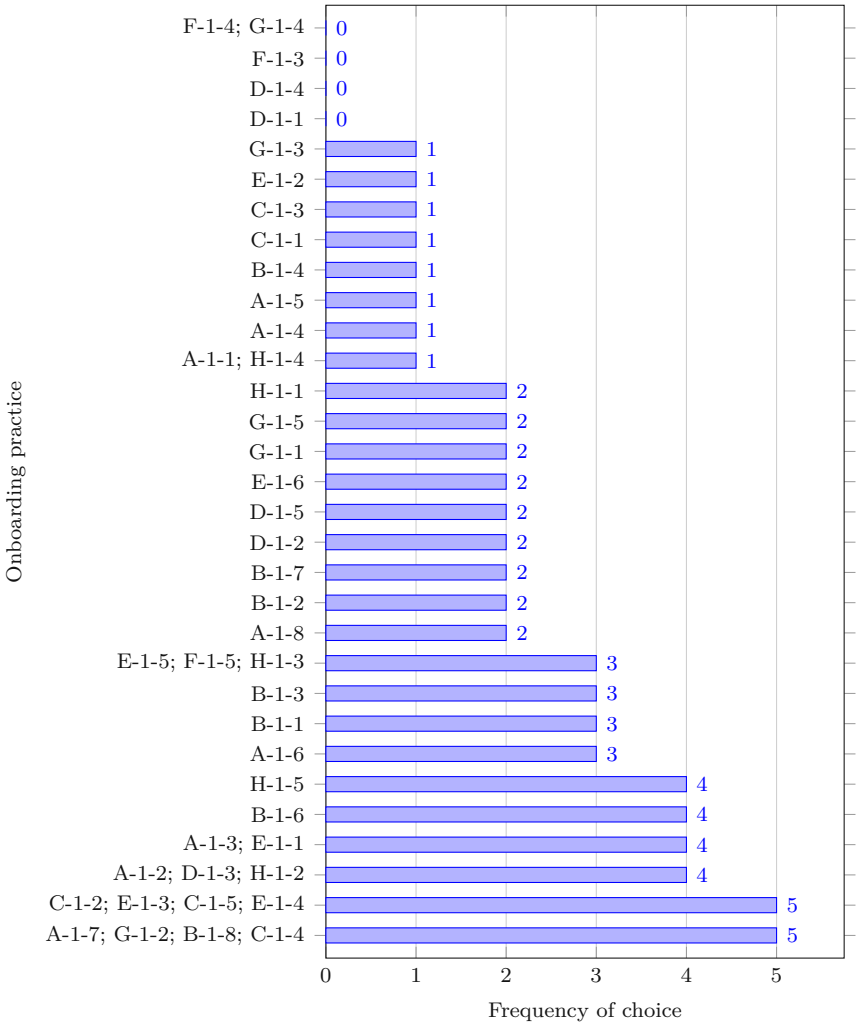

Figure 6.1: Narrowing-down results for proximal outcome “Acceptance by Insiders”

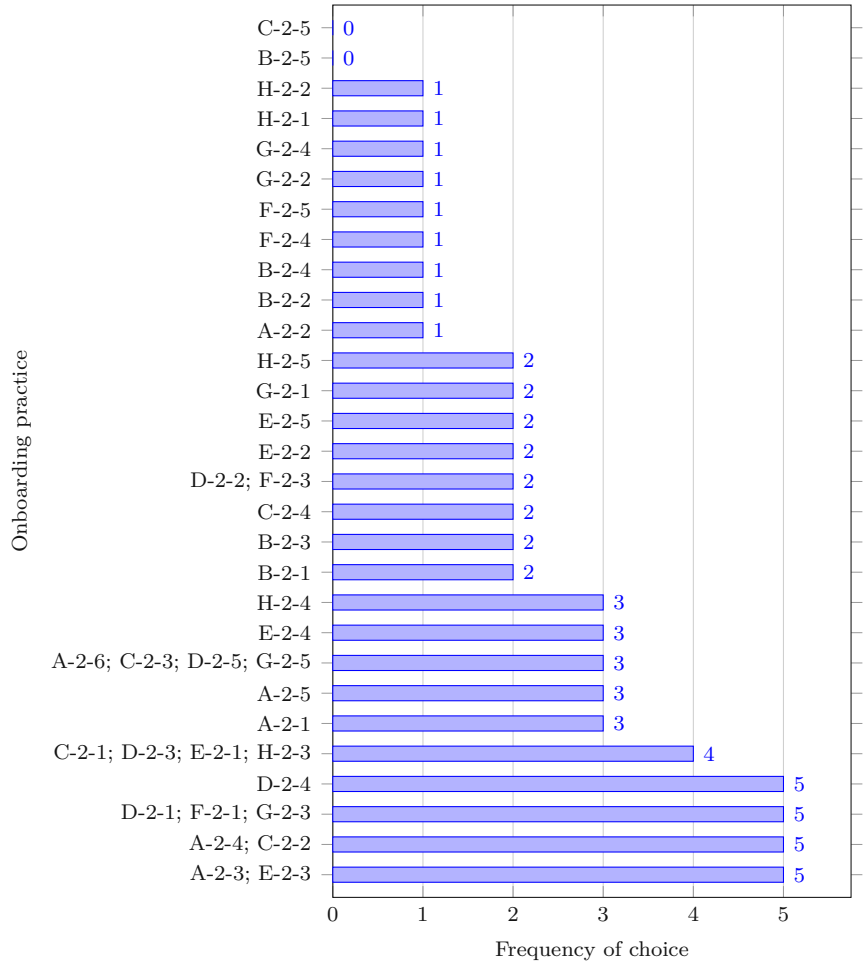

Figure 6.2: Narrowing-down results for proximal outcome "Role Clarity"

6.2.4 Narrowed-down Onboarding Practices contributing to "Knowledge of Organizational Culture"

In figure 6.4, consolidated onboarding practices contributing to proximal onboarding outcome "Knowledge of Organizational Culture" have been narrowed-down by the expert panel. Based on the item selection rule definition, all onboarding practices chosen by at least three participants will be considered in the final Delphi phase. Thus, from a total of 31 onboarding practices the expert panel narrowed-down the list to ten practices.

6.3 Ranking

In this final phase of the study, the expert panel needs to rank either ten or eleven onboarding practices for each of the four onboarding outcomes, which have been selected

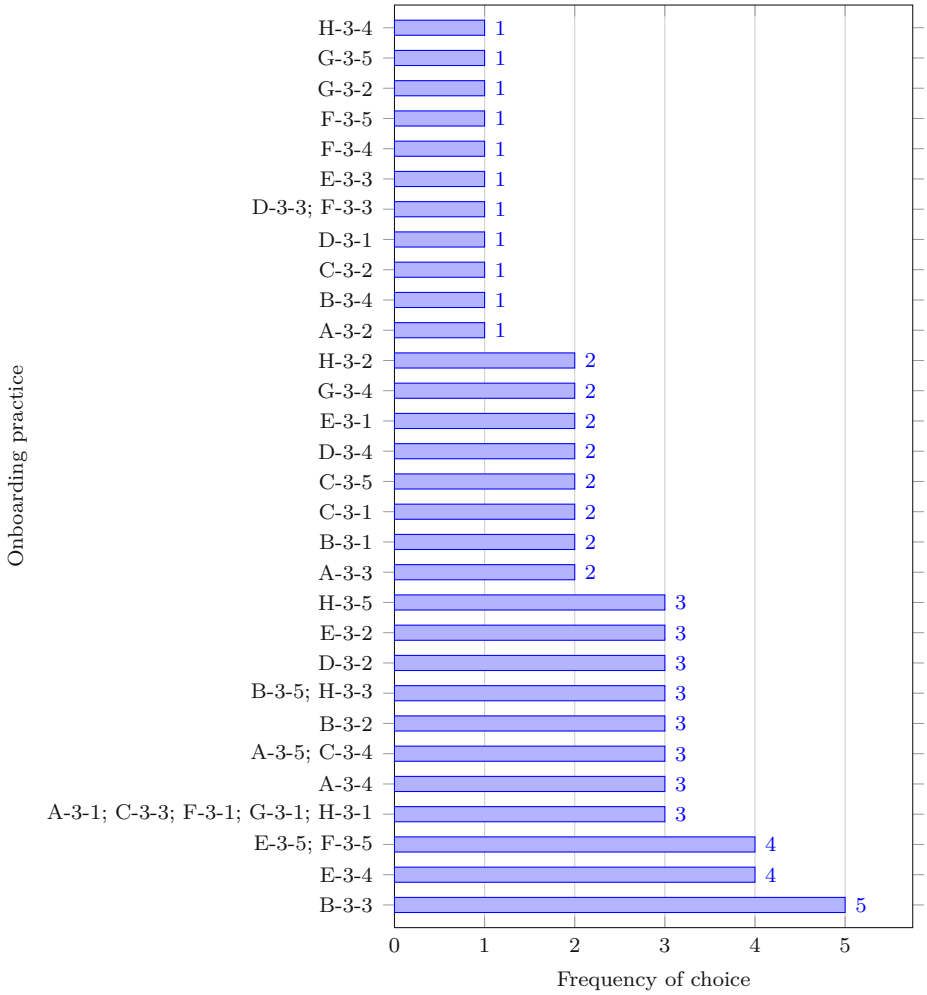

Figure 6.3: Narrowing-down results for proximal outcome “Self-Efficacy”

as most valuable in the previous (narrowing-down) phase by the experts. By ranking these onboarding practices, a ranked list is created by each expert. A mean rank as well as a degree of consensus among the group of experts is calculated after the first ranking round. The feedback is given to the experts and a new round of ranking will be conducted. The ranking will be iteratively executed until either group consensus is given or three rounds of ranking are completed.

6.3.1 Initial Ranking

Seven of the eight participants ranked the onboarding practices during this initial ranking round and one informed that he has to withdraw from the study due to private reasons.

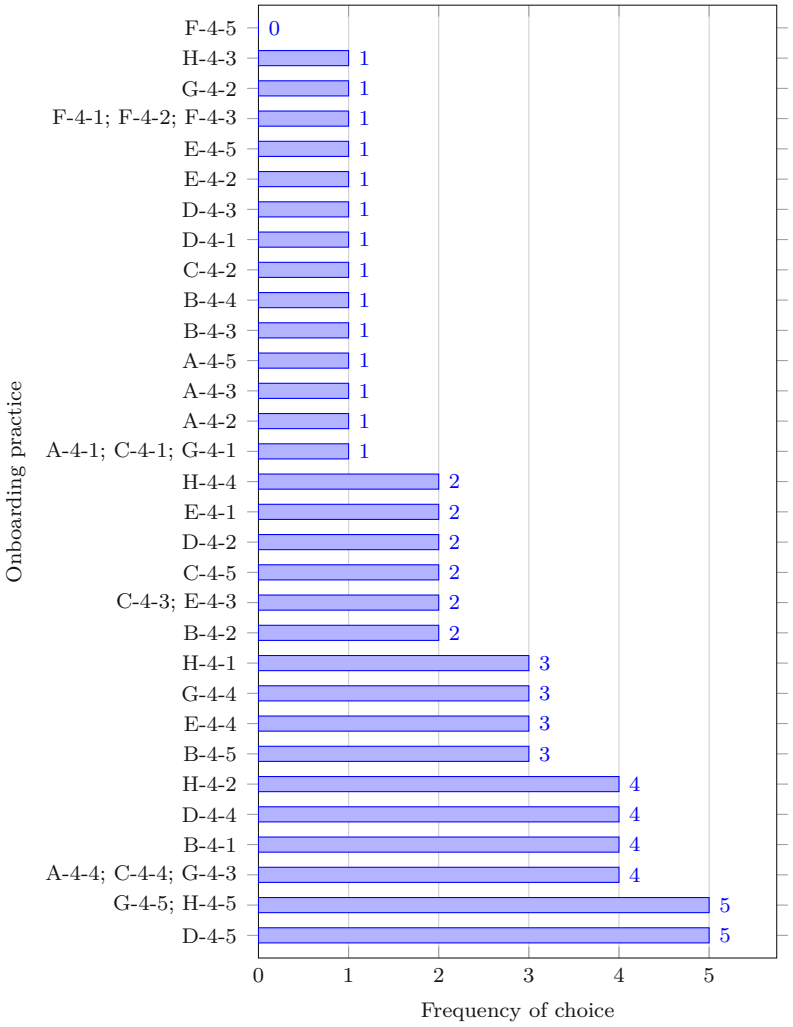

Figure 6.4: Narrowing-down results for proximal outcome "Knowledge of Organizational Culture"

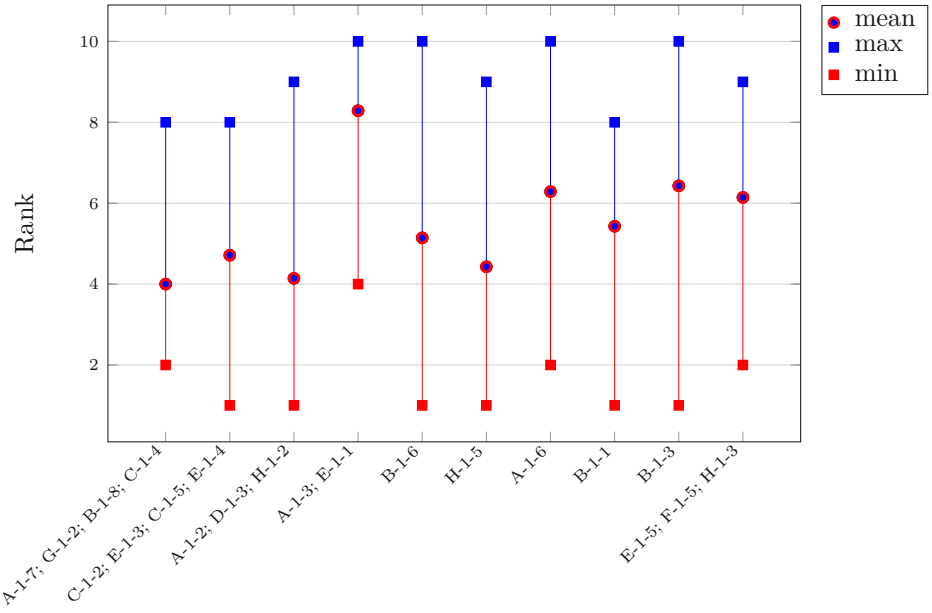

Figure 6.5: Initial ranking results for proximal outcome "Acceptance by Insiders"

6.3.1.1 Initial Ranking of Onboarding Practices contributing to "Acceptance by Insiders"

In figure 6.5 the mean rank, the minimum rank, and the maximum rank of each onboarding practice, which contribute to the proximal onboarding outcome "Acceptance by Insiders" has been illustrated. The results are based on the initial ranking.

In table 6.2, the minimum, maximum, and mean ranking of the initial ranking round for proximal outcome "Acceptance by Insiders" are represented. Furthermore, the sum of rankings for each practice, as well as the squared deviation, is shown. At the end of the table, the result of the calculation of Kendall's W is shown, which indicates a very weak to weak agreement among the Delphi panel.

6.3.1.2 Initial Ranking of Onboarding Practices contributing to "Role Clarity"

In figure 6.6 the mean rank, the minimum rank, and the maximum rank of each onboarding practice, which contributes to the proximal onboarding outcome "Role Clarity", has been illustrated. The results are based on the initial ranking.

In table 6.3, the minimum, maximum, and mean ranking of the initial ranking round for proximal outcome "Role Clarity" are represented. Furthermore, the sum of rankings for each practice as well as the squared deviation, is shown. At the end of the table,

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
A-1-7; G-1-2; B-1-8; C-1-4	2	8	4	28	110.25
A-1-2; D-1-3; H-1-2	1	9	4.1429	29	90.25
H-1-5	1	9	4.4286	31	56.25
C-1-2; E-1-3; C-1-5; E-1-4	1	8	4.7143	33	30.25
B-1-6	1	10	5.1429	36	6.25
B-1-1	1	8	5.4286	38	0.25
E-1-5; F-1-5; H-1-3	2	9	6.1429	43	20.25
A-1-6	2	10	6.2857	44	30.25
B-1-3	1	10	6.4286	45	42.25
A-1-3; E-1-1	4	10	8.2857	58	380.25
Average of sum of rankings				38.5	
Sum of squared deviations					766.5
Kendall's W	0.18961039				

Table 6.2: Non-parametric statistic of initial ranking for proximal outcome "Acceptance by Insiders"

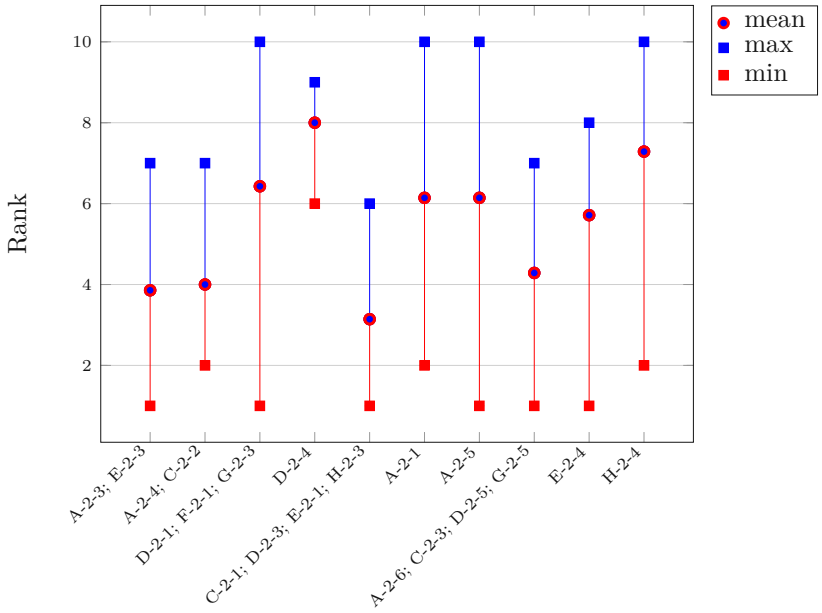

Figure 6.6: Initial ranking results for proximal outcome "Role Clarity"

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
C-2-1; D-2-3; E-2-1; H-2-3	1	6	3.1429	22	272.25
A-2-3; E-2-3	1	7	3.8571	27	132.25
A-2-4; C-2-2	2	7	4	28	110.25
A-2-6; C-2-3; D-2-5; G-2-5	1	7	4.2857	30	72.25
E-2-4	1	8	5.7143	40	2.25
A-2-1	2	10	6.1429	43	20.25
A-2-5	1	10	6.1429	43	20.25
D-2-1; F-2-1; G-2-3	1	10	6.4286	45	42.25
H-2-4	2	10	7.2857	51	156.25
D-2-4	6	9	8	56	306.25
Average of sum of rankings				38.50	
Sum of squared deviations					1134.50
Kendall's W	0.280643166				

Table 6.3: Non-parametric statistic of initial ranking for proximal outcome "Role Clarity"

the result of the calculation of Kendall's W is shown, which indicates a weak agreement among the Delphi panel.

