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Power, Space, and Algorithms: An Ethnographic Study of Intercultural IT Projects and Teams

Roman Glass

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THÈSE

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Pouvoir, Espace et Algorithmes: une étude ethnographique d'équipes projet interculturelles de systèmes d'information

Power, Space, and Algorithms: An Ethnographic Study of Intercultural IT Projects and Teams

Présentée par :

Roman GLASS

Direction de thèse :

Anne BARTEL-RADIC
PROFESSEURE DES UNIVERSITES, Université Grenoble Alpes

Directrice de thèse

Rapporteurs :

Sylvie CHEVRIER
PROFESSEURE DES UNIVERSITES, Université Gustave Eiffel
François-Xavier DE VAUJANY
PROFESSEUR DES UNIVERSITES, Université Paris 9 Dauphine

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Anne BARTEL-RADIC PROFESSEURE DES UNIVERSITES, Université Grenoble Alpes	Directrice de thèse
Sylvie CHEVRIER PROFESSEURE DES UNIVERSITES, Université Gustave Eiffel	Rapporteuse
Isabelle CORBETT-ETCHEVERS MAITRE DE CONFERENCES HDR, Université Grenoble Alpes	Présidente
Frédéric PRÉVOT PROFESSEUR, Kedge Business School	Examineur
François-Xavier DE VAUJANY PROFESSEUR DES UNIVERSITES, Université Paris 9 Dauphine	Rapporteur



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ABSTRACT

The focus of this dissertation is to explore cultural diversity within IT projects and teams within the critical management studies paradigm. The subject of this study is a multinational medical technology company that has changed its way of working in order to globalize projects and work more internationally, coupled with contemporary hybrid work arrangements.

This thesis addresses the question: How do the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes? Derived from this general question are three sub-questions: (1) How do power dynamics emerge and evolve in culturally diverse IT projects? (2) What role do organizational spaces play in the dynamics of culturally diverse IT projects? (3) How do algorithms developed in culturally diverse IT projects affect organizational outcomes?

Management research increasingly must integrate contextual elements, whether in international management or in IT projects. These contextual elements include underlying power structures, unique temporal and spatial arrangements, and algorithms. The motivation behind this study is to better understand the phenomena behind this power play and the role digital technology plays in it. The ethnographic study of behavior is necessary to interpret the workers' world, to grasp the nature and implications of this transition, and most importantly, to manage it effectively.

The research uses a case study approach, focusing on three IT projects as the primary unit within a multinational high-tech company. The three projects were implemented by teams from diverse cultural backgrounds. Ethnographic fieldwork was conducted to gather more in-depth, real-world data. The collected data was then analyzed using Grounded Theory, linking the findings directly to their actual practice in the company under study.

We observed that in the multinational company we studied, beneath the surface of progressive change, there were hidden power dynamics that often affirmed power over knowledge by alluding to the “real” or an objective truth, exacerbated by the challenges of understanding and developing new digital technology systems.

Power dynamics within IT management arise as a consequence of intricate organizational structures, especially in large organizations. Instrumental reason, technological narratives,

and algorithmic systems are pivotal in shaping these dynamics, often masking organizational diversity and reflecting conflicting power strategies.

The results of the study are threefold: (1) Power is a fundamental necessity of project work. Power strategies are expressed in time and space. They are cultural constructs that are reproduced by individuals. The diverse groups of individuals who create and maintain algorithmic systems constitute a special case with novel properties. The algorithm emerges as an intercultural subject rather than an object. (2) Virtual spaces, including task lists, software interfaces, and message channels, reveal the tension between different organizational goals and structures. The complexity of these spaces underscores the impact of algorithms and technology on decision-making processes and organizational communication. (3) Spaces within IT organizations serve as foundations for the emergence and operation of algorithmic systems. As these spaces evolve, they interact closely with the developmental stages of the algorithm, resulting in complexities arising from their active properties and coordination efforts. By attributing agency to algorithms as intercultural entities, they are perceived as capable of influencing and interacting with different organizational elements.

The study makes a theoretical contribution by showing how algorithms are directly influenced by the power dynamics of the organization, which emerge from the spatial and temporal dimensions of the organization. The culturally diverse background shapes a technical artifact that in turn influences the organization in very specific ways. Methodologically, the use of open algorithms and data to analyze the data contributes to digital social science and a better understanding of transparency and agency of the researcher. For managers, the contribution is to reorganize projects in a way that takes into account the emerging agency of algorithms. An algorithmic meta-level of discussion needs to be established.

Keywords: Algorithms, Critical management theory; Cultural Diversity; Ethnography; Intercultural Management; Power; Virtual Space.

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INTRODUCTION

“Wander, wander onward lightly, so that rightly flow the torrent, and with teeming waters yonder, in the bath discharge its current! See! he's running to the shore, and has now attained the pool. And with lightning speed once more comes here with his bucket full! Back he then repairs; See how swells the tide! How each pail he bears. Straightway is supplied!