6.3.1.3 Initial Ranking of Onboarding Practices contributing to "Self-Efficacy"

In figure 6.7, the mean rank, the minimum rank, and the maximum rank of each onboarding practice, which contribute to the proximal onboarding outcome "Self-Efficacy", has been illustrated. The results are based on the initial ranking.

In table 6.4, the minimum, maximum, and mean ranking of the initial ranking round for proximal outcome "Self-Efficacy" are represented. Furthermore, the sum of rankings for each practice, as well as the squared deviation, is shown. At the end of the table, the result of the calculation of Kendall's W is shown, which indicates a very weak agreement among the Delphi panel.

6.3.1.4 Initial Ranking of Onboarding Practices contributing to "Knowledge of Organizational Culture"

In figure 6.8, the mean rank, the minimum rank and the maximum rank of each onboarding practice, which contributes to the proximal onboarding outcome "Knowledge of Organizational Culture", has been illustrated. The results are based on the initial ranking.

In table 6.5, the minimum, maximum, and mean ranking of the initial ranking round for proximal outcome "Knowledge of Organizational Culture" are represented. Furthermore, the sum of rankings for each practice, as well as the squared deviation, is shown. At the

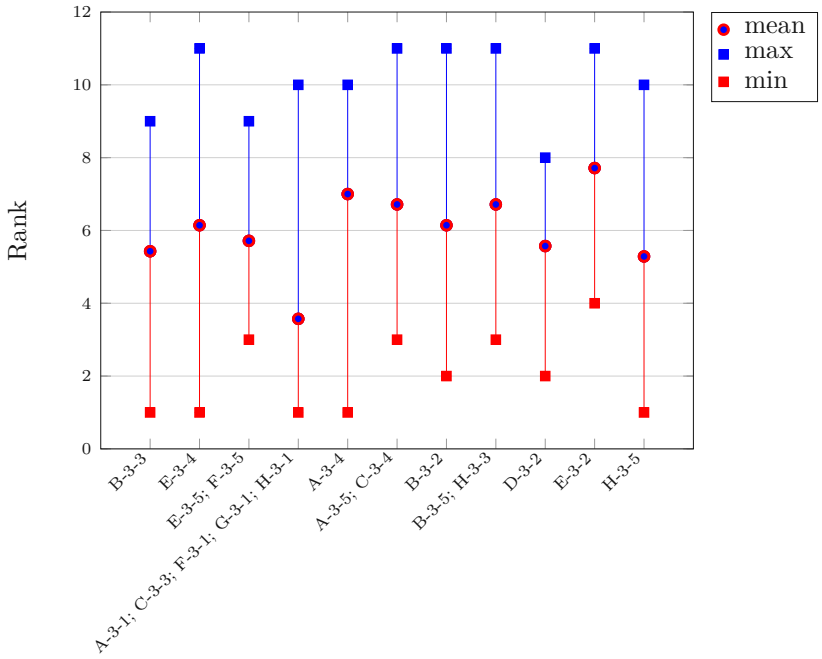

Figure 6.7: Initial ranking results for proximal outcome “Self-Efficacy”

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
A-3-1; C-3-3; F-3-1; G-3-1; H-3-1	1	10	3.5714	25	289
H-3-5	1	10	5.2857	37	25
B-3-3	1	9	5.4286	38	16
D-3-2	2	8	5.5714	39	9
E-3-5; F-3-5	3	9	5.7143	40	4
B-3-2	2	11	6.1429	43	1
E-3-4	1	11	6.1429	43	1
B-3-5; H-3-3	3	11	6.7143	47	25
A-3-5; C-3-4	3	11	6.7143	47	25
A-3-4	1	10	7	49	49
E-3-2	4	11	7.7143	54	144
Average of sum of rankings				42	
Sum of squared deviations					588
Kendall’s W	0.109090909				

Table 6.4: Non-parametric statistic of initial ranking for proximal outcome “Self-Efficacy”

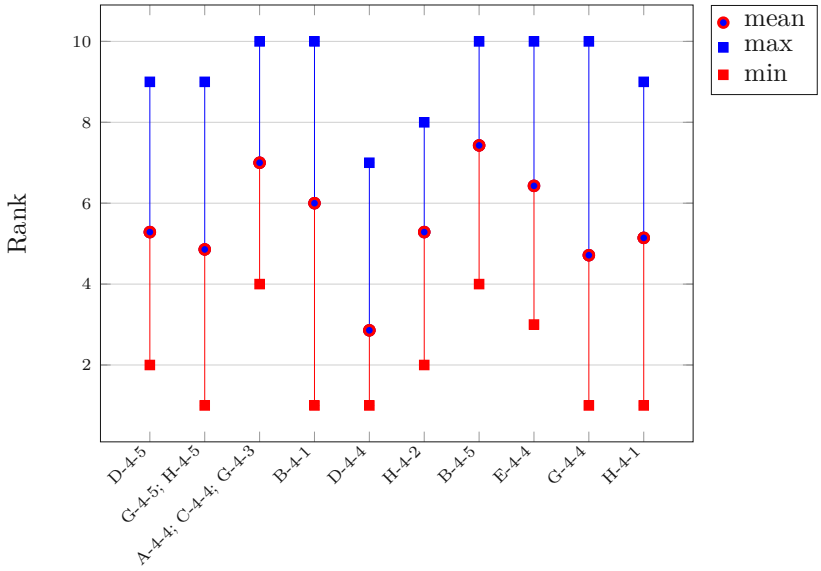

Figure 6.8: Initial ranking results for proximal outcome "Knowledge of Organizational Culture"

end of the table, the result of the calculation of Kendall's W is shown, which indicates a very weak to weak agreement among the Delphi panel.

6.3.2 Second Iteration

The first iteration resulted in very weak or weak group consensus among the Delphi panel. The averaged group consensus of all four categories is 0.19125, which indicates very weak to weak agreement. As long as none of the three criterias mentioned in 5.1.3.4 are fulfilled, the iterations will continue, up to a maximum of three ranking iteration rounds.

6.3.2.1 Second Ranking of Onboarding Practices contributing to "Acceptance by Insiders"

In figure 6.9, the mean rank, the minimum rank, and the maximum rank of each onboarding practice, which contributes to the proximal onboarding outcome "Acceptance by Insiders", has been illustrated. The results are based on the second ranking.

In table 6.6, the minimum, maximum, and mean ranking of the second ranking round for proximal outcome "Acceptance by Insiders" are represented. Furthermore, the sum of rankings for each practice, as well as the squared deviation, is shown. At the end of the table, the result of the calculation of Kendall's W is shown, which indicates a moderate to strong agreement among the Delphi panel.

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
D-4-4	1	7	2.8571	20	342.25
G-4-4	1	10	4.7143	33	30.25
G-4-5; H-4-5	1	9	4.8571	34	20.25
H-4-1	1	9	5.1429	36	6.25
H-4-2	2	8	5.2857	37	2.25
D-4-5	2	9	5.2857	37	2.25
B-4-1	1	10	6	42	12.25
E-4-4	3	10	6.4286	45	42.25
A-4-4; C-4-4; G-4-3	4	10	7	49	110.25
B-4-5	4	10	7.4286	52	182.25
Average of sum of rankings				38.50	
Sum of squared deviations					750.50
Kendall's W	0.185652443				

Table 6.5: Non-parametric statistic of initial ranking for proximal outcome "Knowledge of Organizational Culture"

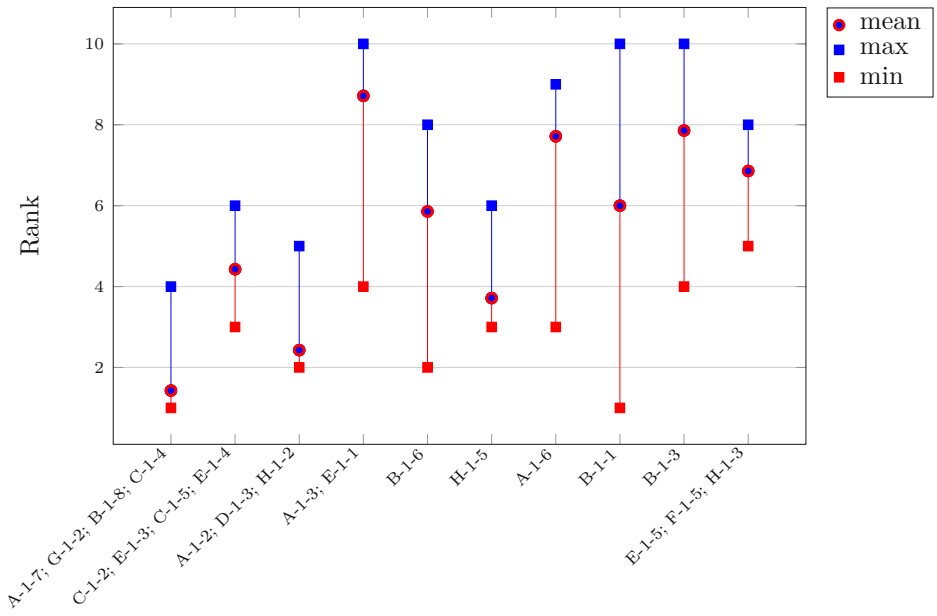

Figure 6.9: Second ranking results for proximal outcome "Acceptance by Insiders"

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
A-1-7; G-1-2; B-1-8; C-1-4	1	4	1.4286	10	812.25
A-1-2; D-1-3; H-1-2	2	5	2.4286	17	462.25
H-1-5	3	6	3.7143	26	156.25
C-1-2; E-1-3; C-1-5; E-1-4	3	6	4.4286	31	56.25
B-1-6	2	8	5.8571	41	6.25
B-1-1	1	10	6	42	12.25
E-1-5; F-1-5; H-1-3	5	8	6.8571	48	90.25
A-1-6	3	9	7.7143	54	240.25
B-1-3	4	10	7.8571	55	272.25
A-1-3; E-1-1	4	10	8.7143	61	506.25
Average of sum of rankings				38.5	
Sum of squared deviations					2614.5
Kendall's W	0.646753247				

Table 6.6: Non-parametric statistic of second ranking for proximal outcome "Acceptance by Insiders"

6.3.2.2 Second Ranking of Onboarding Practices contributing to "Role Clarity"

In figure 6.10, the mean rank, the minimum rank and the maximum rank of each onboarding practice, which contributes to the proximal onboarding outcome "Role Clarity", has been illustrated. The results are based on the second ranking.

In table 6.7, the minimum, maximum, and mean ranking of the second ranking round for proximal outcome "Role Clarity" are represented. Furthermore, the sum of rankings for each practice, as well as the squared deviation, is shown. At the end of the table, the result of the calculation of Kendall's W is shown, which indicates very strong agreement among the Delphi panel.

6.3.2.3 Second Ranking of Onboarding Practices contributing to "Self-Efficacy"

In figure 6.11, the mean rank, the minimum rank, and the maximum rank of each onboarding practice, which contribute to the proximal onboarding outcome "Self-Efficacy", has been illustrated. The results are based on the second ranking.

In table 6.8, the minimum, maximum, and mean ranking of the second ranking round for proximal outcome "Self-Efficacy" are represented. Furthermore, the sum of rankings for each practice as well as the squared deviation, is shown. At the end of the table, the result of the calculation of Kendall's W is shown, which indicates very strong agreement among the Delphi panel.

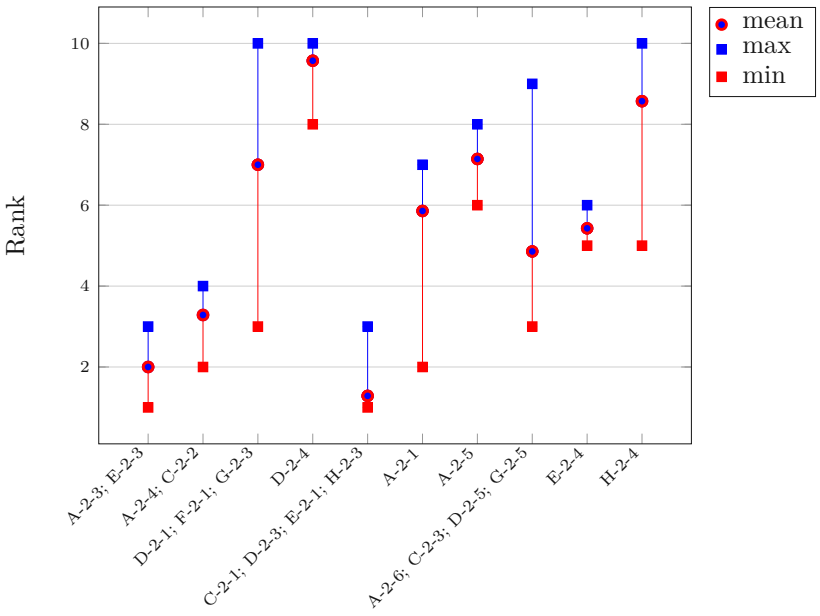

Figure 6.10: Second ranking results for proximal outcome "Role Clarity"

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
C-2-1; D-2-3; E-2-1; H-2-3	1	3	1.2857	9	870.25
A-2-3; E-2-3	1	3	2	14	600.25
A-2-4; C-2-2	2	4	3.2857	23	240.25
A-2-6; C-2-3; D-2-5; G-2-5	3	9	4.8571	34	20.25
E-2-4	5	6	5.4286	38	0.25
A-2-1	2	7	5.8571	41	6.25
A-2-5	6	8	7.1429	50	132.25
D-2-1; F-2-1; G-2-3	3	10	7	49	110.25
H-2-4	5	10	8.5714	60	462.25
D-2-4	8	10	9.5714	67	812.25
Average of sum of rankings				38.50	
Sum of squared deviations					3254.50
Kendall's W	0.805071119				

Table 6.7: Non-parametric statistic of second ranking for proximal outcome "Role Clarity"

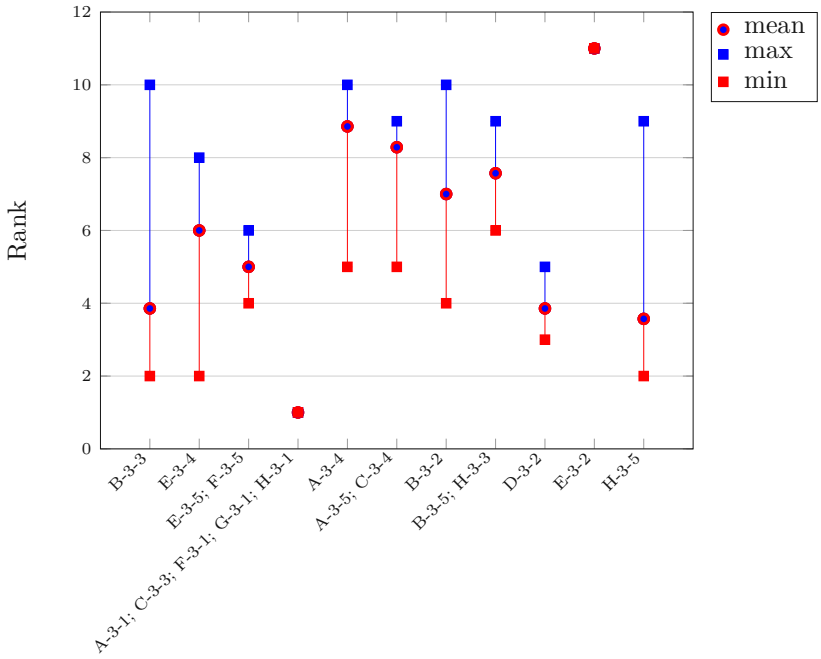

Figure 6.11: Second ranking results for proximal outcome “Self-Efficacy”

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
A-3-1; C-3-3; F-3-1; G-3-1; H-3-1	1	1	1	7	1225
H-3-5	2	9	3.5714	25	289
B-3-3	2	10	3.8571	27	225
D-3-2	3	5	3.8571	27	225
E-3-5; F-3-5	4	6	5	35	49
B-3-2	4	10	7	49	49
E-3-4	2	8	6	42	0
B-3-5; H-3-3	6	9	7.5714	53	121
A-3-5; C-3-4	5	9	8.2857	58	256
A-3-4	5	10	8.8571	62	400
E-3-2	11	11	11	77	1225
Average of sum of rankings				42	
Sum of squared deviations					4064
Kendall’s W	0.753988868				

Table 6.8: Non-parametric statistic of second ranking for proximal outcome “Self-Efficacy”

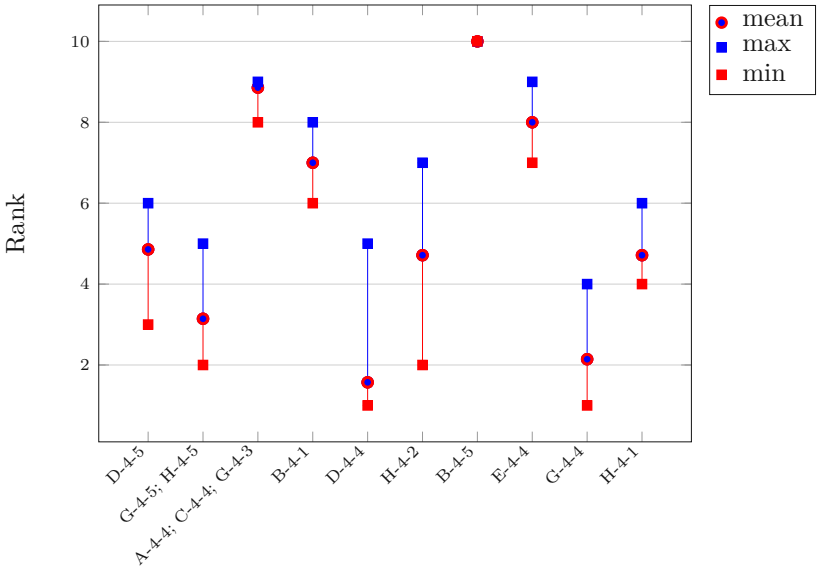

Figure 6.12: Second ranking results for proximal outcome "Knowledge of Organizational Culture"

6.3.2.4 Second Ranking of Onboarding Practices contributing to "Knowledge of Organizational Culture"

In figure 6.12 the mean rank, the minimum rank, and the maximum rank of each onboarding practice, which contributes to the proximal onboarding outcome "Knowledge of Organizational Culture", has been illustrated. The results are based on the second ranking.

In table 6.9, the minimum, maximum and mean ranking of the second ranking round for proximal outcome "Knowledge of Organizational Culture" are represented. Furthermore, the sum of rankings for each practice, as well as the squared deviation, is shown. At the end of the table, the result of the calculation of Kendall's W is shown, which indicates an unusually strong agreement among the Delphi panel.

6.3.3 Third or Final Iteration

The third iteration, is also the final iteration, as this Delphi study defined a maximum of three iterations as one of the stop rules. However, this maximum iteration stop rule will not be applied in this study, as the agreement among the expert panelist is moderate to strong for two proximal outcome (Acceptance by Insiders and Self-Efficacy) and strong to very strong for the remaining two proximal outcomes (Role Clarity and Knowledge of Organizational Culture). The averaged group consensus of all four categories during the second iteration is 0.7755, which indicates strong agreement and consequently fulfilled the stopping criteria, mentioned in 5.2.5.1.

Onboarding practice	Min	Max	Mean	Sum of ranking	Squared deviation
D-4-4	1	5	1.5714	11	756.25
G-4-4	1	4	2.1429	15	552.25
G-4-5; H-4-5	2	5	3.1429	22	272.25
H-4-1	4	6	4.7143	33	30.25
H-4-2	2	7	4.7143	33	30.25
D-4-5	3	6	4.8571	34	20.25
B-4-1	6	8	7	49	110.25
E-4-4	7	9	8	56	306.25
A-4-4; C-4-4; G-4-3	8	9	8.8571	62	552.25
B-4-5	10	10	10	70	992.25
Average of sum of rankings				38.50	
Sum of squared deviations					3622.50

Kendall's W	0.896103896

Table 6.9: Non-parametric statistic of second ranking for proximal outcome "Knowledge of Organizational Culture"

CHAPTER 7

Findings and Discussion

The Ranking-type Delphi study was conducted to explore practices for onboarding in distributed software development teams contributing most to the proximal outcomes of organizational socialization and narrow them down, as well as rank them according to the perception of team leaders or similarly qualified experts in such distributed teams. The findings described in this chapter are grouped into the proximal outcomes, which was also the structure of all Delphi study surveys. Each section lists the best practices from top (high ranked) to bottom (low ranked).

7.1 Proximal Outcome "Acceptance by Insiders"

In this section, best practices which contribute most to the proximal outcome "Acceptance by Insiders", according to the expert panel, are ranked and discussed. Most of the best practices listed in this section consider the distributed environment as a key element and some of them can be applied to either a co-located team or a distributed team.

7.1.1 Best Practice 1

Land a PR first day/first week - give opportunity to shine: A good signal for everyone is for a new hire to land a PR on the first day or at least the first week (get the newcomers to commit to the code-base earlier than otherwise). The new hire gets confidence and satisfaction. With a distributed newcomer, insiders can start trusting the newcomer faster if they see their contributions/progress, albeit small, to the team goal. This is also a good signal for future contributions. Instead of giving low key tasks first, try to give the new hire a highly visible task. A highly visible task is not necessarily a complicated task that overwhelms them.

The best ranked onboarding practice contributing to the proximal outcome "Acceptance by Insiders" is based on building trust. Trust is one of the major influences on social acceptance, as mentioned by Hurst et al. [HKML12]. The description of the onboarding practice states that insiders will trust newcomers who already contributed to the codebase at an early stage by a successful pull request. In a recent study by Rodeghero et al. [RZHF21], which focuses on remote onboarding during the COVID-19 pandemic, a similar recommendation has been given but in the context of being able to quickly get into the development workflow rather than being accepted by organizational insiders.

7.1.2 Best Practice 2

> Onboarding buddy: Identify, appoint, and communicate a dedicated onboarding buddy. Ideally, the onboarding buddy will proactively reach out to the new hire prior to the first day and establish themselves as the new individual's go-to person. After the new hire joins, a buddy connects with the new hire every day for a week or two on video calls, giving social connections, cultural cues, and practical set-up tips for their coding environment. The buddy can often assign initial coding tasks and help the new hire to land their first branch, and even pair program. A successful onboarding buddy leads to a strong interpersonal connection in addition to the manager. It's important that the buddy be a different person from the person's manager so that the new hire feels comfortable asking any question, large or small.

The concept of an onboarding buddy or a mentor is well known in the literature [Bau10, Bri17, JSKH21, Kow08, RZHF21]. As Kowatha et al. [Kow08] clearly states, a formalized buddy system provides "the social ambience that allows the newcomers to develop a sense of belonging and integrate into the organization". Rodeghero et al. [RZHF21] differentiate between an onboarding buddy and a technical mentor. In the context of the proximal outcome "Acceptance by Insiders", the onboarding buddy is related more to this outcome than the technical mentor as it refers to the social integration.

7.1.3 Best Practice 3

> Let the newcomer take responsibilities early: Will raise self-confidence of newcomer. The value of the new team member will be recognised by insiders. Insiders can delegate tasks to newcomer.

This onboarding practice is similar to the first best practice (see 7.1.1), which also relies on early positive visibility among the distributed team which raises the self-confidence of the newcomer. However, the area of responsibility is not mentioned more in detail in this best practice.

7.1.4 Best Practice 4

Virtual on-camera coffee breaks with the team: These events help bring the effect of the corridor/kitchen talks that we miss while working remotely. This also helps newcomers to be able to ’see’ their new team members. The visual connect helps the newcomers feel at ease in a new setting. Similarly, this helps the wider set of team members, the insiders, connect with the newcomer. Having newcomers deliberately join these, however, trying to remember not to ’scare’ the newcomer with sharing a deluge of negative sentiments, even though jokingly, during these sessions. These sessions, which are treated as working time, can be mandatory or opt-in for everyone who wants to participate. There is no agenda. It may take from 5 to 15 min and may occur once a week or even daily.

As suggested by Hemphill and Begel [HB11], frequent interaction within the team “strongly influences the effectiveness and pace of onboarding” of newcomers. This suggestion is also reflected with the fourth best practice contributing to the proximal outcome “Acceptance by Insiders”. It is designed to socially connect among the distributed team, by utilizing video calls frequently. This kind of virtual setting has been discussed by Schramm [Sch18] in the context of building trust among virtual or distributed teams. He mentions virtual coffee breaks as an initiative which helps build trust and relationships within distributed teams based on a study with six virtual teams from international companies.

7.1.5 Best Practice 5

Pair programming via call with screensharing or dedicated tool. Have them work with another developer to complete a task together.

The top five best practices are completed with pair programming, which is an agile technique in software development, where two software developers collaborate together at one workstation while implementing software. As sitting at one workstation is not possible within a distributed team, this best practice is suggested to utilize the aforementioned technique by the support of screensharing or a dedicated tool. Stotts et al. [SWN+03] elaborate that participants in their case studies gave the feedback that distributed pair programming “engenders better teamwork and communication within a virtual distributed team”. Both better teamwork and better communication, strongly influence the effectiveness and pace of onboarding, as already mentioned in 7.1.4.

7.1.6 Best Practice 6

> Application training/walkthrough: Have a senior team member, such as the product manager, engineering manager, or a QA professional, walk them through the application. Share any project glossaries. The goal is understanding the application and domain concepts and language as a user does.

Trainings are a general instrument for onboarding newcomers, as illustrated by Bauer et al. in figure 2.3. The extent to which this kind of trainings and walkthroughs contribute directly to the proximal outcome "Acceptance by Insiders" could not be found in the literature. However, as stated by Colquitt et al. [CSL07], ability is one of three factors which highly correlate with trust. Thus, one can assume that understanding the application and domain concepts as well as the user language, will increase the ability and therefore the trust of team members in the newcomer.

7.1.7 Best Practice 7

> Start a virtual get together or team event: This will be a relaxed setting for getting to know each other better. Maybe the insider has the same interests as other team members. Always a good tool for raising the team spirit. This is usually organized by work and sponsored.

A virtual get together, team or social event is another best practice produced during the Delphi study, which contributes to the proximal outcome "Acceptance by Insiders". Team events and social events help newcomers to "build social connections with the team" and, furthermore "create a safe environment for the new team member" as found by Ju et al. [JSKH21] interviewing software developers, as well as their managers, in the context of co-located teams. Such gatherings should be encouraged by team leaders, regardless of the team being co-located or distributed, states Malhotra et al. [MMR07]. However, team leaders will have difficulties observing when a "social event is required to rebuild momentum" in a distributed than in a co-located team, due to lack of physical presence [MMR07].

7.1.8 Best Practice 8

> Recurring Video Calls: The team turns on their camera for all meetings. The text chat channel is encouraged and monitored as a way to build community and feedback without interrupting. The manager and onboarding buddy encourages 1:1 and group calls for the new hire, both one-off and recurring (e.g. fortnightly), to make immediate and long-term connections. The manager hosts and encourages frequent work and social connections–stand-ups, and even weekly social group calls. Managers set up

1:1s early and often - as often as every day in the first week or so, and every week subsequently.

The best practice in this subsection is highly related to best practices 4 and 7 (see 7.1.4 and 7.1.7). It states that any communication, besides text chat, which is used for communication without interrupting, shall happen via video calls. Respondents of the survey conducted by Rodeghero et al. [RZHF21] emphasize that “it created a challenge in understanding their new team’s dynamics, and it was hard to bond with them” when their team did not use video during meetings and calls.

7.1.9 Best Practice 9

Working developer machine/environment: Have another developer assist them in setting up their machine so they can build and debug the software locally. Also have the new developer update the setup documentation.

Especially in a distributed environment, setting up the working environment might lead to issues where help is needed. Rodeghero et al. [RZHF21] point out that a lack of documentation and instructions may lead to a delay in the newcomer being productive. Thus, the best practice mentioned in this section will help to quickly set up the working environment with the help of a team member and the documentation of this. The collaborative approach to setup the working environment also avoids situations where newcomers are hesitant to seek help from team members [JSKH21].

7.1.10 Best Practice 10

Onboarding trip: An expensive but highly effective tool is to pay for each new hire to travel to visit one or more peers within the first few weeks. This can be done with the onboarding buddy, a small project group, or a well-timed offsite. Associating this with both ideating and landing code together can be particularly effective. This trip can be utilized to set things up and get going.

Despite some literature referring to a positive effect in onboarding of team members when an onsite orientation program is conducted [JS10, MSG20, BSDB20], the expert panel placed the best practice of having an onboarding trip in the last place of the ranking. As Moe et al. [MSG20] emphasize in their research study, “the most important measure to build strong networks for newly recruited people was the three-weeks visit”. This statement is also supported by Handy [Han95], who suggests that “the more virtual the organization [is], the more its people need to meet in person”.

7.2 Proximal Outcome "Role Clarity"

All mentioned ten best practices in this category, which have been brainstormed, narrowed-down, and ranked by the Delphi expert panel, do not solely apply to distributed teams but also to co-located teams as well, despite the fact that it was clearly stated in the instructions of the Delphi survey to consider best practices in the context of distributed teams. This indicates that several practices which apply to co-located teams could also be applied to distributed teams.

7.2.1 Best Practice 1

Explicitly written role expectations: Write down the expectations of each role in the documentation and make them refer to it when something is not clear enough. It shall explain how each role is expected to contribute to the overall goal of the team and the organization. This helps the new hire not only understand her/his role but also those of other on the team. Onboarding a new hire is also an excellent opportunity to challenge the documentation if there are some less explicit parts. It's in general recommended to be as explicit and transparent as possible to reduce redundancy and overhead. Additionally these roles can be sent out as intro emails, stating what is expected of the new hire and what are the initial goals (these are usually refined each month).

The best ranked practice contributing to the proximal outcome "Role Clarity" is an explicitly written expectation for each role within the team. By implementing such a practice, more information is available for the particular role of the newcomer. As a consequence of having more available information to the role, role ambiguity is reduced and this prevents dissatisfaction with the role [KWQ+64].

7.2.2 Best Practice 2

Documented Work Processes, Ceremonies, and Roles: Have docs, checklists, decks, and videos of your processes, ceremonies, and role definitions for new hires to help achieve the task expected of the given role. Ask for review and questions. Present key expectations live.

The second best practice is also related to giving more information to the newcomer. Ju et al. [JSKH21] found that task-related documentation is helpful for newcomers in software development, as developers tend to seek documentation first "before asking the team's help and they feel frustrated when documentation cannot provide answers", according to the interview findings in their research study in the context of co-located

teams. Additionally, Ju et al. [JSKH21] suggests that newcomers first tasks should be “supported by clear, complete, updated and well-organized documentations, so that new members can quickly locate relevant information and avoid inaccurate or incomplete information”.

7.2.3 Best Practice 3

Onboarding Buddy: While documentation can be a powerful blunt tool for explicit role expectations, an onboarding buddy who is peer with the same role can talk new hires through the more subtle aspects of the role. Walking the new hire through the documented processes also helps. Modeling also shows values and role expectations alive in the organization. Furthermore, this helps new hire understand how the buddy contributes to the goals in his/her capacity and how the buddy works with other roles in the team to make his/her contribution more efficient.

The idea behind the best practice ranked in third place has been already mentioned as the second best practice (see 7.1.2), which contributes to “Acceptance by Insiders”. This best practice is also supported by Harris et al. [HCTSS20], who state the influence of a mentor or buddy on the newcomer’s understanding of formal tasks and responsibilities. Besides the contribution of an onboarding buddy to the proximal outcomes “Acceptance by Insiders” and “Role Clarity”, Harris et al. [HCTSS20] mention that a buddy also contributes to the proximal outcome “Knowledge of Organizational Culture”, as onboarding buddies “assist the newcomer learn [...] the unwritten organizational politics and policies”.

7.2.4 Best Practice 4

Weekly/Frequent manager 1:1s: It’s crucial to ensure new hires get critical feedback regularly to adjust their behaviours and tune their performance if needed. It’s common to be misaligned in the first weeks or even months, so these rituals help to recenter their focus if they deviate too much from their role or the company goals. Thus, set up weekly manager 1:1s with good coaching, critical feedback and a chance for questions and answers. New hires will have questions about expectations, whether they are meeting them and in case there is a need of re-alignment. Give them a regular, open chance to explore.

The fourth best practice in this category is a weekly or frequent manager one-on-one with the newcomer. Especially in the context of distributed teams, certain feedback and alignments must happen in a more structured way than in co-located teams, as opportunities such as giving feedback in the hallway is not possible. Hemphill and Begel [HB11] also recommend having “structured processes and frequent interactions” as such

organizational settings help distributed teams perform better. Rodeghero et al. [RZHF21] also found that scheduling short one-one-one meetings between manager and newcomer throughout the week is helpful according to the survey participants and interviewees.

7.2.5 Best Practice 5

> Community of practice: we use communities of practice (for people having the same role, e.g. usability engineers, developers, QA, ...) to give an idea of how other people fill their role. This is usually held once a month.

The "community of practice" is the fifth best practice ranked by the expert panel of the Delphi study. Lesser and Storck [LS01] describe the "community of practice" as "a group whose members regularly engage in sharing and learning, based on their common interest". They also mention that, besides gaining technical and organizational aspects, such communities help build trust and mutual obligation among the community members. Building trust further implicates the contribution of such an organizational structure to the proximal onboarding outcome "Acceptance by Insiders". Interestingly, the authors Lesser and Storck emphasize that such "communities of practice" develop connections among practitioners regardless of whether they are co-located or not. Furthermore, in a case study on practice-based learning at Google by Johnson and Senges [JS10], the authors list "communities of practice" as one of the findings which make the onboarding successful at Google without specifying the geographical dispersion of the studied newcomers.

7.2.6 Best Practice 6

> Good Job Descriptions: Spend time on job descriptions to make them both specific and inspiring. This is a candidate's first impression, and they will take them seriously if it looks like you have. Talk about scope, skills, and expectations.

In contrast to the first best practice (see 7.2.1) in this category, the best practice mentioned in this subsection is intended to give the candidate, rather than a newcomer, a first impression of the job with a good job description during the recruiting phase. Bauer and Erdogan [BE11] emphasize the role of recruiting and realistic job previews. A good job description will help candidates to understand the future role and reduces role ambiguity, similar to the best ranked practice contributing to the proximal outcome "Role Clarity".

7.2.7 Best Practice 7

Participatory Ceremonies: Ceremonies that invite engineers to participate in a way that reinforces role and expectation can be very effective. Weekly or bi-weekly demo days set up a culture and expectation of incremental delivery, feedback, and celebration. Participatory sprint planning sets expectations of future delivery. Participatory business prioritization gives engineers an understanding of what’s most important to the business and how their role fits within it.