Stop, for, lo! All the measure of thy treasure. Now is right!—Ah, I see it! woe, oh, woe! I forget the word of might.” — J. W. von Goethe, *The Sorcerer's Apprentice* (von Goethe, 1839)

We can think of technology in two ways: first, as a static tool, something passive, invented for the task at hand. If we ignore the complex work done with the help of simple tools, this may be true of most devices in use. But second, technology can be viewed as a complex system. Even more sophisticated digital technology, such as algorithms, may appear to be just a tool, but they act more like the spirits summoned by Schiller's *Sorcerer's Apprentice*—something that may seem simple in its parts. But once summoned, it takes on a life of its own. Forever ossified, the ghosts of its creators haunt the organization through morphed effects, allowing the algorithm to fully develop in the spatio-temporal domain. In its inhuman way, the algorithm is only a semblance of its human creation, triggering regulatory mechanisms and trying to deal with the emerging properties.

In the context of management innovations such as the agile project methodology and modern hybrid work arrangements, underlying power dynamics are becoming increasingly apparent. These dynamics often emphasize power through claims to objective truths and are exacerbated by the intricacies of digital technology. This study aims to dissect these power dynamics and the role of digital technology within them, leading us to the research question: *How do the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes?*

Three sub-questions of this study explore elements of the question in detail:

1. How do power dynamics emerge and evolve in culturally diverse IT projects?
2. What role do organizational spaces play in the dynamics of culturally diverse IT projects?

3. How do algorithms developed in culturally diverse IT projects affect organizational outcomes?

The following field notes shed some light on the conversations that take place in the day-to-day work of software development and how they are discussed with the people who run the business. A Czech territory manager discusses with three other analysts how the lead assignment should be structured. Not to get too deep into the details, but the topic is marketing funneling. The territory manager begins with his experience: “This is my experience for Slovenia; I do not know if this is true for larger regions.” An analyst replies: “I think we should make it for the regions. Besides, I think a lot of this applies to small countries. Different regions may have different criteria for assigning the lead. For example, a criterion might work for German-speaking countries, but not for different regions. Then you have to leave it out.” However, when it comes to the connection of the territory manager, it is clear that many processes of how business is done are reinterpreted, born differently from the imagination. For example, further in the conversation, the analyst assumes: “You always know exactly which territory is meant. There is always a territory manager.” Another analyst continues and says to document a clear example for each case: “If you could give an example, we have a clear structure. You do not need to define 100% at this point.” And the next analyst defines what would be the best case: “We always hire a territory manager as soon as possible. It is more professional. I think it is the same for all regions. Try to connect the primary person”. And an agreement among analysts: “So you always link a contact to a territory manager.” But the territory manager knows the business in detail: “No, you cannot. Sometimes in the hospital you do not know”.

Framing the topic—Navigating Through Cultural, Diversity, and Complexity Frameworks in Intercultural Management

The small excerpt from my field notes refers to the three initial theoretical framings. (1) Culture. That concept often needs to be explicitly mentioned. Conflicts arise and are interpreted differently, but to say that culture is the reason for these discrepancies or disputes is not really at the forefront. However, for the purposes of this dissertation, and in line with the literature on intercultural management, I would suggest that the interpretation of the “territory manager” is fundamentally a cultural issue. The view of headquarters, embodied by its business analysts, that every lead has a territory manager attached to it is not shared or

understood in the same way across cultural units, which is unclear to all individuals in the organization. (2) Diversity. We will introduce the various dimensions of diversity later. However, to ground the data and argue why diversity as a theoretical concept emerges from the data, the people in this conversation understand specific differences. They know that people come from different regions and have different roles, and they treat each other accordingly. In particular, one of the positive outcomes of diversity, informational diversity, is evident in the notes. Because the territory manager from the small region is involved, the information is picked up that a supposedly universal situation is more complicated in the intricate details. (3) Complexity. This is the last point and can be taken from the notes. The cultural differences in stating, interpreting, restating, and reinterpreting symbols with a particular meaning create a complex system. Where some aspects of the organization as a system can be seen as less complex, together through its intercultural interaction, small regions with the headquarters, complex new systems emerge that are different from the view of the headquarters, but also from the view of the subsidiaries. The interplay between technology and diversity can be seen as intertwined facets that influence an organization's approach to management. Especially in the context of today's rapidly globalizing world, diversity in all its forms—be it in terms of resources, competencies, or knowledge—has become of paramount importance in the realm of strategic management.

Therefore, diversity and technology can be placed in a broader perspective that is consistent with the principles of the resource-based view of management (Penrose 1959). This perspective emphasizes the importance of resource heterogeneity, which gives a firm uniqueness and contributes to its competitive advantage. In addition to this perspective, there are four other prominent theories of firm strategy (Prévot et al. 2010):

1. Resource-Based View (Penrose, 1959): This perspective highlights the role of resource heterogeneity, which bestows uniqueness upon the company and serves as the foundation of its competitive advantage.
2. Competences (Prahalad & Hamel, 1990): This theory emphasizes the pivotal role of elevated competence profiles within a company's strategy, similar to the Penrose view, to achieve and maintain a competitive edge.
3. Knowledge (Spender & Grant, 1996): Diversity is presumed to bestow an informational advantage, contributing to a company's strategic advantage through a broader range of knowledge resources.

4. Dynamic Capabilities (Nelson & Winter, 1982): The fusion of diverse and innovative organizational elements forms the basis of this theory, allowing a company to adapt and excel in dynamic environments.
5. Relations (Dyer & Singh, 1998): This theory pertains to the relational perspective, encompassing the broader embedding of diverse actors within a more intricate network. It gains an edge by fostering relations with a broader spectrum of networks, aligning with the Penrose view's emphasis on resource heterogeneity and the company's distinctiveness.

The unit of analysis in this study is the project. We take a minimalist definition of project management as being undertaken by people with limited resources over a period of time (Duncan & Project Management Institute, 1996). Project management is often seen as prescriptive and normative, in line with the positivist paradigm, but it can also be interpreted as descriptive, in line with the interpretivist paradigm (Packendorff, 1995). In this vein, the field of project management for information systems is in a way left behind, opening up for Grounded Theory to work through an empirical contribution, critical in paradigm, but ultimately an interpretation of empirical data.

But to emphasize the relevance of this research, let's review a common notion of why project management is important and why we need to improve it. A common report is that the Standish Group visualizes the failure of IT projects by showing that in 1995, there was a loss of \$81 billion in canceled IT projects for the American government and corporations, or that 31% ended in failure (Ewusi-Mensah, 1997). While these high failure rates can be attributed to a number of reasons, such as the inexperience of government employees with project management, they still illustrate the importance of finding ways to manage these mini-organizations within the organization. On the other hand, success and failure are themselves narrative devices open to interpretation (Fincham, 2002). Often in the projects it could be observed that in the final phase of the project a consensus was actively sought to define the project as a success. Then the notion of projects as small units within the organization (Packendorff, 1995) is useful for us here, as it shows the small open system within the organization with special parameters, e.g. certain selection of consulting firms with separate individuals who normally don't work in the organization.

The crisis of project management explored above, can be connected of a general internal crisis of management, which can also be linked to the emergence of intercultural

management. Because the cultural hegemony was starting to be questioned. Critical fields in the humanities and social sciences as Cultural Studies lead to a better understanding of which tendencies are not a naturally given, but something that has to be culturally challenged. This general tendency led also to the development of critical management studies. Even epistemologically it was the failure of positivism as an approach to solving major problems. The search for management innovations by looking further, has its origins in society's increased emphasis on individual performance and the need for employers to identify with the workplace, with the additional stress of incongruent roles, etc. (Cicmil & Hodgson, 2006; see Fournier & Grey, 2000 for an overview).

With the advent of digital technology, the inclusion of information systems in projects has redefined organizational boundaries and processes, seamlessly blending geographies and cultures in unprecedented ways. As technology fosters unprecedented connectivity and interdependence, the organizational landscape is changing, with cultural diversity coming to the fore. No longer confined to their localities, businesses now span continents and cultures, requiring a deeper understanding of the interplay between technology and diverse cultural contexts. This expanding horizon challenges existing norms and invites us to view management not only through the lens of technology, but also through the multifaceted prism of global cultures.

The integration of information technology has completely changed the economic system. Particularly in the area of information systems, workers can be sourced globally and assimilated into local contexts. This approach responds to the increasing market complexity and pressure on MNEs to operate in a global environment (Bartlett & Ghoshal, 1989), but these assembled groups often encounter conflicting characteristics inherent in individuals (Argote & McGrath, 1993), further increasing organizational complexity. In organizations where diverse roles serve as the foundational structure, they also manifest as sources of power (Crozier & Friedberg, 2014).

Thus, digital technology has enabled a different world of management. Globalization processes led to a confrontation of management theory with the Other. Concepts that were thought to be universal had to be understood as embedded in a cultural context. But even the ideas themselves turned out to have a specific context. In this way, management knowledge evolved as the global economy changed. Not only was knowledge under pressure from the

changes in an economic system that enabled international transactions through interconnected information systems, but so was society at large.

There are two competing attitudes toward diversity, one positive and the other negative (Milliken & Martins, 1996; van Knippenberg & Schippers, 2007; Williams & O'Reilly III, 1998). Perceptions of diversity lead people to distinguish between in-group and out-group members. A key aspect of this definition emphasizes how members perceive their own differences within the organization. An in-group is defined by the salient criteria that make up the group (Williams & O'Reilly III, 1998).

On the one hand, social psychology suggests that homogeneous groups perform better because of a pre-existing common understanding and attraction (Byrne, 1969; Cox, 1991), and negatively because of fault lines that form between different characteristics of the individual and the group (Lau & Murnighan, 1998). On the other hand, diversity can also lead to an informational advantage (Jehn et al., 1999; Williams & O'Reilly III, 1998) because a diverse group provides more context for making informed decisions. This occurs at all sociological levels, individual, organizational, and societal, with emergent properties resulting from the interaction between the different levels (Tajfel, 1982). Systems theory can justify this behavior by arguing that diverse groups together form a rich language, which in turn can describe rich processes (Weick, 1995). Diversity is an inherent antagonism when an organization is described as an open system (Katz & Kahn, 1978). While diversity pushes the system toward decentralization and specialization, its overarching strategic goals aim to strengthen central influence. In this way, centralization and standardization become a tool of the system to manage complexity (Argote & McGrath, 1993).