The seventh best practice is contributes to the proximal outcome “Role Clarity” by reinforcing role and expectation during participatory ceremonies. Similar to the fourth best practice (see 7.2.4) in this category, this seventh best practice supports the feedback loop within the team, which helps the newcomer to understand the specific role of the newcomer and team members. Thus, these ceremonies may reduce the role ambiguity of the newcomer. Celebration and collaboration in such ceremonies, in case of successful execution, also raises the team spirit and may increase the contribution to the proximal outcome “Acceptance by Insiders”.

7.2.8 Best Practice 8

Start with bug fixes or small tasks: It is the easiest way to ramp them up into a product and be exposed to various system parts. Bugs and small tasks are a way to expose the new hires to others than focusing on a single long project when you can be isolated and need deep focus. Exposing yourself will help you be discovered and trusted. People will also see the value you deliver tangibly, and that’s when you start earning respect. Make sure initial tasks are very clear. In a grown environment tasks might get clarified a lot by context and are not always exhaustively defined within a ticket. The new hire should get a very clearly defined task.

This best practice, placed more on the lower end of the ranking, gives the newcomer an early insight into the software product and thus helps to clarify the newcomer’s role about the technical tasks. It also stresses the importance of the opportunity to be accepted by insiders (contribution to proximal outcome “Acceptance by Insiders”), while aligning with other team members on bugs and small tasks.

7.2.9 Best Practice 9

Use daily standups: During daily standups you will see if the team members remain in their roles. If not, question the reason: is the role description not sufficient or does the team member break out their role.

The best practice “Daily standups” has been placed in rank nine in this category. These regular exchanges with the team shall help to clarify the role of each team member and especially the newcomer. In a grounded theory study by Stray et al. [SSD16], an evidence-based guideline for daily standups was suggested, which states that the purpose of a daily standup is to “obtain a shared understanding of the current activities of other team members”. This suggested purpose of a daily standup also supports the idea behind the best practice of actively or passively clarifying the role and to taking measures if deviations are found.

7.2.10 Best Practice 10

> Shadow people on-call: Some roles necessitate being on-call from time to time to act if there is an alert in production. It’s a good strategy for the new hires to shadow on-call people to see how they operate and what it means. This will also be a great way to create relationships and generate empathy for teammates sometimes struggling with emergencies.

The lowest ranked best practice helps to make newcomers understand and aware about on-call activities. This can be understood as a part of the newcomers role, which the newcomer will need to do as well once more experienced in the software product. As on-call activties can be an important part of a software developers role, this best practice contributes to the clarification of the role. It also mentions the opportunity to create relationships and generate empathy for teammates, which on the other hand contributes to the proximal outcome “Acceptance by Insiders”.

7.3 Proximal Outcome “Self-Efficacy”

Similar to the proximal outcome “Role Clarity”, the best practices listed in this section, which contribute to the proximal outcome “Self-Efficacy” according to the Delphi expert panel, can be applied to both co-located and distributed teams. There are only two practices (see 7.3.1 and 7.3.4) which specifically indicate communication through a digital tool.

7.3.1 Best Practice 1

> Concept of helping newcomers achieve early ’success’ by helping them achieve their first commit, their first PR review, their first retro facilitation. Show them that they have mastered the system setup, the landing toolbox, and the basics of the codebase. Give highly visible tasks to newcomers not boring bugfixes or tech debt nobody will ever see. Succeeding in those tasks will raise their self-esteem. Celebrate the success

in the team channel! It will show the other team members that the newcomer is of measurable value to the team.

The best ranked practice in the category “Self-Efficacy” is similar to the best ranked practice in the category “Acceptance by Insiders” (see 7.1.1). According to Bandura [Ban10], one of the major sources to improve self-efficacy is having success, which nurtures a strong belief in personal efficacy. The aforementioned best practice, ranked on top by the expert panel, is focused exactly on the early success of newcomers by achieving their first commit, their first pull request review, and their first retro facilitation. It is important that the mentioned activities in this best practice are successful, as failure can weaken the self-efficacy.

7.3.2 Best Practice 2

Celebrate success: If the team has succeeded a task, celebrate. This will raise self-efficacy of all team-members. Working as a team means succeeding as a team. Each team member is allowed to hold the cup even the substitutes or newly joined members.

’Celebrating success’ has been already mentioned slightly in the first best practice in this category, and ranked as second best practice from the expert panel. Bandura [Ban10] mentions as third major source, which contributes to self-efficacy, the motivation of a person which increases the effort put into an activity. The aforementioned best practice increases the motivation of the team, including the motiviation of the newcomer. This in turn, increases the self-efficacy according to the expert panel.

7.3.3 Best Practice 3

Have them contribute any improvements to your documentation. Documentation can become out of date. In addition, newcomers can illuminate where it is unclear and offer improvements to explanations.

Early contributions such as improvements to the documentation, an artifact of the team, may increase the self-efficacy, as this can be related to mastering experiences, one of the major sources contributing to self-efficacy according to Bandura [Ban10]. Generally, adapting and updating the documentation leads to added value to the existing team and future newcomers, which strengthens the newcomer’s belief that he or she can make a difference by his or her action.

7.3.4 Best Practice 4

Being coached by senior colleagues: Being coached by seniors like tech leads or other senior members. It's essential to give and save time for it and avoid measuring senior people's performance only based on delivery. If not, they will prefer building to coach new hires. Feedback loops like 1:1s or pull request reviews are a great way to be coached, but this can also be a lot in async through Slack or else.

The fourth best practice in this category is the coaching of newcomers by senior colleagues. Newcomers who are coached by senior members of the team may have an increased level of task mastery as senior members can assess the current set of competencies and skills of the newcomer, and guide the newcomer to gain new or close the gap in competencies and skills, by setting appropriate measures.

Furthermore, a major source contributing to self-efficacy is social modelling, according to [Ban10]. A newcomer, being coached by a senior colleague, could identify him- or herself to that particular senior colleague who achieves goals and succeeds by resilient effort, which could make the newcomer believe in his or her own abilities.

7.3.5 Best Practice 5

Seek to learn through failures: Putting in place a blameless culture to create a safe space where new hires are welcome to experiment and fail if necessary. Failures are a crucial way to learn and they must be confident that leadership is open for them to try even if the outcome is not ensured. Retrospectives can be used to discuss problems very openly and to learn from mistakes. This behavior is usually picked up by new hires, as everybody gets a word in. Learning from other's mistakes is key to improve self-efficacy (not just one's own), also to see what other people struggle with.

Bandura [Ban10] states generally that failure weakens and success strengthens self-efficacy. However, he also mentions how people with a low and strong sense of efficacy cope in situations of failure. People with a strong sense of efficacy "attribute failures to insufficient effort or deficient knowledge or skills that are remediable, redouble their effort in the face of obstacles, [and] quickly recover their sense of efficacy after failures or setbacks" according to Bandura [Ban10]. The fifth best practice contributing to the proximal outcome "Self-Efficacy" is helping newcomers by giving a safe space for failures, which may lead to those attributions and outcomes associated to strong sense of efficacy mentioned before.

7.3.6 Best Practice 6

> Pair programming for initial tasks. Pair programming allows them to share in the success while teaching them about the system and giving them confidence to work solo.

The sixth best practice contributing to the proximal outcome “Self-Efficacy” also points out the need for early success to increase self-efficacy as a newcomer. Pair programming was already mentioned as a best practice in the category “Acceptance by Insiders” (see 7.1.5). With its characteristic of contributing to the newcomers learning and understanding about the system and software development (task mastery), pair programming can be seen as an onboarding practice with multiple positive effects on newcomers.

7.3.7 Best Practice 7

> Build areas of expertise: while we try to as many people be able to accomplish diverse tasks in order to avoid bottlenecks, it makes sense to give people the chance dive deeper making him/her an expert in a specific tool or technology, e.g. every person, also juniors - and newcomers should be able to select one such area and become proficient in it - this achieves a sense of mastery, also for a newcomer, where they are actually ahead of others, although they are newcomers.

Being an expert in a specific area, even still being a newcomer, already contributes early to mastery experiences, which is one of the major sources for self-efficacy. Thus, the best practice mentioned in the current subsection, ranked seventh in this category, is another contributor to self-efficacy according to the expert panel.

7.3.8 Best Practice 8

> Get feedback from the newcomer: As the newcomer most probably has worked with other teams he can give valuable feedback on optimising the teams’ work. The newcomer will feel good by honoring his experience. Other team members will profit from newcomer’s experience as well.

Similar to the seventh best practice (see 7.3.7), this best practice also helps the newcomer to contribute early on by giving the newcomer chances to give feedback on the team’s work.

7.3.9 Best Practice 9

Provide feedback and coaching during 1-1s: Managers should let new hires know when they are doing well and when people are positive about them. Managers can even privately ask for this kind of input – including coaching – and then share what they've heard. 1-1s are a good forum to share constructive feedback and to offer explicitly opportunities to tackle tasks that offer chances of early success or recognition with the team. Even coaching can be helpful for self-efficacy: if someone is coached to improve in a way that builds them up, it can do wonders for their self-efficacy.

The ninth best practice is about providing feedback and coaching to the newcomer by the manager. Giving regular feedback and coaching to a newcomer improves the engagement of the newcomer, as managers can give meaningful advice about tasks, but also about early career support [SC10].

7.3.10 Best Practice 10

Intrinsic motivation: Encourage developers to shape not only the plans but the business goals behind them, so increased ownership can lead to increased intrinsic motivation. Developers will build self-efficacy if they want or need it. Make them want it.

The top ten best practices are completed with the best practice "Intrinsic motivation", representing one of the major sources for self-efficacy, according to Bandura [Ban10], which is social persuasion or motivation. Motivation in general can increase the effort put into an activity and the aforementioned best practice supports it by encouraging developers to take more ownership.

7.3.11 Best Practice 11

Review Step: after a task is completed, it goes into peer review, again providing feedback and pointing out problems, this helps to ease in with the teams way of working.

The lowest ranked best practice, which contributes to the proximal outcome "Self-Efficacy" by the expert panel, is a peer review step after task completion. Similar to the ninth best practice in this category (see 7.3.9), this best practice is about feedback, but in contrast to the ninth best practice, this particular best practice focuses on the peer feedback after task completion.

7.4 Proximal Outcome “Knowledge of Organizational Culture”

Also the last category of proximal outcomes, “Knowledge of Organizational Culture”, does not contain best practices which solely relate to practices in the context of distributed teams. Once again, as stated previously, it can be generalized that there are several practices that apply to co-located as well as distributed teams. All ten chosen and ranked best practices for onboarding in distributed software development teams in this particular section could be applied in co-located, as well as distributed, teams.

7.4.1 Best Practice 1

Explicit company values during the first week of onboarding: We can organize sessions between all new hires during the first week of onboarding to introduce and converse around company values. We can also try using real scenarios and let the new hires brainstorm to find a satisfactory outcome for each one while respecting the culture. This is also an exciting way to see how the culture will evolve depending on the new hires with fresh perspectives. Culture depends on its members; therefore, new employees will influence it in the long run.

The best ranked practice contributing most to the proximal outcome “Knowledge of Organizational Culture” according to the expert panel, is a collective socialization tactic which introduces the company values during an onboarding session for all new hires. As Klein and Weaver [KW00] found in their study, new hires, who attend a formal orientation program, “were significantly more socialized on 3 of 6 socialization dimensions (goals/values, history, and people) than employees who did not attend the training.” The top ranked best practice mentioned in this subsection represents a formal orientation program as well and fits into the scheme of how to attain the knowledge of organizational culture. Gruman and Saks [GS20] conclude in their review that completely remote orientation programs have positive as well as negative effects on newcomer socialization. They suggest a blended approach by having a balance between face-to-face and remote interaction.

7.4.2 Best Practice 2

Live by your principles: For instance if you have no meeting days, don’t put meetings on those days with the newcomer despite you might not obliging to the rule.

The second best practice in this category is about upholding the organization’s or the team leads principles. Culture is created by learning and one of the ways how organizational

culture can be learned is by identification with leaders, according to Schein [Sch90]. He also points out that one of the primarily embedding mechanisms is "what leaders pay attention to, measure, and control". Thus, upholding principles such as the best practice mentioned in this subsection will increase the newcomer's knowledge of organizational culture.

7.4.3 Best Practice 3

> Regular team/company events to shape team/company culture: Team/company events are the best way to get to know your colleagues (also from other departments) to let them share something personal, to see where their own values lie. Team/Company culture is nothing you can bring top down on a company, its a living and growing thing that comes from all directions. Such events help employees to get a different view on their company. It may even bring them feedback to their work from other departments.

This best practice has been ranked in the third place in the category "Knowledge of Organizational Culture". As already mentioned in 7.1.7, team and company events help newcomers to "build up social connections with the team" according to Ju et al. [JSKH21], who were studying co-located teams at Microsoft. Furthermore, and specially in the context of this thesis, Rodeghero et al. [RZHF21] recommend in their study, that organizations should emphasize team building in distributed teams with "remote team activities" such as "happy hours, a workout class such as yoga, coffee chats, or playing online games together". To gain knowledge of the organizational culture, team and company events may help the newcomer to understand the dominant organizational culture but one should also be aware that it is "very likely to have a number of subcultures in various parts of the organization that stray from the dominant culture" [War17].

7.4.4 Best Practice 4

> Provide newcomers with information about your company's projects: Even if this information isn't relevant for their job, they will get to know the company better. Other projects, which may sound interesting to newcomers will be an extra boost for motivation.

Giving the newcomer information about the company projects also contributes to a certain extent to the proximal outcome "Knowledge of Organizational Culture". Rodeghero et al. [RZHF21] also emphasize the importance of providing information about the organization to the newcomer. As projects are also part of the company and its activities, this information is also of importance according to the expert panelists.

7.4.5 Best Practice 5

> Be transparent: If someone asks for information provide them with all the information you have and try to get even more. Secrets are a source for speculation and unnecessary thinking. Transparency will raise your own credibility.

Transparency and supporting newcomers by providing information is the core idea behind the fifth best practice, found by the Delphi expert panel. Sharma et al. [SS20] also “suggests that an organizational culture that encourages transparency and helping others can help newcomers to onboard successfully”.

7.4.6 Best Practice 6

> Describe how the company’s culture applies to real projects: There are many ways to feel a culture through the prism of real projects: watching past recordings of meetings around projects, reading project documentation, and shadowing employees working on a project. Nothing beats the actual implementation of the company’s values into everyday work. This also ensures the company keeps aligned with its values while executing plans because exposing projects as vehicles of the culture is an efficient way to stay accountable when everyone is using it as inspiration.

As Steiner and Christiansen [SC10] mention in their book, hours of PowerPoint presentation does not contribute to a good orientation experience. Instead, the integration of a newcomer into the organizational culture should be done by illustrating the cultural assets through real examples, such as job simulations, bringing in veteran employees, explaining organizational culture based on situations, and also distinguishing between as-is and to-be company culture. The best practice represented in this subsection shall emphasize the importance of bringing theoretical organizational culture and values into real-work examples, while onboarding newcomers.

7.4.7 Best Practice 7

> Meet with the product owner. Explain the goals of the product and how it meets the needs of the market. Encourage questions and suggestions to meet those needs.

The seventh ranked best practice is about getting an explanation about the goals of the product and the product-market-fit from the product owner. This kind of meeting and explanation can be compared to a practice found by Ju et al. [JSKH21], which plans with “onboarding sessions in the first few days to explain the big picture to the new

member". It has to be restated, that the previously mentioned best practice has been found while researching co-located software development teams by Ju et al., and not distributed teams. The last sentence used by one of the Delphi expert panelist to describe the seventh best practice, mentioning the need to encourage questions, refers to one of the recommendations from the research study of Rodeghero et al. [RZHF21], which also suggests "managers and team members [to] encourage new hires to reach out for help and ask questions when they arise".

7.4.8 Best Practice 8

Social talk before daily also gives the opportunity to chat about organizational culture (where the whole team is present).

The best practice ranked in eighth place, which is about interacting with team colleagues during daily standups and talking about organizational culture, gives the newcomer the opportunity to discuss the team's organizational culture or retrieve valuable information on how the organizational culture of the team is. Similar to the best practice of team or company events (see 7.4.3), this best practice gives the newcomer a better insight into the culture or subcultures of the company.

7.4.9 Best Practice 9

Manager 1:1: Regular 1:1s is again a key tool for spreading organizational culture. Observe, in and out of the 1:1s. Coach. Ask questions, and encourage questions. Offer opportunities in the first few weeks/months, amongst other things, to also share knowledge about the culture of the workplace, clarify doubts about the culture/vision/mission if any. See in regular 1:1s if the newcomer feels well and if not to see what makes them uncomfortable.

One-on-ones have been already mentioned in previous best practices in other categories (see 7.1.8, 7.2.4 and 7.3.4) and is also mentioned as a best practice contributing to the proximal outcome "Knowledge of Organizational Culture". Stein and Christiansen [SC10] see advantages in such a practice as they see introductions to the organizational culture (e.g. strengths and weaknesses of a company's culture) within one-on-ones, as beneficial. Furthermore, Stein and Christiansen [SC10] recommend to use one-on-ones to discuss "what the new hires have experienced, comparing and contrasting corporate culture to subcultures (e.g. teams, divisions)".

7.4.10 Best Practice 10

Ask the new employee about their values and goal. This should have been done during the interview, but it’s worth repeating. It gives you an opportunity to connect their needs with the needs of the company. This typically includes productivity, growth, balance, etc.

The lowest ranked best practice in this category is about aligning the needs of the newcomers with the needs of the company. It gives the newcomer a better understanding of the organizational culture about topics such as performance and personal development.