If we define diversity by the crucial element of salient criteria, we are already assuming a relationship between two individuals, a subject-subject relationships to turn around the properly iterate on the notion of subject-object relations. Saliency means, that an individual perceives differences in the other subject. The two recognize each other as subjects, and can interpret their actions. The element of perception is defined as a social phenomenon arising from human groups. When we look at salient divergences, we exclude object-object relationships, as opposed to subject-subject relationships. An open system would have these relationships, for example, in the market realities of technoscapes (Appadurai, 1996), where the network of object-object relationships has an impact on the lifeworld of humans. An example from this study would be the repair process of a medical device, where the health of

a person depends on the relationships between machines, e.g., sensors that check the sterility of a device to prevent infection.

In this thesis, I focus primarily on cultural diversity as an aspect that emerged from the work reality found (Sackmann & Phillips, 2004). In the research approach, culture is an entry point of the study, not something that is expected to emerge from the data. Otherwise, it might be overlooked and considered unimportant. For example, many conflicts seem to arise from other factors and are rarely identified as cultural and communicated as such. More often, other factors are taken into account. However, the moment the taboo of discussing culture is lifted, the situation can be explained.

In the realm of management, culture is multifaceted. From the positivist perspective, rooted in sociology and psychology, it is primarily a communication process: individuals encode and decode messages based on their unique worldviews (Hall, 1966). In contrast, the modern interpretive perspective, rooted in anthropology, defines culture as an evolving construct that is continually reshaped through interactions and negotiations among individuals rather than a static code (Clifford & Marcus, 1986; Habermas, 2011a). This dynamic interpretation emphasizes the adaptability of culture and the importance of ongoing individual engagement in its formation.

For example, we have a conflict over a legal issue that can only be analyzed from the perspective of a country-specific difference. But enriching the analysis with a cultural perspective can better explain the behavior by taking into account the cultural context of the law and how such contexts arise because of a specific established cultural system. To be more precise, the French law on the translation of all texts in information systems (“Toubon Law”) can be read precisely at this level: it is what it is, and it is the law. However, it can also be read culturally, that different historical situations and a specific concept of nationality lead to the decision of the government, which is democratic and therefore governed by the people, to introduce this law. This also has direct implications in a managerial context, such as how to contextualize this law. The German colleagues often treated it as an unnecessary curiosity, but the reactions of the French colleagues show that it is interpreted differently in France.

Let us turn back our focus on complexity as it is essential for our theoretical considerations. The concept provides explanations for emergent behaviors that might otherwise remain unexplained. Complex systems have emergent properties, things that are unexpected, and precede our notions of them. For example, an IT organization's algorithms are not just a

technical, banal translation of concepts that are then implemented by business consultants. When criticizing the perceived value neutrality of technology, it is not enough to assign a negative or positive value to it. One must understand how algorithms change the system, with complexity being a crucial technological property. There will always be emergent properties that are only understood after the technology has been implemented, its environmental context (Bush, 2009). In society, this can be seen with the technology of touch displays for smartphones, which led to greater accessibility for groups before they were neglected by information technology and provided equal access to this technology. While women and the elderly were actively excluded from technology, small personal devices were able to remove this exclusion (Rasmussen & Håpnes, 1991). This in turn gives rise to an always-on mentality of social networks that create methods to organize society more equally (Baer, 2018; Bennett et al., 2016; Mendes et al., 2019). There are numerous examples in society of these emergent properties of complex systems: radio systems for resistance (Weitz, 1995), washing machines for feminism because of the time freed up (due to fixed gender roles) (Berg & Lie, 1995), penicillin for parent-child bonding because of reduced infant mortality.

It is quite clear that the use of smartphones and social media can also have negative effects (Dumas & Stough, 2022; Elsayed, 2021). An example can be given here for the observed data of this case study. Not only do unexpected behaviors emerge, but a property can also develop a paradoxical tension. For example, an algorithm implemented to create transparency in the workplace can be perceived as a tool for surveillance. This does not make one or the other exclusive, because an organization may be complex enough to include subsystems that use the algorithm differently. Nevertheless, the antagonism created by the organization must be made explicit through complexity and systems theory in order to reflect and observe these consequences.

Research Design

The study is explicitly situated within the critical paradigm. The school of Critical Management Studies provides a critical perspective that looks at things that seem natural and transforms them into objects to be criticized (Alvesson & Willmott, 2012; G. Jack et al., 2011; Mahadevan, 2020; Romani et al., 2018).

The critical paradigm is an approach to research such as positivist, interpretive, and postmodern, among others (Romani et al., 2018). From the paradigmatic stance, our research

intention can be stated to advance the democratization of the workplace, building on Alvesson and Willmott's (1992) call for the organization to be more embedded in a democratic society. In the critical paradigm of case studies and intercultural management, power is examined in its strategies as employed by individuals.

Especially when power is assumed to be absent, the critical perspective reinforces the assumption that there can never be a lack of power, its absence can only be explained by its transformation (Primesz et al., 2016). Power can then be possessed by digital technology, the meaning of which must be understood in its context (Mahadevan & Mayer, 2012).