CHAPTER 8

Conclusion

The purpose of this thesis is to provide a set of best practices for onboarding in distributed software development teams, based on the perception of team leaders or similar qualified experts. On the one hand, the best practices resulting from this thesis contribute to the existing scientific literature on onboarding in the context of distributed software development teams, and on the other hand, organizations or teams may benefit from the set of best practices, as they indicate how organizations can guide newcomers during the onboarding in distributed software development teams.

In this final chapter, an outline of the thesis is given and the research questions defined in the beginning of the thesis are revisited. Furthermore, the limitations, as well as future research opportunities, are discussed.

After giving an introduction in the first chapter, the second, third and fourth chapter build the theoretical base of this thesis. The second chapter focuses on the question concerning what organizational socialization is and how it is related to onboarding. It also answers the first research question (*RQ1*) about the expected outcomes of organizational socialization. The expected outcomes can be split into proximal and distal outcomes. This thesis focuses on the proximal outcomes or also called newcomer adjustment indicators, which are "Acceptance by Insiders", "Role Clarity", "Self-Efficacy" and "Knowledge of Organizational Culture". In the third chapter, the differences between distributed and co-located teams, the challenges that distributed teams face and factors which lead to effective and successful distributed teams are described. To conclude the theoretical base of this thesis, the fourth chapter summarizes the state of the art research about socialization tactics in distributed software development teams, including multiple case studies and an explorative research study.

To explore the space of practices for onboarding in distributed software development teams as well as to rank these practices, a Ranking-type Delphi study was chosen as a research method. The Delphi research methodology and the design of the research study

in detail are described in the fifth chapter. Chapter six describes the application of the Delphi research method, which is split into the recruiting and selection of the expert panel, the Brainstorming, Narrowing-down and Ranking phase.

The Delphi study took place within a time frame of six months. As the results of the study solely base on the knowledge and experience of the Delhi expert panel, as well as their ability to reach group consensus, the composition of the expert panel in a Delphi study is pivotal. During the recruitment and selection phase 266 practitioners, who match to the predefined Knowledge Resource Nomination Worksheet, were identified and invited to take part in this study. Ten experts in the field of interest accepted the invitation and seven of ten experts took part in all of the three phases of the Delphi study. These seven experts represent the panel of this Delphi study.

The Brainstorming phase of the Delphi study resulted in 168 onboarding practices or 120 consolidated onboarding practices, categorized into the four proximal outcomes, which were studied during the background research. This set of consolidated onboarding practices is the answer to the second research question (*RQ2*) of this thesis. In the second phase of the Delphi study those consolidated onboarding practices were narrowed-down to ensure only practices important to the expert panel were chosen for the final phase of the Delphi study. Thus, only practices chosen by at least one third of the experts, made it into the next phase. In the final Ranking phase, two out of a maximum number of three iterations were conducted. At the end of the first iteration, the Delphi panelists had a very weak to weak agreement on the ranking of the best practices throughout all proximal outcome categories. The subsequent iteration achieved an moderate to strong consensus for two proximal outcomes and strong to very strong consensus for the remaining two proximal outcomes among the experts, which brought the predefined Delphi stopping-rule into action and did not lead into a third ranking iteration.

As a final result and the answer to the third research question (*RQ3*) of this thesis, ten to eleven ranked onboarding practices in distributed software development teams for each of the proximal outcomes were found. Five of the best practices for onboarding found in the category “Acceptance by Insiders” and two in the category “Self-Efficacy” are conceptualized for the application in distributed team environments. All 34 other best practice found in the proximal outcome “Acceptance by Insiders” as well as in the remaining categories “Role Clarity”, “Self-Efficacy” and “Knowledge of Organizational Culture” can be applied to either co-located or distributed teams. In the following, some of the identified best practices in distributed software development teams for each of the proximal outcomes are mentioned.

The proximal outcome “Acceptance by Insiders” explains the social integration of a newcomer into the organization. Newcomers joining a distributed software development team should have the possibility to work on a highly visible task and land an early pull request. The newcomer should also take responsibilities early on, which increases the confidence and satisfaction of the newcomer. Additionally, to guide the new software developer through the onboarding, an onboarding buddy should be provided. He or she, who should not be the manager of the newcomer, connects with the newcomer on a daily

basis, supports to creation of social links, provides cultural clues, practical set-up tips and, most importantly, is the go-to person for any questions of the newcomer. To build strong social bonds, it is also recommended to have virtual on-camera coffee breaks and virtual get-togethers or team events. The sum of the outcomes of the aforementioned practices and other practices found, induces organizational insiders to accept the newly hired software developer.

Understanding and learning the role as well as its tasks is described as "Role Clarity", which represents the second newcomer adjustment indicator or proximal outcome. By having good job descriptions during recruitment, but also explicitly written role expectations and well documented work processes, ceremonies and roles, a newly hired software developer gains a better understanding of what is expected from him or her. Also, having an onboarding buddy, who shows and embodies values and role expectations, accelerates the newcomer's understanding of the role. These practices can be complemented by having frequent 1:1s between the newcomer and his or her manager, so the newcomer is able to adjust behaviours and performance, based on regular feedback. The Delphi panel also identified communities of practice as a best practice in onboarding. Besides other benefits arising from communities of practice, such communities, which consist of organizational members, who have the same role as the newcomer, help newly hired software developers to gain technical and organizational aspects related to their role.

The third proximal outcome, called "Self-Efficacy", influences the expectation of a newcomer about the abilities to succeed in new situations. Similar to already mentioned practices, helping newcomers to have early success, e.g. achieve their first commit, first pull request, and first retro facilitation, leads to greater Self-Efficacy. Furthermore, celebrating achievements from the team, regardless from which team member, and living a blameless culture where failures are seen as a crucial way to learn, nurture the Self-Efficacy of the newcomer but also the whole team. Senior team members are also a source for newcomers to get feedback and coaching. It is crucial to understand, that this can only succeed if the performance of senior members is not only measured based on delivery. Generally, all practices where newcomers are able to obtain mastery experiences and identify themselves with others, who are achieving goals, influence Self-Efficacy positively.

The fourth proximal outcome is "Knowledge of Organizational Culture" and a practice which contributes most to this is a formal orientation program, which introduces the values, culture, and policies of the organization to the newcomer. This practice can be further complemented by showing real projects and situations where values, culture, and policies are applied. Furthermore, being transparent and open with all information, as well as giving insights to projects of the organization, even to those not directly relevant for newcomers, increases the knowledge of the organizational culture.

Overall, the identified best practices show that several of the onboarding practices can be utilized by organizations, regardless of the distribution of a software development team. It also reveals that onboarding practices contributing to "Acceptance by Insiders", which is seen as one of the most important adjustment outcome by socialization researchers, need special attention when researching or implementing onboarding practices for distributed

software development teams as these practices consider the geographic dispersion the most.

8.1 Limitations

Like any other empirical study, this thesis has certain limitations. In this section the limitations of this thesis are described.

The research method applied in this thesis is based on the expert knowledge and their ability to reach group consensus. Even though the recruitment and selection of the expert panel has been carefully executed, based on a Knowledge Resource Nomination Worksheet, the quality of the identified best practices differ very likely based on the composition of the expert panel. Thus, another group of experts may have led to another set of best practices in this thesis.

Another limitation which is related to application of the Delphi research method in this thesis, is the number of experts that participated in the study. Despite the Delphi panel consisting of ten experts initially, which is the lower boundary recommended by researchers for executing a Delphi study, three of the participants left during the course of the study. This decreases the generalizability of the outcome of this thesis.

Furthermore, the re-validation of the consolidated onboarding practices with the Delphi panel has not been conducted to reduce the effort of each of the experts. As the re-validation ensures that the meaning of the practices has not been changed by the consolidation process, the avoidance can be seen as another limitation.

As this thesis considered only team leaders or similarly qualified experts as panelists of this Delphi study, it does not considering the perception of the actuals subjects of the onboarding practices - the newcomers themselves. This missing perception is also seen as a limitation of this thesis.

Finally, even though the software development industry is currently male dominated, it has to be considered that all participants of the Delphi study were male, which limits the thesis to a certain extent as well.

8.2 Future Research

To improve the generalizability, it should be considered to have a larger and diverse panel that satisfies the recommended size of a Delphi panel.

Lastly, designing a Delphi research study which incorporates two or more panels, a panel representing team leaders and another panel representing newcomers who participated in onboarding recently, would give a better insight into the effectiveness of onboarding practices. In particular, comparing ranked best practices for onboarding in distributed software development teams from different panels, might disclose whether newcomers see onboarding practices as useful and effective as team leaders see them.

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Bibliography

[AB96] Susan J Ashford and J Stewart Black. Proactivity during organizational entry: The role of desire for control. *Journal of Applied psychology*, 81(2):199, 1996.

[AC83] Susan J Ashford and Larry L Cummings. Feedback as an individual resource: Personal strategies of creating information. *Organizational behavior and human performance*, 32(3):370–398, 1983.

[Adk95] Cheryl L Adkins. Previous work experience and organizational socialization: A longitudinal examination. *Academy of management journal*, 38(3):839–862, 1995.

[AG03] Manju K Ahuja and John E Galvin. Socialization in virtual groups. *Journal of Management*, 29(2):161–185, 2003.

[AN12] Sue Ashford and Samir Nurmohamed. From past to present and into the future: A hitchhiker's guide to the socialization literature. *The Oxford handbook of organizational socialization*, 8, 2012.

[AS88] Eugene M Anderson and Anne Lucasse Shannon. Toward a conceptualization of mentoring. *Journal of Teacher education*, 39(1):38–42, 1988.

[AS96] Blake K Ashforth and Alan M Saks. Socialization tactics: Longitudinal effects on newcomer adjustment. *Academy of management Journal*, 39(1):149–178, 1996.

[ASS07] Blake E Ashforth, David M Sluss, and Alan M Saks. Socialization tactics, proactive behavior, and newcomer learning: Integrating socialization models. *Journal of vocational behavior*, 70(3):447–462, 2007.

[Ban10] Albert Bandura. Self-efficacy. *The Corsini encyclopedia of psychology*, pages 1–3, 2010.

[Bau10] Talya N Bauer. Onboarding new employees: Maximizing success. *SHRM Foundation's Effective Practice Guideline Series*, 7, 2010.

[BBE+07] Talya N Bauer, Todd Bodner, Berrin Erdogan, Donald M Truxillo, and Jennifer S Tucker. Newcomer adjustment during organizational socialization: A meta-analytic review of antecedents, outcomes, and methods. *Journal of applied psychology*, 92(3):707, 2007.

[BCSS18] Ricardo Britto, Daniela S Cruzes, Darja Smite, and Aivars Sablis. On-boarding software developers and teams in three globally distributed legacy projects: A multi-case study. *Journal of Software: Evolution and Process*, 30(4):e1921, 2018.

[BE11] Talya N Bauer and Berrin Erdogan. Organizational socialization: The effective onboarding of new employees. 2011.

[BE12] Talya N Bauer and Berrin Erdogan. Organizational socialization outcomes: Now and into the future. 2012.

[Bel03] Richard C Bell. The repertory grid technique. 2003.

[Ber11] Gregory R Berry. Enhancing effectiveness on virtual teams: Understanding why traditional team skills are insufficient. *The Journal of Business Communication (1973)*, 48(2):186–206, 2011.

[BMY19] Jim Buchan, Stephen G MacDonell, and Jennifer Yang. Effective team onboarding in agile software development: techniques and goals. In *2019 ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)*, pages 1–11. IEEE, 2019.

[Bri17] Ricardo Britto. *Strategizing and evaluating the onboarding of software developers in large-scale globally distributed legacy projects*. PhD thesis, Blekinge Tekniska Högskola, 2017.

[BSDB19] Ricardo Britto, Darja Smite, Lars-Ola Damm, and Jürgen Börstler. Performance evolution of newcomers in large-scale distributed software projects: An industrial case study. In *2019 ACM/IEEE 14th International Conference on Global Software Engineering (ICGSE)*, pages 1–11. IEEE, 2019.

[BSDB20] Ricardo Britto, Darja Smite, Lars-Ola Damm, and Jürgen Börstler. Evaluating and strategizing the onboarding of software developers in large-scale globally distributed projects. *Journal of Systems and Software*, 169:110699, 2020.

[Bul93] Connie Bullis. Organizational socialization research: Enabling, constraining, and shifting perspectives. *Communications Monographs*, 60(1):10–17, 1993.

[BV09] George B Bradt and Mary Vonnegut. *Onboarding: How to get your new employees up to speed in half the time*. John Wiley & Sons, 2009.

[Cas00] Wayne F Cascio. Managing a virtual workplace. *Academy of Management Perspectives*, 14(3):81–90, 2000.

[CDCM+20] Paula Caligiuri, Helen De Cieri, Dana Minbaeva, Alain Verbeke, and Angelika Zimmermann. International hrm insights for navigating the covid-19 pandemic: Implications for future research and practice, 2020.

[CFSB04] Haydee M Cuevas, Stephen M Fiore, Eduardo Salas, and Clint A Bowers. Virtual teams as sociotechnical systems. In *Virtual and collaborative teams*, pages 1–19. IGI Global, 2004.

[CS07] Stacey L Connaughton and Marissa Shuffler. Multinational and multicultural distributed teams: A review and future agenda. *Small group research*, 38(3):387–412, 2007.

[CSL07] Jason A Colquitt, Brent A Scott, and Jeffery A LePine. Trust, trustworthiness, and trust propensity: A meta-analytic test of their unique relationships with risk taking and job performance. *Journal of applied psychology*, 92(4):909, 2007.

[DH63] Norman Dalkey and Olaf Helmer. An experimental application of the delphi method to the use of experts. *Management science*, 9(3):458–467, 1963.

[DH17] James H Dulebohn and Julia E Hoch. Virtual teams in organizations, 2017.

[FBB04] Fay Fransella, Richard Bell, and Don Bannister. *A manual for repertory grid technique*. John Wiley & Sons, 2004.

[FDS11] Ruolian Fang, Michelle K Duffy, and Jason D Shaw. The organizational socialization process: Review and development of a social capital model. *Journal of management*, 37(1):127–152, 2011.

[Fel81] Daniel Charles Feldman. The multiple socialization of organization members. *Academy of management review*, 6(2):309–318, 1981.

[FPF17] Robert C Ford, Ronald F Piccolo, and Loren R Ford. Strategies for building effective virtual teams: Trust is key. *Business Horizons*, 60(1):25–34, 2017.

[GC03] Cristina B Gibson and Susan G Cohen. *Virtual teams that work: Creating conditions for virtual team effectiveness*. John Wiley & Sons, 2003.

[GS20] Jamie A Gruman and Alan M Saks. e-socialization. In *Encyclopedia of Electronic HRM*, pages 125–130. De Gruyter Oldenbourg, 2020.

[Han95] Charles Handy. Trust and the virtual organization. *Harvard business review*, 73(3):40, 1995.

[HB03] Pamela J Hinds and Diane E Bailey. Out of sight, out of sync: Understanding conflict in distributed teams. *Organization science*, 14(6):615–632, 2003.

[HB11] Libby Hemphill and Andrew Begel. Not seen and not heard: Onboarding challenges in newly virtual teams. *131.107*, 65, 2011.

[HCTSS20] Lisa Harris, Helena Cooper-Thomas, Peter Smith, and Roy Smollan. Reclaiming the social in socialization: A practice-based understanding of newcomer adjustment. *Human Resource Development Quarterly*, 2020.

[HKK02] Pamela Hinds, Sara B Kiesler, and Sara Kiesler. *Distributed work*. MIT press, 2002.

[HKML12] Charlice Hurst, John Kammeyer-Mueller, and Beth Livingston. The odd one out: How newcomers who are different become adjusted. *The Oxford handbook of organizational socialization*, 54:115–138, 2012.

[HM01] James D Herbsleb and Deependra Moitra. Global software development. *IEEE software*, 18(2):16–20, 2001.

[HM03] James D. Herbsleb and Audris Mockus. An empirical study of speed and communication in globally distributed software development. *IEEE Transactions on software engineering*, 29(6):481–494, 2003.

[HS07] Chia-Chien Hsu and Brian A Sandford. The delphi technique: making sense of consensus. *Practical Assessment, Research, and Evaluation*, 12(1):10, 2007.

[JKL98] Sirkka L Jarvenpaa, Kathleen Knoll, and Dorothy E Leidner. Is anybody out there? antecedents of trust in global virtual teams. *Journal of management information systems*, 14(4):29–64, 1998.

[JL99] Sirkka L Jarvenpaa and Dorothy E Leidner. Communication and trust in global virtual teams. *Organization science*, 10(6):791–815, 1999.

[Jon86] Gareth R Jones. Socialization tactics, self-efficacy, and newcomers' adjustments to organizations. *Academy of Management journal*, 29(2):262–279, 1986.

[JS10] Maggie Johnson and Max Senges. Learning to be a programmer in a complex organization. *Journal of Workplace Learning*, 2010.

[JSKH21] An Ju, Hitesh Sajnani, Scot Kelly, and Kim Herzig. A case study of onboarding in software teams: Tasks and strategies. In *2021 IEEE/ACM 43rd International Conference on Software Engineering (ICSE)*, pages 613–623. IEEE, 2021.

[KGS01] Bradley L Kirkman, Cristina B Gibson, and Debra L Shapiro. "exporting" teams: Enhancing the implementation and effectiveness of work teams in global affiliates. *Organizational Dynamics*, 2001.

[Kir95] Catherine Kirchmeyer. Demographic similarity to the work group: A longitudinal study of managers at the early career stage. *Journal of Organizational Behavior*, 16(1):67–83, 1995.

[KL02] Timothy R Kayworth and Dorothy E Leidner. Leadership effectiveness in global virtual teams. *Journal of management information systems*, 18(3):7–40, 2002.

[KMW03] John D Kammeyer-Mueller and Connie R Wanberg. Unwrapping the organizational entry process: disentangling multiple antecedents and their pathways to adjustment. *Journal of Applied Psychology*, 88(5):779, 2003.

[Kow08] N Rao Kowtha. Engineering the engineers: Socialization tactics and new engineer adjustment in organizations. *IEEE transactions on engineering management*, 55(1):67–81, 2008.

[KP12] Howard J Klein and Beth Polin. Are organizations on board with best practices onboarding. *The Oxford handbook of organizational socialization*, 54:267–287, 2012.

[KPLS15] Howard J Klein, Beth Polin, and Kyra Leigh Sutton. Specific onboarding practices for the socialization of new employees. *International Journal of Selection and Assessment*, 23(3):263–283, 2015.

[KRG+02] Bradley L Kirkman, Benson Rosen, Cristina B Gibson, Paul E Tesluk, and Simon O McPherson. Five challenges to virtual team success: Lessons from sabre, inc. *Academy of Management Perspectives*, 16(3):67–79, 2002.

[KRTG04] Bradley L Kirkman, Benson Rosen, Paul E Tesluk, and Cristina B Gibson. The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of management journal*, 47(2):175–192, 2004.

[KW00] Howard J Klein and Natasha A Weaver. The effectiveness of an organizational-level orientation training program in the socialization of new hires. *Personnel Psychology*, 53(1):47–66, 2000.

[KWQ+64] Robert L Kahn, Donald M Wolfe, Robert P Quinn, J Diedrick Snoek, and Robert A Rosenthal. Organizational stress: Studies in role conflict and ambiguity. 1964.

[Lee21] Margaret R Lee. *Leading virtual project teams: Adapting leadership theories and communications techniques to 21st century organizations*. CRC Press, 2021.

[Loc69] Edwin A Locke. What is job satisfaction? *Organizational behavior and human performance*, 4(4):309–336, 1969.

[LR01] Jeremy S Lurey and Mahesh S Raisinghani. An empirical study of best practices in virtual teams. *Information & Management*, 38(8):523–544, 2001.

[LS00] Jessica Lipnack and Jeffrey Stamps. Virtual teams. *People working across boundaries with technology.(2. edition) New York: John Wiley*, 2000.

[LS01] Eric L. Lesser and John Storck. Communities of practice and organizational performance. *IBM systems journal*, 40(4):831–841, 2001.

[LT+75] Harold A Linstone, Murray Turoff, et al. *The delphi method*. Addison-Wesley Reading, MA, 1975.

[MDS95] Roger C Mayer, James H Davis, and F David Schoorman. An integrative model of organizational trust. *Academy of management review*, 20(3):709–734, 1995.

[MGM04] Luis L Martins, Lucy L Gilson, and M Travis Maynard. Virtual teams: What do we know and where do we go from here? *Journal of management*, 30(6):805–835, 2004.

[MJ91] Vernon D Miller and Fredric M Jablin. Information seeking during organizational entry: Influences, tactics, and a model of the process. *Academy of Management Review*, 16(1):92–120, 1991.

[MMR07] Arvind Malhotra, Ann Majchrzak, and Benson Rosen. Leading virtual teams. *Academy of Management perspectives*, 21(1):60–70, 2007.

[MSG20] Nils Brede Moe, Viktoria Stray, and Marcus R Goplen. Studying onboarding in distributed software teams: a case study and guidelines. In *Proceedings of the Evaluation and Assessment in Software Engineering*, pages 150–159. 2020.

[MSP79] Richard T Mowday, Richard M Steers, and Lyman W Porter. The measurement of organizational commitment. *Journal of vocational behavior*, 14(2):224–247, 1979.

[NQ91] Debra L Nelson and James Campbell Quick. Social support and newcomer adjustment in organizations: Attachment theory at work? *Journal of organizational behavior*, 12(6):543–554, 1991.

[OKW07] Ilan Oshri, Julia Kotlarsky, and Leslie P Willcocks. Global software development: Exploring socialization and face-to-face meetings in distributed strategic projects. *The Journal of Strategic Information Systems*, 16(1):25–49, 2007.

[OP04] Chitu Okoli and Suzanne D Pawlowski. The delphi method as a research tool: an example, design considerations and applications. *Information & management*, 42(1):15–29, 2004.

[Pap97] WR Pape. Group insurance: Virtual teams can quickly gather tile knowledge of even far-flung staff. *INC-BOSTON MA-*, 19:29–34, 1997.

[PCPNT13] Guy Pare, Ann-Frances Cameron, Placide Poba-Nzaou, and Mathieu Templier. A systematic assessment of rigor in information systems ranking-type delphi studies. *Information & management*, 50(5):207–217, 2013.

[PDLK04] Gaelle Picherit-Duthler, Shawn D Long, and Gary F Kohut. Newcomer assimilation in virtual team socialization. In *Virtual and Collaborative Teams*, pages 115–132. IGI Global, 2004.

[PS97] Kulwant S Pawar and Sudi Sharifi. Physical or virtual team collocation: Does it matter? *International Journal of Production Economics*, 52(3):283–290, 1997.

[PSMB74] Lyman W Porter, Richard M Steers, Richard T Mowday, and Paul V Boulian. Organizational commitment, job satisfaction, and turnover among psychiatric technicians. *Journal of applied psychology*, 59(5):603, 1974.

[PSV94] Dewayne E Perry, Nancy A. Staudenmayer, and Lawrence G Votta. People, organizations, and process improvement. *IEEE Software*, 11(4):36–45, 1994.

[RHL70] John R Rizzo, Robert J House, and Sidney I Lirtzman. Role conflict and ambiguity in complex organizations. *Administrative science quarterly*, pages 150–163, 1970.

[RK10] April H Reed and Linda V Knight. Project risk differences between virtual and co-located teams. *Journal of computer information systems*, 51(1):19–30, 2010.

[RZHF21] Paige Rodeghero, Thomas Zimmermann, Brian Houck, and Denae Ford. Please turn your cameras on: Remote onboarding of software developers during a pandemic. In *2021 IEEE/ACM 43rd International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP)*, pages 41–50. IEEE, 2021.

[SA97] Alan M Saks and Blake E Ashforth. Organizational socialization: Making sense of the past and present as a prologue for the future. *Journal of vocational Behavior*, 51(2):234–279, 1997.

[SC10] Mark Stein and Lilith Christiansen. *Successful onboarding*. McGraw-Hill Professional Publishing, 2010.

[Sch90] Edgar H Schein. *Organizational culture.*, volume 45. American Psychological Association, 1990.

[Sch97] Roy C Schmidt. Managing delphi surveys using nonparametric statistical techniques. *decision Sciences*, 28(3):763–774, 1997.

[Sch18] Mads Schramm. The virtual coffee break: Virtual leadership–how to create trust and relations over long distances. In *Online Collaboration and Communication in Contemporary Organizations*, pages 256–275. IGI Global, 2018.

[SHE09] Frank Siebdrat, Martin Hoegl, and Holger Ernst. How to manage virtual teams. *MIT Sloan Management Review*, 50(4):63, 2009.

[SHK07] Gregory J Skulmoski, Francis T Hartman, and Jennifer Krahn. The delphi method for graduate research. *Journal of Information Technology Education: Research*, 6(1):1–21, 2007.

[SLKC01] Roy Schmidt, Kalle Lyytinen, Mark Keil, and Paul Cule. Identifying software project risks: An international delphi study. *Journal of management information systems*, 17(4):5–36, 2001.

[SNCL15] Richard Skinner, R Ryan Nelson, Wynne W Chin, and Lesley Land. The delphi method research strategy in studies of information systems. 2015.

[SS20] Gaurav G Sharma and Klaas-Jan Stol. Exploring onboarding success, organizational fit, and turnover intention of software professionals. *Journal of Systems and Software*, 159:110442, 2020.

[SSD16] Viktoria Stray, Dag IK Sjøberg, and Tore Dybå. The daily stand-up meeting: A grounded theory study. *Journal of Systems and Software*, 114:101–124, 2016.

[Sur05] James Surowiecki. *The wisdom of crowds*. Anchor, 2005.

[SWN+03] David Stotts, Laurie Williams, Nachiappan Nagappan, Prashant Baheti, Dennis Jen, and Anne Jackson. Virtual teaming: Experiments and experiences with distributed pair programming. In *Conference on extreme programming and agile methods*, pages 129–141. Springer, 2003.

[TDH98] Anthony M Townsend, Samuel M DeMarie, and Anthony R Hendrickson. Virtual teams: Technology and the workplace of the future. *Academy of Management Perspectives*, 12(3):17–29, 1998.

[TH02] Felix B Tan and M Gordon Hunter. The repertory grid technique: A method for the study of cognition in information systems. *MIS quarterly*, pages 39–57, 2002.

[TM93] Robert P Tett and John P Meyer. Job satisfaction, organizational commitment, turnover intention, and turnover: path analyses based on meta-analytic findings. *Personnel psychology*, 46(2):259–293, 1993.

[TT08] Leigh L Thompson and Maurice Thompson. Making the team: A guide for managers. 2008.

[VMS77] John Eastin Van Maanen and Edgar Henry Schein. Toward a theory of organizational socialization. 1977.

[VO00] Chockalingam Viswesvaran and Deniz S Ones. Perspectives on models of job performance. *International Journal of Selection and Assessment*, 8(4):216–226, 2000.

[Wan77] John P Wanous. Organizational entry: Newcomers moving from outside to inside. *Psychological Bulletin*, 84(4):601, 1977.

[Wan12] Connie R Wanberg. Facilitating organizational socialization: An introduction. *The Oxford handbook of organizational socialization*, 360, 2012.

[War17] Donald D Warrick. What leaders need to know about organizational culture. *Business Horizons*, 60(3):395–404, 2017.

[WKM00] Connie R Wanberg and John D Kammeyer-Mueller. Predictors and outcomes of proactivity in the socialization process. *Journal of applied psychology*, 85(3):373, 2000.

[WWKM07] Connie R Wanberg, Elizabeth T Welsh, and John Kammeyer-Mueller. Protégé and mentor self-disclosure: Levels and outcomes within formal mentoring dyads in a corporate context. *Journal of Vocational Behavior*, 70(2):398–412, 2007.

Appendix

Collected Onboarding Practices contributing to Proximal Outcomes

Proximal Outcome "Acceptance by Insiders"

Practice	Description
A-1-1	Spectrum Interviews: In hiring, the manager, PMs], and representative peers all interview the candidate. This encourages both the employees and the candidate to explore fit, and gives employees a feeling of participation, voice, and trust in the hiring process. It's particularly valuable to have engineers interview the candidate without manager or PM on the call.
A-1-2	Onboarding buddy: After joining, a single peer connects with the new hire every day for a week or two on video calls, giving social connections, cultural cues, and practical set-up tips for their coding environment. The buddy can often assign initial coding tasks and help the new hire to land their first branch, and even pair program. A successful onboarding buddy leads to a strong interpersonal connection in addition to the manager.
A-1-3	Onboarding trip: An expensive but highly effective tool is to pay for each new hire to travel to visit one or more peers within the first few weeks. This can be done with the onboarding buddy, a small project group, or a well-timed offsite. Associating this with both ideating and landing code together can be particularly effective.
A-1-4	Written and Live Culture Interview: In hiring, give each candidate an opportunity not only to show cultural fit, but to demonstrate their communication ability live and in a written format. Skilled written communication can be very important in an async environment, which is common in distributed teams. The written cultural answers can also be distributed and evaluated without candidate identifiers, reducing bias before live interviews occur. The cultural questions ideally reflect the key company values that ideal/desired employees show every day.

A-1-5	Written Code Assignment Interview: In hiring, give each candidate a chance to code a representative project, in their own space (not observed), and submit the results. This project should be built by a very senior engineer to show results. An effective approach can be to have a starting project that works but has problems, and ask candidates to add a feature and fix the bugs they can find. Restricting time on the effort can both encourage a fair evaluation and encourage a reasonable and constrained commitment from the candidate. Four hours can be ideal from an evaluation perspective, but two has worked to some degree. Collect and distribute this work in a way that does not include personal information about the candidate, so initial evaluation reduces bias before interviewers meet the candidate.
A-1-6	Recurring Video Calls: The team turns on their camera for all meetings. The text chat channel is encouraged and monitored as a way to build community and feedback without interrupting. The manager and onboarding buddy encourages 1:1 and group calls for the new hire, both one-off and recurring (e.g. fortnightly), to make immediate and long-term connections. The manager hosts and encourages frequent work and social connections–stand-ups, and even weekly social group calls. Managers set up 1:1s early and often–as often as every day in the first week or so, and every week subsequently.
A-1-7	Land a PR first day/first week: A good signal for everyone is for a new hire to land a PR on the first day or at least the first week. The new hire gets confidence and satisfaction. The team sees immediate progress and a good signal for future contributions.
A-1-8	Encourage a lively text/async environment Slack, IRC, or Discord are often the lifeblood of a distributed engineering culture. Encourage a respectful, lively environment, with fun, work, celebration, feedback, and so on. Document the best practices and expectations for new hires, and make them experience the centrality of the tool.
B-1-1	Application training/walkthrough. Have a senior team member, such as the product manager, engineering manager, or a QA professional, walk them through the application. Share any project glossaries. The goal is understanding the application and domain concepts and language as a user does.
B-1-2	Language and/or framework training, if necessary. Give the developer time and resources to learn any part of your stack where they are missing experience.
B-1-3	Working developer machine/environment. Have another developer assist them in setting up their machine so they can build and debug the software locally. Also have the new developer update the setup documentation.
B-1-4	Reading the internal development guides for coding style and code reviews. Code readability is key to maintainability, and a hallmark of readability is consistency. Similarly, they must understand what is expected of them in a code review.

B-1-5	Code walkthrough by a senior team member. Teach them the different components of the software. Explain how they interact, unorthodox approaches, etc.
B-1-6	Pair programming via call with screensharing or dedicated tool. Have them work with another developer to complete a task together.
B-1-7	Perform a code or design review. Have them review another developer's code and provide feedback according to our guidelines.
B-1-8	Change the software and submit a pull request. Complete a task from the backlog. Submit it for review and incorporate feedback.
C-1-1	Setting up the stage and expectations for insiders. In my experience this is important to let the insiders get acquainted with the skillset and experience of the newcomer, the induction plan and tentative milestones for expecting the newcomer to get acquainted with the environment and eventually start contributing.
C-1-2	On-camera coffee sessions with the team. To have newcomers be able to 'see' their new team members is very important. The visual connect helps the newcomers feel at ease in a new setting. similarly, this helps the wider set of team members, the insiders, connect with the newcomer.
C-1-3	Have a solid on-boarding plan, with checklists, and making it visible to the newcomer and insiders. While this was always important even for co-located teams, this helps newcomers who're joining from a remote location by them knowing what is expected to happen over the first 3-6 months. Similarly, the insiders can see how the newcomer is progressing
C-1-4	Get the newcomers to commit to the code-base earlier than otherwise. With a distributed newcomer, insiders can start trusting the newcomer faster if they see their contributions, albeit small, to the team goal. This means that there needs to be more investment made by having someone invest their time in helping the newcomer get onboarded on the stack/processes early enough, pair with them... so that they start contributing early.
C-1-5	Have informal coffee/drinks set in to the teams' calendars. These events help bring the effect of the corridor/kitchen talks that we miss while working remotely.These don't need to be attended by all team members all the time but something that exists in everyone's calendar a couple of times a week so that they join when they can. Having newcomers deliberately join these, however, trying to remember not to 'scare' the newcomer with sharing a deluge of negative sentiments, even though jokingly, during these sessions.
D-1-1	Boot camp: new hires form a temporary squad Onboarding in groups is a great way to minimize the effort and redundancies of onboarding new hires and training them. It also creates a sense of community amongst them. This sense of community eventually will create opportunity by crossing the networks between new hires and boost the chances to meet with key people while also extending their own network.

D-1-2	Fun fact and a brief introduction of the employee's background during an all-hands: Ask them to write a welcome letter with a fun fact to expose themselves and show authenticity. No need to enter personal details if wanted; things can stay professional. Showing authenticity and vulnerability triggers empathy from others and make them respected. People also will trust them more because they tend not to hide their true selves.
D-1-3	Identify, appoint, and communicate a dedicated onboarding liaison (buddy): It's important that this informal mentor be a different person from the person's manager so that the new employee feels comfortable asking any question, large or small. Any new employee will and should have endless questions, and the last thing you want is to have them feel uncertain about who to ask. Ideally, the onboarding liaison will proactively reach out to the new employee prior to the first day and establish themselves as the new individual's go-to person. Having a buddy is a great way to create a special relationship with an insider.
D-1-4	Intentional chance meetings and increasing their network: In a virtual setting, you can't rely as much on the organic and spontaneous relationship-building that happens in hallways, over lunches, and at office events. That's why it's best to be proactive and intentional about setting up a mix of formal and informal one-on-one interactions between the new hire and other individuals. To combat the lack of spontaneous opportunities for small talk and other relationship building that would typically happen in an office, encourage new hires and their teammates to set up a mix of formal conversations, to cover rules, responsibilities, and business objectives, and shorter, informal interactions over coffee, lunch, or debriefing on a recent meeting. It helps also recognize team dynamics and build a broader network. Research shows that it's more powerful to have a broad network than a deep network, especially as one becomes increasingly senior in an organization. Some companies set up a "shadow week" in which the new hire attends a wide variety of team and stakeholder group meetings, even those that may feel less directly relevant to that new hire's core responsibilities. All these techniques will make the new hire increases their network and build relationships with others.
D-1-5	Make unspoken assumptions explicit: Even if it feels awkward, explicit guidance around norms that are often taken for granted — the company's tone and level of formality, virtual etiquette on videoconferences, messaging norms, and working hours — can be helpful. Don't leave new employees to guess at these issues; doing so can create ambiguity and stress. Ask questions on everything not explicit create relationships with people by showing you care about improving existing processes but also makes you discoverable by the company.