A critical discourse questions the basic assumption that things are just the way they are. For example, in the broader strategic orientation of digitization, an agile flat structure has been propagated, which is found upon closer examination of the empirical data. Due to a matrix organization, a hierarchical line structure is behind the flat project structure. But not only that, even the projects themselves have implicit hierarchies, which become visible by analyzing the power strategies of the actors. As it becomes clear in the critical and epistemological analysis, we assume that things are not grounded in objective reality and go beyond the subject-object dichotomy to explore more deeply the relationship between how things are constructed. Their existence can only be explained in terms of their dialectical development. Each object in the discourse during the study changed its properties along the paradoxical tensions created by the development of the projects (Giddens, 2000). This means that the power of an actor in the system is not fixed but dynamically reallocated. For example, a project manager may seem to be managing the project perfectly, but then be blocked by the software architect. This in turn changes the whole object of the implemented algorithms. Our epistemological and ontological assumptions are that nothing is what it is, but that everything is in flux, even the subject-object relationship itself, since objects such as the algorithm can be perceived as a subject in development. It then acts upon the subjects instead of being acted upon by them. This research stance is considered post-reflexive because it transcends the reflexive turn of the subject-object relationship by focusing on the object of interest (O'Doherty & Neyland, 2019). Another important consideration for the research design is that post-reflexive thinking means including the questions posed by the researcher herself as an object of reflection (Strathern, 2005). Since the research question of this dissertation is *how the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes*, we need to ask why this question is being asked in the first place. We ask this question because we are situated in management studies and affected by

the crisis. Algorithms and the organizational outcomes are novel elements that need to be explored in order to find solutions for the dynamic environment under study. But when taking a critical approach from the crisis as a motivational criterium, then we should be critical of being critical, and also able to formulate positive outcomes of algorithms and culture.

I was involved in the three IT projects studied in this research. The data was collected ethnographically because interviewees would be receptive to constructing things and would not be able to see how things are acted out to understand the micro-politics of management (Forester, 1992). The perspective was auto-ethnographic in describing my own experiences, but also ethnographic in describing others. This position of myself in the projects is used to derive a long-term view of the object of study (Lüders, 2017). My embeddedness in the project functions to reveal the otherwise hidden everyday of technological work, to extract and create the meaning of technological work (Mahadevan, 2020). For algorithms in particular, ethnography allows us to understand the underlying reasons for their creation (Kitchin, 2017).

The three cases were recorded alongside the daily work at the time. The case study is not a method in itself, but only the general approach to the topic (Hillmann & Hartfiel, 2007; Lamnek & Krell, 2016). The basic unit is the projects: (1) Project Momentum, a smaller project that contrasts with the following ones, from April 2019 to July 2019, (2) Virtuoso.2 (August 2019 to June 2020), (3) Virtuoso.3 (March 2020 to July 2021). The full timeframe of the empirical study is from April 2019 to July 2021. The ethnographic study included twenty-nine core actors. The three projects provided the data to determine how exactly the project work was done.

The data were then analyzed using Grounded Theory (GT) for theory generation. This method was chosen to ensure that the emerging theory to answer the research question is grounded in the emerging data. It resists two primary streams of research: on the one hand, testing theories taken from the literature and then using ethnographic data to "prove" the correctness of the theory. On the other hand, the data should not only be used to construct a narrative around the research question of how the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes. Rather, Grounded Theory generates a theory, an understanding, and an explanation of the data while it is recursively verified. In this way, it is a hermeneutic method in that as the understanding of the text grows, so do the ethnographic data, i.e., field notes and memos. More questions are generated, which in turn

lead to a different analysis of the data. Thus, the codes are not initially fixed, but emerge, then are changed by newly emerging codes. Then the codes may be refined or merged with the researcher's growing understanding. The basis of this understanding is the theoretical data based on the actions of the actors in the observed system.

Research Findings

Three questions were asked, by splitting the dynamic tendencies into core analytical object: (1) How do power dynamics emerge and evolve in culturally diverse IT projects? (2) What role do organizational spaces play in the dynamics of culturally diverse IT projects? (3) How do algorithms developed in culturally diverse IT projects affect organizational outcomes?

Congruently, three major findings emerged from the data, related to the role of (1) power in chapter 4, (2) space in chapter 5, (3) and algorithms in chapter 6. Underneath them, several codes form each theory. Nevertheless, those three theories are not closed and independent but build each other on top of each other.

First, power is the contradiction between a dominant discourse of openness, creativity, and non-hierarchical behavior and the tendencies to consolidate power, regulate behavior, and suppress deviance. The formulation of power strategies as a key theme is related to the use of a critical perspective in our research (Alvesson & Willmott, 2012; G. Jack et al., 2011; Mahadevan, 2020; Romani et al., 2018). This perspective, with its focus on equal power structures, encompasses in MNCs the conflict between different features of the firm (Benson, 1977) and between individuals in teams (P. S. Adler et al., 2007). At the same time, power is not accepted as a static concept, but through a cultural lens, it is a contested, ever-changing concept (Primesz et al., 2016). In general, we can observe a dichotomy of power as something positive that produces negative judgments (Foucault, 2020).

After analyzing the data, we were able to see how the use of instrumental reason, i.e., limiting one's motivation by focusing on achieving a goal, can be observed using the theory of communicative action. Instead of an open, communicative discourse characterized by trust, various overarching power strategies are used to achieve strategic goals (Habermas, 1984, 2011a).

To interpret the codes, pairs were created to show the tension in the projects between different behaviors. For creativity, diversity was an opposing concept, because whenever

workers came up with creative solutions, the resulting diversity was seen as unfavorable. In the manager's view, as diversity increased, so did complexity. Likewise, diversity was paired with consensus, because at the end of any divergence, consensus had to be built. This process was complicated in the projects because of the different organizational structures. Ultimately, the need for consensus to finally decide on a solution revealed underlying power structures. We could see organizational power, where decisions were made according to their knowledge, and technological power, where decisions were blocked because it was not considered technologically appropriate. Restrictions characterized the consensus itself. Especially when creative spaces were created, they were restricted to allow total concentration. A distinction was made between restrictive behavior and permission, marking what was allowed. Within this framework of power, we can then see how power strategies are employed and what underlying desires need to be satisfied.

Second, the compositions of organizational spaces establish power strategies. Especially with the impact of the sanitary crisis, the emergence of COVID-19 as a hyper-object changed the spatial ground rules. Suddenly, virtual spaces became more important because this was the only way to perform the work. The sudden change in materiality opened up the possibility of equalizing space, making it easier for people to communicate their ideas (Fulk & Collins-Jarvis, 2001) or make communication more intimate (Walter, 1995, 1997). The effects of this change and regression are still being felt, and even more so for the inequalities of this future regarding white and blue collar workers. These inequalities are particularly felt across the spatio-temporal continuum, as the gig economy opens up the standardized eight-hour week into smaller tasks (Barth, 2022), allowing for new forms of multimodal, dialogic communication (Baralou & Tsoukas, 2015), but even then, the growing autonomy seems to swing back to finer-grained, digitally enabled control (de Vaujany et al., 2021).

Basically, the study makes the theory of space-time more precise by distinguishing between space that can be seen as something conceived, i.e., creative spaces, how the participants imagine them, and how they experience them. This is related to the concept of Third Space in the literature. Third Spaces are fundamentally liminal (Bhabha, 1994; V. W. Turner, 1969). Liminality always includes time and space, not unlike a ritual marked by a transition from one state to another, but also by the manipulation of space (V. W. Turner, 1982). Virtual spaces, in their liminality, i.e. in-betweenness and condensation, are essential for doing business. A space created by the tension between real and imagined space produces a new conceptualization of space that is neither real nor imagined, but distinguished by being both

simultaneously (Soja, 1996). For example, the physicality of the virtual meeting with its network connection, user interface, etc., and the imagination of how such a meeting should look like, and then finally the third space where the behavior of individuals is characterized by trying to cope with the difference between their imagination of the space and how it is. It is then seen that this spatial awareness is driven by the individual's desires and the power strategies that result from trying to satisfy these desires, a mediator of the subjects' intentions (Jones et al., 2004). Space emerges as something that is not neutral and as a critical device to explain the project work. In the subject-object inversion of post-reflexivity (O'Doherty & Neyland, 2019), space can be conceptualized as something that loses its object position and must be perceived as a subject itself, the virtuality that acts on the workers with an appropriate agency. This agency can be seen as repressed because it is more structured like a language that surrounds it as something specifically social (MacWhinney, 1998).

In our research, we aim to challenge the taken-for-granted aspects of our lifeworld phenomena. Building on the critical paradigm literature, we seek to uncover the underlying motivations behind actors' actions rather than simply accepting them at face value (Alvesson & Willmott, 1992; Kemmis, 2008; Steffy & Grimes, 1992). This uncovering takes place not only for space, but also for culture, not as a static concept of countries that can be categorized into dimensions, but as a place of contested meaning (Boussebaa & Morgan, 2014; Romani et al., 2014; Sorrells, 2013). In this context, the concept of the lifeworld as the horizon of the individual (Habermas, 2011a) is essential because it excludes a totalized notion of culture that is consistently given globally. However, something that is locally negotiated (Adorno, 2004).

Third, algorithms are not just technical artifacts, i.e., objects, but subjects themselves. The algorithm does not just change the organization, it is a subject with a power strategy. This strategy is shaped by the organization and the actors themselves, but what emerges as a complex system is more than what was intended and affects the organization. For this reason, the algorithm is not just seen as a technical artifact, but produces an algorithmic system (Seaver, 2013). Algorithms form part of the organization is unconscious, organizing meaning behind the scenes (Thrift, 2005). For example, there is an observed societal tendency for the algorithm to represent something that is out of the hands of individuals in power and is used to exercise power over individuals (Pasquale, 2015). The algorithm becomes an “object-in-use” (Vaast & Levina, 2005), part of the symbolic order of the organization as a sense-

making organism. Culture, in particular, may relate to algorithms in such a way that it makes sense to speak of “algorithmic culture” because of its strong dependence (Striphas, 2015).