E-1-1	On-Site setup: even in a distributed setting, it helps tremendously to have on-site setup sessions with a dedicated to peer (a kind of mentor/onboarding facilitator - this does not have to be the same person every time someone new comes!) to help set things up and get going
E-1-2	Setup sessions with a dedicated to peer (assign a mentor/onboarding facilitator) but using virtual meetings / chat etc.
E-1-3	Dedicated virtual space for social (i.e. non work-related) talk (as a group with peers): we like to have 5 mins of social talk each day, e.g. before the Daily Standup. Everyone is expected to participate, this is not opt-in. And this is part of working time as it facilitates team bonding and getting to know each other better.
E-1-4	Virtual coffee break: this is a variation of best practice number 2, which we also, a dedicated meeting slot twice a week (also part of working time), a little bit longer - 15 mins. This is opt-in for everyone who wants to participate. There is no agenda or anything.
E-1-5	Team events - online or offline - help accept and integrate newcomers, this is usually organized by work and sponsored
E-1-6	Virtual after work beer, this is usually a private effort
F-1-1	Build trust with manager and a peer
F-1-2	Empathy with newcomer
F-1-3	Cultural adjustment ID coming from a different country than where the team
F-1-4	Set up dedicated time for questions and answers for newjoiner
F-1-5	Social activities with team
G-1-1	1on1s: Set up meetings with every relevant stakeholder group for the newcomer (i.e. product, UI/UX, marketing, etc.). For the closer team set up 1on1s with everybody the newcomer will work with directly.
G-1-2	Give opportunity to shine: Instead of giving low key tasks first try to give the newcomer a highly visible task. A highly visible task is not necessarily a complicated task that overwhelms them.
G-1-3	Actively ask for opinion: In team meetings actively ask for the opinion of the newcomer to give them an opportunity to speak up in a team that might already be set to find their role and to show their peers how they think and what they think.
G-1-4	Actively ask if you as lead can help: This should be applied cautiously as it should not be perceived as micro management. But offering help opens a safe space to share weaknesses and enables collaboration.
G-1-5	Invite to every relevant team meeting on the first day: Give the newcomer already on the first day the feeling that they are welcome and part of the team
H-1-1	Let the newcomer solve a long-lasting problem: The newcomer has a different view on existing problems. Even if he doesn't succeed he may inspire insiders to try new solutions on solving the problem. It will the newcomers motivation on working for the team.

H-1-2	Make the newcomer and an insider co-work closely: They will soon know each other very well. If the insider accepts the newcomer, he will be accepted by other insiders as well. The newcomer gets the "inside" view of the team.
H-1-3	Start a virtual get together: This will be a relaxed setting for getting to know each other better. Maybe the insider has the same interests as other team members. Always a good tool for raising the team spirit.
H-1-4	Involve insiders in hiring process: The insiders will be more open to a newcomer they where choosing. Insiders have knowledge of skills of the newcomer before he enters the team an can make use of those skills earlier. The newcomer will be encouraged by the fact that his new team members wanted him to join.
H-1-5	Let the newcomer take responsibilities early: Will raise self-confidence of newcomer. The value of the new team member will be recognised by insiders. Insiders can delegate tasks to newcomer.

Table 1: Onboarding practices contributing to proximal outcome "Acceptance by Insiders"

Proximal Outcome "Role Clarity"

Practice	**Description**
A-2-1	Good Job Descriptions: Spend time on JDs to make them both specific and inspiring. This is a candidate's first impression, and they will take them seriously if it looks like you have. Talk about scope, skills, and expectations.
A-2-2	Written Code Projects: When interviewing, asking for a written code project. The assignment should mimic the kind of work expected from employees so it sets up expectations clearly from the start. If you ask for, or look for, clear commit history, or solid tests, or clear comments, or good naming and structure, or whatever, the candidate can get a visceral understanding of key aspects of their role.
A-2-3	Documented Work Processes, Ceremonies, and Roles: Have docs, decks, and videos of your processes, ceremonies, and role definitions for new hires. Ask for review and questions. Present key expectations live.
A-2-4	Onboarding Buddy: While documentation can be a powerful blunt tool for explicit role expectations, onboarding buddies can talk new hires through the more subtle aspects of the role. Walking the new hire through the documented processes also helps. Modeling also shows values and role expectations alive in the organization.

A-2-5	Participatory Ceremonies: Ceremonies that invite engineers to participate in a way that reinforces role and expectation can be very effective. Weekly or bi-weekly demo days set up a culture and expectation of incremental delivery, feedback, and celebration. Participatory sprint planning sets expectations of future delivery. Participatory business prioritization gives engineers an understanding of what's most important to the business and how their role fits within it.
A-2-6	Weekly manager 1:1s: Set up weekly manager 1:1s with good coaching and a chance for questions and feedback. New hires will have questions about expectations, and whether they are meeting them. Give them a regular, open chance to explore.
B-2-1	Walk them through the issue tracker. Explain how the fields are used, especially any internal significance.
B-2-2	Walk them through the backlog. Explain how it was prioritized. Share the principles behind the thinking.
B-2-3	Read the style guide, which explains how code should be formatted, and in some cases, written. Discuss the principles that drove the choices. Encourage them to voice improvements.
B-2-4	Read the code review documentation. Communicate expectations for code reviews. Encourage them to voice improvements.
B-2-5	Have them plan 2 weeks of work. They choose issues they can complete and estimate them. Update the two week plan weekly. Communicate blockers and schedule slips daily.
C-2-1	Providing documentation, wiki etc which explains how each role is expected to contribute to the overall goal of the team and the organization. This helps the newcomer not only understand her/his role but also those of other on the team.
C-2-2	Setting newcomers with a buddy who's a peer with the same role. This helps them understand how the buddy contributes to the goals in his/her capacity. How the buddy works with other roles in the team to make his/her delivery more efficient.
C-2-3	Feedback loops through frequent 1-1s. The 1-1s help set the expectations but also in terms of re-alignment in case there is a need. These 1-1s give both the organization and the newcomer the required platform to ensure there's no lack of clarity in terms of what's expected off the newcomer.
C-2-4	Celebrating early 'successes'. Going back to the practice of facilitating early commits, this practice here is to celebrate these early commits even thought they might be small. It reinforces that the newcomer is playing the expected role. For roles other than software development, this practice could take the shape a little differently. For example celebrating a successful retro facilitation by a scrum master.

C-2-5	Keeping the alignment with the job description/posting and reality as close as possible. Often times our job postings are a reflection of where we'd like to be in an ideal world and might be slightly mis-aligned with the reality. This can often time lead to confusion in the early weeks/months of a newcomer's time at the organization in terms of his/her role and can be avoided by better worded job postings and transparency during the hiring process.
D-2-1	Start with bug fixes or small tasks: It is the easiest way to ramp them up into a product and be exposed to various system parts. Bugs and small tasks are a way to expose the new hires to others than focusing on a single long project when you can be isolated and need deep focus. Exposing yourself will help you be discovered and trusted. People will also see the value you deliver tangibly, and that's when you start earning respect.
D-2-2	Onboarding OKRs: Set clear expectations and connect the individual's work to the broader organizational mission, vision, and goals. New hires should recognize how their responsibilities fit into the company's overall success. When an individual joins the team, the hiring manager should share essential communications and presentations done by the organization's leadership on the direction and goals of the company so the new hire can put their work into the context of the whole. Having a clear set of responsibilities and outcomes can be critical to helping a new employee prioritize and sequence work and accomplish some quick wins that create a strong foundation and momentum for the individual's future success. OKRs align new hires with the company vision and make sure they understand objectives quickly.
D-2-3	Explicitly written role expectations Write down the expectations of each role in the documentation and make them refer to it when something is not clear enough. Onboarding a new hire is also an excellent opportunity to challenge the documentation if there are some less explicit parts. It's in general recommended to be as explicit and transparent as possible to reduce redundancy and overhead.
D-2-4	Shadow people on-call: Some roles necessitate being on-call from time to time to act if there is an alert in production. It's a good strategy for the new hires to shadow on-call people to see how they operate and what it means. This will also be a great way to create relationships and generate empathy for teammates sometimes struggling with emergencies.
D-2-5	Feedback loops in 1:1s: It's crucial to ensure new hires get critical feedback regularly to adjust their behaviours and tune their performance if needed. It's common to be misaligned in the first weeks or even months, so these rituals help to recenter their focus if they deviate too much from their role or the company goals.
E-2-1	Explicit role definition: We use intro emails, stating what is expected of the new person, what are initial goals (these are usually refined each month)

E-2-2	Definition by analogy: We give individual 1:1 intro sessions (technical, domain, process, organizational) with experts in the given field to give an understanding what is usually accomplished by the given role, but also which other roles there are and how it all plays together (giving a complete picture)
E-2-3	Checklists and How Tos: we rely on checklists and how to instructions (guidelines in wiki, but also recorded video sessions) to help achieve the task expected of the given role
E-2-4	Community of practice: we use communities of practice (for people having the same role, e.g. usability engineers, developers, QA, ...) to give an idea of how other people fill their role. This is usually held once a month.
E-2-5	Distributed Pair Programming: we also use distributed pair programming (newcomer with senior usually) to show the newcomer how other persons approach tasks/problems and what is entailed in that role
F-2-1	Clear initial task to complete
F-2-2	Clear understanding of the system or service
F-2-3	Provide enough onboarding information prepared by multiple peers in team
F-2-4	Trainings that should help upskill for the job
F-2-5	Introduction with partners who could mentor newjoiner on practical tasks
G-2-1	Give a productive task early on: This helps to show the newcomer what they are expected to do. Usually I don't put much time pressure on the first tasks but rather want to see eagerness and drive
G-2-2	Meet the direct team: When meeting the direct team also state expertises so the newcomer knows where to get help and also to identify subconsciously where there might be white spaces they can shine in.
G-2-3	Make sure initial tasks are very clear: In a grown environment tasks might get clarified a lot by context and are not always exhaustively defined within a ticket. The newcomer should get a very clearly defined task.
G-2-4	Don't let them sit and do nothing: Especially for developers it takes a bit of time to set up your own dev environment but this should not be an invitation to let the newcomer do nothing. You can also set up bits and pieces while doing the job and give purpose to the newcomer
G-2-5	1on1s with the superior: Regular checkins within the first weeks to clarify all open questions, to show vision/mission/next steps and to onboard newcomer on a more tailored to them level.
H-2-1	Choose the fitting role during selection process: In the selection process you should get an idea what role fits best for the newcomer. Most probably the newcomer will be hired on a specific role. Question your decision and trial it.
H-2-2	Assign a role to the newcomer on the first day and stick to it: Don't let newcomers do a trainee program in your team. They will get to know other roles in meetings and throughout time. Don't hesitate to change the role if it doesn't fit.

H-2-3	Write down the role description: Define the field of responsibility and write it down. This is a hint for both - newcomer and other team members. Adopt the role description if needed.
H-2-4	Use daily standups: During daily standups you will see if the team members remain in their roles. If not, question the reason: is the role description not sufficient or does the team member break out their role.
H-2-5	Don't be too strict with roles: Even if a team member has a role assigned he maybe will fit another role. Or he will even act in another role then and when. Allow multiple role assignments but be sure that there's a primary role with reponsibility.

Table 2: Onboarding practices for proximal outcome "Role Clarity"

Proximal Outcome "Self-Efficacy"

Practice	**Description**
A-3-1	Land a PR early Get a PR in the first day or the first week. Show them that they have mastered the system setup, the landing toolbox, and the basics of the codebase. Celebrate it in the team channel!
A-3-2	Choose an early smaller project In the first weeks, give the new hire a smaller project, paired with another person or two, that gives them a clear win while they get a basic understanding of the codebase.
A-3-3	Point to an upcoming project that will be a stretch (and then give it to them) Early on, consider talking to more senior hires about what they might work on after they have gained context. Make it meaty enough to be interesting, but not too scary–and don't let them work in a silo. Then give it to them in a few months!
A-3-4	Intrinsic motivation: Encourage developers to shape not only the plans but the business goals behind them, so increased ownership can lead to increased intrinsic motivation. Developers will build self-efficacy if they want or need it. Make them want it.
A-3-5	Provide feedback and coaching: Managers should let hires know when they are doing well and when people are positive about them. Managers can even privately ask for this kind of input–including coaching–and then share what they've heard. Even coaching can be helpful for self-efficacy: if someone is coached to improve in a way that builds them up, it can do wonders for their self-efficacy.
B-3-1	Publicly praise any improvements they make to the process. Acknowledge that newcomers bring experience and practices that can improve the team. Even when they don't, an outsider's eyes can illuminate practices that are cumbersome and non-optimal. Encourage this.

B-3-2	Pair programming for initial tasks. Pair programming allows them to share in the success while teaching them about the system and giving them confidence to work solo.
B-3-3	Have them contribute any improvements to your documentation. Documentation can become out of date. In addition, newcomers can illuminate where it is unclear and offer improvements to explanations.
B-3-4	Creating a schedule of work helps in two areas. It allows them to start with tasks that are less intimidating to give them confidence. And it gives them accountability and motivation to complete their tasks. It also trains them to be better estimators.
B-3-5	Ask them to share anything useful they've learned with the team. They might be aware of tools we aren't currently learning. Or the act of solving a problem could give them valuable information on best or worst practices that the whole team could benefit from.
C-3-1	Communicating success factors to new comers. Both success factors for teams and as individuals. Explaining the performance appraisal process in the first few months of the new comer joining.
C-3-2	Not an onboarding process per se but it is important to let newcomers see, without letting them know, individuals who're consistently achieving goals and the kudos they receive so that newcomers get a sense of what success is and how it is achieved.
C-3-3	Going back to the concept of helping newcomers achieve early 'success' by helping them achieve their first commit, their first PR review, their first retro facilitation helps in them getting their early taste of mini-success and build their confidence.
C-3-4	Feedback loop within 1-1s. 1-1s are a good forum to share constructive feedback, to re-emphasise jobs well done and to offer explicitly opportunities to tackle tasks that offer chances of early success or recognition with the team.
C-3-5	The need to understand the newcomer's nature is super important. What works for one of us in terms of finding pathways to success might not work for another. One newcomer might jump at the opportunity at facilitating a workshop while another might not like to be put in the spotlight.
D-3-1	Continuous personal growth: New hires need first to comprehend themselves, their strengths, weaknesses, and personalities. They have to focus on their strengths while keeping weaknesses in check so they don't become liabilities. Personal growth is the basis of everything and must be a continuous process.
D-3-2	Being coached by senior colleagues: Being coached by seniors like tech leads or other senior members. It's essential to give and save time for it and avoid measuring senior people's performance only based on delivery. If not, they will prefer building to coach new hires. Feedback loops like 1:1s or pull request reviews are a great way to be coached, but this can also be a lot in async through Slack or else.

D-3-3	Find a mentor and be inspired by others: Leaders need to lead by example to inspire new hires. Cross-pollination is a great way to spread influence and make others align with new techniques and approaches. Also, new hires can take the opportunity to find a mentor, and the company can help with that by putting in place an internal mentorship program.
D-3-4	Increase accountability by building in public: Expose the new hire to everyone and make them accountable for the outcome of what they try to achieve. This will help them try to reach their goals instead of hiding anonymity. It organically triggers feedback loops, leading to getting feedback earlier and adapting accordingly.
D-3-5	Seek to learn through failures: Putting in place a blameless culture to create a safe space where new hires are welcome to experiment and fail if necessary. Failures are a crucial way to learn and they must be confident that leadership is open for them to try even if the outcome is not ensured.
E-3-1	Analysis Step: before a new task gets started (after to do), the new comer looks into it, how he/she would go about in solving it (depending on the task size, this usually takes 30mins to 1h) and a short 15mins ad hoc meeting with a senior is requested, validating/improving the approach. This helps validate approaches, get input from more experienced colleagues, before wasting time going the wrong way, minimizing frustration on all ends.
E-3-2	Review Step: after a task is completed, it goes into peer review, again providing feedback and pointing out problems, this helps to ease in with the teams way of working.
E-3-3	Progress checking: we give estimates (by team) for each task giving newcomers a sense of where they stand in relation to team average. This is starts from day one, however newcomers are not expected to meet team average from the start, but get a separate additional time pool for learning/onboarding in the first months.
E-3-4	Build areas of expertise: while we try to as many people be able to accomplish diverse tasks in order to avoid bottlenecks, it makes sense to give people the chance dive deeper making him/her an expert in a specific tool or technology, e.g. every person, also juniors - and newcomers should be able to select one such area and become proficient in it - this achieves a sense of mastery, also for a newcomer, where they are actually ahead of others, although they are newcomers.
E-3-5	Retrospectives: we like to discuss problems very openly in our retrospectives to learn from mistakes. This behavior is usually picked up by newcomers, as everybody gets a word in. Learning from other's mistakes is key to improve self-efficacy (not just one's own), also to see what other people struggle with.
F-3-1	First code commit during first days of joining
F-3-2	Clear goal of a small task to deliver
F-3-3	Mentor to guide newcomer in the team

F-3-4	Hardware and software setup should support independent work
F-3-5	Guidance on how to initiate contact with others to ask for help
G-3-1	Give opportunity to shine: Give highly visible tasks to newcomers not boring bugfixes or tech debt nobody will ever see.
G-3-2	Use the drive of newcomers to tackle new topics: Newcomers are ideal to embark on new topics and building up knowledge in spaces where the team before that might have had weaknesses
G-3-3	Be loud about success: Praise the newcomers success also in the wider team to show that they are a valuable part of the team
G-3-4	Keep failures in a smaller circle: Everybody fails, especially in a new environment it might take some time to shine. As a leader you should keep your teams failures within a limited circle of people and rather help them out than publicly announce their failures.
G-3-5	Set realistic but challenging goals and let them reach them: Success must be measured in some regard. One can be meeting a timeline and quality requirements.
H-3-1	Provide newcomers with some easy tasks: Succeeding in those tasks will raise their self-esteem. It will show the other team members that the newcomer is of measurable value to the team. Choose harder tasks if the newcomer succeeds.
H-3-2	Let others give feedback to the newcomers' work: Positive feedback will encourage the newcomer. Make sure that feedback will be valuable. Let the newcomer give feedback on himself and his work.
H-3-3	Get feedback from the newcomer: As the newcomer most probably has worked with other teams he can give valuable feedback on optimising the teams' work. The newcomer will feel good by honoring his experience. Other team members will profit from newcomer's experience as well.
H-3-4	Let team members prepare sessions on problem solving: If a team member believes he knows more about a specific problem he will feel himself more important for the team. Preparation of problem solving sessions by individuals will save time for the rest of the team. If the team members stays in in charge for a specific task he will stay motivated for a longer time.
H-3-5	Celebrate success: If the team has succeeded a task, celebrate. This will raise self-efficacy of all team-members. Working as a team means succeeding as a team. Each team member is allowed to hold the cup even the substitutes or newly joined members.