The actors have different nationalities, which is used to describe the data as a marker for the intercultural background of the algorithm. However, it is not only the individual characteristics that influence the algorithm, but also how different world regions influence each other on a societal and organizational level. On an organizational level, the relationship between headquarters, subsidiaries, and suppliers is structured. This can also be seen as a spatial characteristic.

Then there are the temporal characteristics, i.e. how the developmental stages of the algorithm affect the algorithm and thus the surrounding organization. The genesis of an algorithmic system can be divided into several stages: design, build, and manage. While the design phase is the densest, where many decisions are made, we can see our previously established concepts at play here. Power strategies are used to shape the algorithm, e.g. by restricting its defined behavior. In addition, space actively influences the creation of the algorithm by what is covered by the algorithm, i.e. the processes of the headquarters or defined subsidiaries, but also by who sets the goals of the algorithmic system. Then, in the build phase, it is found that the specification is not just mechanically implemented by neutral engineers, but that their cultural background, as well as their ability to communicate with the business analysts, is crucial to the creation of the algorithm. The next and final stage of the algorithm, its management, is equally crucial, as it shows the dynamic nature of the algorithm, as a well-defined institution changes its underlying code, the organization's change process.

After summarizing the chapters of the dissertation, the following section will delve into the literature review, which presents the basic a priori concepts that need to be understood before going deeper into the data and letting the theory emerge from there, while simultaneously attempting to establish a conversation with the relevant literature.

PART I: FOUNDATIONAL INSIGHTS: LITERATURE REVIEW, METHODOLOGICAL APPROACH, AND IN-DEPTH CASE EXPLORATION

1. LITERATURE REVIEW

The research question for this study is: **How do the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes?**

As this thesis has an inductive research design, the following key concepts are derived from the initial qualitative codes. The literature connects to the research findings. In the first place, the data was collected and then coded with minimal preconceptions, namely in the management and cultural studies field. Then to address this question, three key concepts were identified as theoretical lenses: complexity, culture, and diversity.

1. Culture: Culture is seen as a source of complexity in technology organizations, as many cultures often present under a joint project goal, creating both intercultural synergy and conflict.
2. Diversity: Intercultural diversity is also seen as one aspect of intercultural complexity, especially in the literature. We will explore how intercultural complexity can help or hinder project work in technology organizations.
3. Complexity: We see complexity as a management problem, and we will use the concept of complexity as a theoretical lens to understand how it is managed in technology organizations. We will also use system theory to understand complexity within the context of technology organizations.

To better understand these three key concepts, we will review the literature on complexity, culture, and diversity in the context of technology organizations. Overall, this literature review will provide an overview of the existing research on intercultural complexity in technology organizations and will help to provide context and background for our study.

1.1 Culture

Research in management has taken different approaches with Adler (1983) describing a typology of management research when studying culture:

- Parochial, a culture-free approach, where culture does not play a role.
- Ethnocentric cultural differences are just a matter of translation. If there are differences when we can adjust an approach to fit the culture. Assumes a common core.
- Polycentric studies cultures without this assumed core but looking for the differences.
- Comparative research assumes both translated common concepts, but also what is not translatable.

From these approaches, it is paradigmatic that we choose a comparative approach, with some concepts being, specifically, emerging concepts that different cultures have in common and are like established relationships between cultures, concepts that make intercultural action possible.

Culture in the context of management can be defined on the basis of which scientific paradigm takes precedence in developing the theory. The paradigm underlies those scientific fields. Cross-cultural management often functions as a super-structure of a scientific field. First and foremost, the positivist school of thought that still dominates the research takes its inspiration from sociology and psychology (Dunning, 1989; G. A. Jack et al., 2008). Here, culture can be understood as a form of communication, as posited by Hall (1966). In this process, a sender formulates a message based on their personal experiences and worldview. A receiver interprets this message through the lens of their own experiences and worldview. The success of this communication—whether both parties understand each other—depends on the compatibility of their respective worldviews. Then, culture can be seen as the systematic process through which messages are formulated and interpreted. Indeed, Hofstede's (2001) cultural dimensions are the bedrock of cross-cultural management (Chapman, 1996), only to be commonly criticized for failing to explain change in culture through this static model, and being too reductionist by using quantitative dimensions.

But one can define culture based on a different, interpretive school of thought, which is located in, and developed from anthropology (Chapman, 1996; Kuper, 2000). This view is more modern in that the view that culture is something as static as a code, doesn't possess the explanatory power of change and difference. Culture then is not taken as something given but as a concept in constant need of renegotiation by the involved persons (Clifford & Marcus, 1986). Culture is then established through the communication and interaction between individuals (Habermas, 2011a). This study will take into account the later version, as it can explain more phenomena.

We choose an intercultural perspective in our research as this reflects the work reality found (Sackmann & Phillips, 2004). Regional perspectives were taken by subjects not necessarily from this cultural background. We are being intercultural by merging cultural codes and re-interpreting them according to the new context. We have put culture at the forefront of our analysis to understand the social and organizational character of the complexity.