Table 3: Onboarding practices for proximal outcome "Self-Efficacy"

Proximal Outcome "Knowledge of Organizational Culture"

Practice	**Description**

A-4-1	Bootcamp: The company should invest in a well-designed bootcamp that teaches culture. New hires attend immediately. Bring in entertaining experts.
A-4-2	Internally and externally published values: Values are ideally at the heart of an organization culture. Publish them externally and internally. Bring them up repeatedly. If it feels artificial, maybe these are the wrong values!
A-4-3	Onboarding buddies: Onboarding buddies teach the daily nuts and bolts of organizational culture. The model them. They explain them. They talk about them.
A-4-4	Manager 1:1: Regular 1:1s is again a key tool for spreading organizational culture. Observe, in and out of the 1:1s. Coach. Ask questions, and encourage questions.
A-4-5	A culture of growth and feedback: A "Westrum Generative Culture" or a "Growth Mindset" have been researched (Westrum, Accelerate) to be key to high-performing organizations. This culture means that folks can coach skillfully, and that folks model learning well. The organization culture will come gradually and imperfectly. Modeling humility and learning can be key to long-term adoption of the organizational culture.
B-4-1	Meet with the product owner. Explain the goals of the product and how it meets the needs of the market. Encourage questions and suggestions to meet those needs.
B-4-2	Meet with QA. Understand how the software will be tested. Encourage discussion about quality and security expectations.
B-4-3	The rest of these are specific to our organization. I give a personalized version of my programmer productivity talk. This covers both personal and team productivity practices and offers an opportunity to both educate and discuss.
B-4-4	Many productivity practices might be difficult to practice or unclear. In addition, one of the biggest failures of management is not aligning the goals of the company with the goals of the individual contributors. So we explain the personal benefits of these practices (knowledge transfer, enabling time off, etc.).
B-4-5	Ask the new employee about their values and goal. This should have been done during the interview, but it's worth repeating. It gives you an opportunity to connect their needs with the needs of the company. This typically includes productivity, growth, balance, etc.
C-4-1	Needless to say trainings/workshops in the mission/vision/culture of the organization. This needs no further explanation.
C-4-2	Similar onboarding sessions for the context of the team within which the newcomer works. This time with more focus on the processes agreed upon by the team.
C-4-3	In my experience having an organizational-wide wiki really helps newcomers absorb information at their own pace, outside the structured training sessions.

C-4-4	1-1s, in the first few weeks/months offer opportunities, amongst other things, to also share knowledge about the culture of the workplace, clarify doubts about the culture/vision/mission if any.
C-4-5	Informal get-togethers like remote coffee sessions also help newcomers get a perception of how we as individuals feel the 'real' culture of an organization/team is vis-a-vis the culture the organization feels it has. Though it is risky that some conversations could spook a newcomer, in my experience this can be addressed if the newcomer asks to clarify these things. Overall I believe this helps newcomers.
D-4-1	Write a company handbook Writing a company's handbook helps explain its operation, following its values and culture. It's a source of truth that new hires can refer to when needed instead of deducing the culture through multiple mediums in an unclear manner. This book can serve as the fundamentals for everything else, and every time it updates, its changes are spread into the entire company and documented resources.
D-4-2	Document everything As stated before from another onboarding practice, everything must be explicit and documented to avoid redundancy and unclear instructions or expectations. The best way to document is to do it organically and as close to the context as possible (code, conversations, projects, etc.). Documentation will translate the company's culture directly inspired by the handbook and the defined values.
D-4-3	Organize all hands All hands are regular meetings where all employees are invited. They are a clever way to see how the company's culture expresses itself through the talks from leadership. New hires live a truly unique experience, and it's a direct way to see the dynamic between all the workforce. All hands must be recorded whenever possible to give the option to watch them later (especially for new hires that want to experiment past all hands).
D-4-4	Explicit company values during the first week of onboarding We can organize sessions between all new hires during the first week of onboarding to introduce and converse around company values. We can also try using real scenarios and let the new hires brainstorm to find a satisfactory outcome for each one while respecting the culture. This is also an exciting way to see how the culture will evolve depending on the new hires with fresh perspectives. Culture depends on its members; therefore, new employees will influence it in the long run.
D-4-5	Describe how the company's culture applies to real projects There are many ways to feel a culture through the prism of real projects: watching past recordings of meetings around projects, reading project documentation, and shadowing employees working on a project. Nothing beats the actual implementation of the company's values into everyday work. This also ensures the company keeps aligned with its values while executing plans because exposing projects as vehicles of the culture is an efficient way to stay accountable when everyone is using it as inspiration.

E-4-1	Mentoring: every newcomer gets a mentor to provide answers regarding organizational culture
E-4-2	Dedicated channels (in tools like Slack, Teams, etc) to broadcast organizational information help stay on top of organization culture
E-4-3	Intranet: should provide all the necessary information to get going with guidelines and contacts
E-4-4	Social talk before daily also gives the opportunity to chat about organizational culture (where the whole team is present)
E-4-5	Orientation session with a peer in the same team, in addition to the one with HR, to "translate" the expected culture into actual day-to-day doing
F-4-1	Explain our place in the organizational hierarchy up to the CEO
F-4-2	Explain the charter of our organization
F-4-3	Explain the mission of our team
F-4-4	Share practical lessons on how the organization communicates or shares information
F-4-5	Make sure that a newjoiner has invites to all organizational meetings
G-4-1	Vision onboarding: Have a meeting where its just about the vision and mission of the company.
G-4-2	Use vision/mission/values in discussions: A vision and mission well lived are always a guiding north star that can help to make decisions. Show that you live by your vision/mission/values also in team meetings to bring the culture into the newcomers mind. (i.e. if you want to use inclusive language, do it very explicitly when a newcomer onboards)
G-4-3	Well being check: See in regular 1on1s if the newcomer feels well and if not to see what makes them uncomfortable.
G-4-4	Live by your principles: For instance if you have no meeting days, don't put meetings on those days with the newcomer despite you might not obliging to the rule.
G-4-5	Regular team events to shape team culture: Team events are the best way to get to know your colleagues to let them share something personal, to see where their own values lie. Team culture is nothing you can bring top down on a company, its a living and growing thing that comes form all directions.
H-4-1	Provide newcomers with information about your company's projects: Even if this information isn't relevant for their job, they will get to know the company better. Other Projects, which may sound interesting to newcomers will be an extra boost for motivation.
H-4-2	Be transparent: If someone asks for information provide them with all the information you have and try to get even more. Secrets are a source for speculation and unnecessary thinking. Transparency will raise your own credibility.

H-4-3	Provide applicants with basic information about the organization: If someone wants to work for you he should know the basics about the organization. Maybe he thinks that things are different. Prevents a higher drop out rate.
H-4-4	Organize meetings with important people: Meeting the chef isn't always comfortable, but it could it be more often. An informal meeting with a manager will strengthen loyality. You cannot be loyal to a company or chef you don't know.
H-4-5	Enforce company events: Employees get to know each other during events througout departments. This helps employees to get a different view on their company. It may even bring them feedback to their work from other departments.

Table 4: Onboarding practices for proximal outcome "Knowledge of Organizational Culture"

Consolidated Onboarding Practices contributing to Proximal Outcomes

Proximal Outcome "Acceptance by Insiders"

Consolidated Practices	**Harmonized Description**
A-1-1, H-1-4	Spectrum Interviews: In hiring, the manager, PMs, and representative peers all interview the candidate. This encourages both the employees and the candidate to explore fit, and gives employees a feeling of participation, voice, and trust in the hiring process. Employeees have knowledge of skills of the candidate/newcomer before he or she enters the team an can make use of those skills earlier. The newcomer will be encouraged by the fact that his or her new team members wanted him to join. It's particularly valuable to have engineers interview the candidate without manager or PM on the call.

A-1-2, D-1-3, H-1-2	Onboarding buddy: Identify, appoint, and communicate a dedicated onboarding buddy. Ideally, the onboarding buddy will proactively reach out to the new hire prior to the first day and establish themselves as the new individual's go-to person. After the new hire joins, a buddy connects with the new hire every day for a week or two on video calls, giving social connections, cultural cues, and practical set-up tips for their coding environment. The buddy can often assign initial coding tasks and help the new hire to land their first branch, and even pair program. A successful onboarding buddy leads to a strong interpersonal connection in addition to the manager. It's important that the buddy be a different person from the person's manager so that the new hire feels comfortable asking any question, large or small.
A-1-3, E-1-1	Onboarding trip: An expensive but highly effective tool is to pay for each new hire to travel to visit one or more peers within the first few weeks. This can be done with the onboarding buddy, a small project group, or a well-timed offsite. Associating this with both ideating and landing code together can be particularly effective. This trip can be utilized to set things up and get going.
C-1-2, E-1-3, C-1-5, E-1-4	Virtual on-camera coffee breaks with the team: These events help bring the effect of the corridor/kitchen talks that we miss while working remotely. This also helps newcomers to be able to 'see' their new team members. The visual connect helps the newcomers feel at ease in a new setting. Similarly, this helps the wider set of team members, the insiders, connect with the newcomer. Having newcomers deliberately join these, however, trying to remember not to 'scare' the newcomer with sharing a deluge of negative sentiments, even though jokingly, during these sessions. These sessions, which are treated as working time, can be mandatory or opt-in for everyone who wants to participate. There is no agenda. It may take from 5 to 15 min and may occur once a week or even daily.
A-1-7, G-1-2, B-1-8, C-1-4	Land a PR first day/first week - give opportunity to shine: A good signal for everyone is for a new hire to land a PR on the first day or at least the first week (get the newcomers to commit to the code-base earlier than otherwise). The new hire gets confidence and satisfaction. With a distributed newcomer, insiders can start trusting the newcomer faster if they see their contributions/progress, albeit small, to the team goal. This is also a good signal for future contributions. Instead of giving low key tasks first, try to give the new hire a highly visible task. A highly visible task is not necessarily a complicated task that overwhelms them.

E-1-5, F-1-5, H-1-3	Start a virtual get together or team event: This will be a relaxed setting for getting to know each other better. Maybe the insider has the same interests as other team members. Always a good tool for raising the team spirit. This is usually organized by work and sponsored.
F-1-4, G-1-4	Actively ask if you as lead can help: This should be applied cautiously as it should not be perceived as micro management. But offering help opens a safe space to share weaknesses and enables collaboration. Alternatively set up dedicated time for QA for new hire.

Table 5: Consolidated onboarding practices contributing to proximal outcome "Acceptance by Insiders"

Proximal Outcome "Role Clarity"

Consolidated Practices	**Harmonized Description**
A-2-3, E-2-3	Documented Work Processes, Ceremonies, and Roles: Have docs, checklists, decks, and videos of your processes, ceremonies, and role definitions for new hires to help achieve the task expected of the given role. Ask for review and questions. Present key expectations live.
A-2-4, C-2-2	Onboarding Buddy: While documentation can be a powerful blunt tool for explicit role expectations, an onboarding buddy who is peer with the same role can talk new hires through the more subtle aspects of the role. Walking the new hire through the documented processes also helps. Modeling also shows values and role expectations alive in the organization. Furthermore, this helps new hire understand how the buddy contributes to the goals in his/her capacity. How the buddy works with other roles in the team to make his/her contribution more efficient.
A-2-6, C-2-3, D-2-5, G-2-5	Weekly/Frequent manager 1:1s: It's crucial to ensure new hires get critical feedback regularly to adjust their behaviours and tune their performance if needed. It's common to be misaligned in the first weeks or even months, so these rituals help to recenter their focus if they deviate too much from their role or the company goals. Thus, set up weekly manager 1:1s with good coaching, critical feedback and a chance for questions and answers. New hires will have questions about expectations, whether they are meeting them and in case there is a need of re-alignment. Give them a regular, open chance to explore.

C-2-1, D-2-3, E-2-1, H-2-3	Explicitly written role expectations: Write down the expectations of each role in the documentation and make them refer to it when something is not clear enough. It shall explain how each role is expected to contribute to the overall goal of the team and the organization. This helps the new hire not only understand her/his role but also those of other on the team. Onboarding a new hire is also an excellent opportunity to challenge the documentation if there are some less explicit parts. It's in general recommended to be as explicit and transparent as possible to reduce redundancy and overhead. Additionally these roles can be sent out as intro emails, stating what is expected of the new hire and what are the initial goals (these are usually refined each month).
D-2-1, F-2-1, G-2-3	Start with bug fixes or small tasks: It is the easiest way to ramp them up into a product and be exposed to various system parts. Bugs and small tasks are a way to expose the new hires to others than focusing on a single long project when you can be isolated and need deep focus. Exposing yourself will help you be discovered and trusted. People will also see the value you deliver tangibly, and that's when you start earning respect. Make sure initial tasks are very clear. In a grown environment tasks might get clarified a lot by context and are not always exhaustively defined within a ticket. The new hire should get a very clearly defined task.
D-2-2, F-2-3	Onboarding OKRs: Set clear expectations and connect the individual's work to the broader organizational mission, vision, and goals. New hires should recognize how their responsibilities fit into the company's overall success. When an individual joins the team, the hiring manager should share essential communications and presentations done by the organization's leadership on the direction and goals of the company so the new hire can put their work into the context of the whole. Having a clear set of responsibilities and outcomes can be critical to helping a new employee prioritize and sequence work and accomplish some quick wins that create a strong foundation and momentum for the individual's future success. OKRs align new hires with the company vision and make sure they understand objectives quickly.

Table 6: Consolidated onboarding practices contributing to proximal outcome "Role Clarity"

Proximal Outcome "Self-Efficacy"

Consolidated Practices	**Harmonized Description**

A-3-1, C-3-3, F-3-1, G-3-1, H-3-1	Concept of helping newcomers achieve early 'success' by helping them achieve their first commit, their first PRs review, their first retro facilitation. Show them that they have mastered the system setup, the landing toolbox, and the basics of the codebase. Give highly visible tasks to newcomers not boring bugfixes or tech debt nobody will ever see. Succeeding in those tasks will raise their self-esteem. Celebrate the success in the team channel! It will show the other team members that the newcomer is of measurable value to the team.
A-3-5, C-3-4	Provide feedback and coaching during 1-1s: Managers should let new hires know when they are doing well and when people are positive about them. Managers can even privately ask for this kind of input–including coaching–and then share what they've heard. 1-1s are a good forum to share constructive feedback and to offer explicitly opportunities to tackle tasks that offer chances of early success or recognition with the team. Even coaching can be helpful for self-efficacy: if someone is coached to improve in a way that builds them up, it can do wonders for their self-efficacy.
B-3-1, G-3-3	Publicly praise any improvements they make to the process. Acknowledge that newcomers bring experience and practices that can improve the team. Even when they don't, an outsider's eyes can illuminate practices that are cumbersome and non-optimal. Encourage this.
B-3-5, H-3-3	Get feedback from the newcomer: As the newcomer most probably has worked with other teams he can give valuable feedback on optimising the teams' work. The newcomer will feel good by honoring his experience. Other team members will profit from newcomer's experience as well.
D-3-3, F-3-3	Find a mentor and be inspired by others: Leaders need to lead by example to inspire new hires. Cross-pollination is a great way to spread influence and make others align with new techniques and approaches. Also, new hires can take the opportunity to find a mentor, and the company can help with that by putting in place an internal mentorship program.
E-3-5, F-3-5	Seek to learn through failures: Putting in place a blameless culture to create a safe space where new hires are welcome to experiment and fail if necessary. Failures are a crucial way to learn and they must be confident that leadership is open for them to try even if the outcome is not ensured. Retrospectives can be used to discuss problems very openly and to learn from mistakes. This behavior is usually picked up by new hires, as everybody gets a word in. Learning from other's mistakes is key to improve self-efficacy (not just one's own), also to see what other people struggle with.

Table 7: Consolidated onboarding practices contributing to proximal outcome "Self-Efficacy"

Proximal Outcome "Knowledge of Organizational Culture"

Consolidated Practices	Harmonized Description
A-4-1, C-4-1, G-4-1	Bootcamp/Training/Workshop: The company should invest in a well-designed bootcamp/training/workshop that teaches organizational culture, mission and vision. New hires attend immediately. Optionally, bring in entertaining experts.
A-4-4, C-4-4, G-4-3	Manager 1:1 Regular 1:1s is again a key tool for spreading organizational culture. Observe, in and out of the 1:1s. Coach. Ask questions, and encourage questions. Offer opportunities in the first few weeks/months, amongst other things, to also share knowledge about the culture of the workplace, clarify doubts about the culture/vision/mission if any. See in regular 1:1s if the newcomer feels well and if not to see what makes them uncomfortable.
C-4-3, E-4-3	Having an organizational-wide wiki really helps newcomers absorb information at their own pace, outside the structured training sessions. It should provide all the necessary information to get going with guidelines and contacts.
F-4-1, F-4-2, F-4-3	Explain the charter, the mission and the organizational hierarchy up to the CEO.
G-4-5, H-4-5	Regular team/company events to shape team/company culture: Team/company events are the best way to get to know your colleagues (also from other departments) to let them share something personal, to see where their own values lie. Team/Company culture is nothing you can bring top down on a company, its a living and growing thing that comes form all directions. Such events help employees to get a different view on their company. It may even bring them feedback to their work from other departments.

Table 8: Consolidated onboarding practices contributing to proximal outcome "Knowledge of Organizational Culture"