The linkage between culture and behavior is not direct (Boyacigiller et al., 2004). It is always mediated in a way that culture emerges in the data as "cultural reproduction which connects newly arising situations to existing conditions in the semantic dimension" (Kemmis, 2008: 130). Culture is discursive, not arising from nothing, but actively negotiated by actors (Clifford & Marcus, 1986).

Even though in the general discourse of the organization, what arose from the data was that culture is not a topic in the foreground. Differences are seen mainly based on the country or regional exception but are rationalized to a certain extent. However, especially from the information systems perspective, differences are leading to inefficiencies that need to be standardized as part of a global transformation, where the consulting partner was referring to efficiency gains when globalizing.

Often culture is assumed to be an independent variable as in foundational texts of intercultural management (e.g., Harbison & Myers, 1959; Kerr et al., 1960), rationalizing the different organizations with different cultural stages. Where a difference in culture is explained by a cultural readiness as part of an industrialization process, reflecting in some way the foreign policy work of the United States at that time (Rhodes & Westwood, 2007), seeing the United States as the most industrialized country, with a universal development model to be followed, or imitated. This aligns with the culture-free thesis (Hickson & McMillan, 1981), which assumes culture to be an expression of a substructure. As

strange/antiquated as this sounds to transfer a developmental model to culture, this kind of understanding emerged equally in the data. However, culture, as a meaningful concept for individuals, is expressed as technology.

From the business perspective, there is more understanding of the cultural difference in the concept of different business processes, regulations, or market requirements. This corresponds to the literature on being culture-bound (Hofstede, 2001; D'Iribarne, 1989; Sorge & Warner, 1986). In the culture-bound thesis, organizations are not assumed to be the same even in the same industry, as the contingency researchers assumed, but have differences and commonalities even when existing in an industrial society. The differences can be explained broadly socio-historically, but concrete patterns or rules cannot be interfered with (Sorge & Warner, 1986).

Boyacigiller *et al.* (2004) identify three streams in cross-cultural management: (1) cross-national comparison, (2) Intercultural interaction focus, (3) multiple cultures perspective, those mapping towards the identification of research on what culture is, as a construct bound to a nation, as something emerging through contact, and as something coexisting. As we could not see in our data, single national cultures arose that could be looked at singularly, or multiple cultures could be observed on its terms, that of intercultural interaction, as the only way to define what culture is and what culture does.

This view can be enhanced by newer typologies defined by Romani *et al.* (2018), with four research paradigms that complement the former views. We utilize a layered approach, superimposing each paradigm, to deepen our foundational comprehension:

1. Culture behaves according to strict laws, naturally given. (Positivist)
2. In human interactions, experience is always already filtered and part of subjective experience. (Interpretive)
3. This meaning is not passive, comparable to reading a book, but actively constructed through narratives or discourse. (Postmodern)
4. Not every individual has the power to construct the discourse and assign its networks of meaning, but specific individuals employ power strategies to bend the intersubjective perception of reality to achieve specific goals. (Critical)

In the social sciences and the branch of qualitative studies, we can make the main differentiation by their claims, (1) the positivist tradition, which focuses on explaining culture, and the interpretivist tradition of understanding culture (Boyacigiller et al., 2004). This can be identified as a reference to Dilthey's (1990) explanation of how the natural sciences operate differently from the social sciences. While we explain the former, we understand the latter. This insight is possible because we recognize ourselves in the other and can relate. When positivists claim laws in the social sciences, they assume an object-like relationship between individuals. But between us understanding a rock, is different from understanding my colleague. In the natural sciences it is wrong to assume a reason of why something is that way. In the social sciences, we should ask for the meaning.

Going back to the theoretical development, an early start of our conversation with the literature can be seen in Mead's social behaviorism (Mead & Mead, 1985), focusing on communicative action, which we classify as a precursor to Habermas' communicative action. Those actions are central to what constitutes culture and, through this, the individual. Hall (1990) then stresses the importance of non-verbal communication, decentering culture from language, with non-verbal communication expressing underlying cultural values.

Habermas (2011) approaches culture through the communication and interaction of individuals. These are always in the process of cultural reproduction. They use and simultaneously reproduce culture (Habermas, 2011a). This theoretical framework of communicative action distinguishes communication's teleological and communicative aspects. Communication, as well as culture, are not always used in the same way. The teleological aspect implies the motivation by the realization of one's goals, while the communicative aspect aims at forming a consensus (Habermas, 2011a). Both concepts go hand in hand: culture is part of a given context accepted by the individual and is actively used for interaction and goal achievement. The critical theory approach chosen here sees culture not just as a system to be interpreted but also as a system that is formed and (mis-)used by individuals and society.

Cultural differences exist in a complex interplay between different cultures on different levels. One of those intercultural encounters is in its organizational structure. The encounter of Japanese culture with its differences compared to the West, with classical works of Foreign Investment Literature, is at the forefront of intercultural management (Shenkar, 2001). From here, the intercultural developed its importance for management. First and

foremost, unifying on a national level, in (N. J. Adler, 1983), an early polycentric view, carefully sorting out the differences between the two cultures, by Japan also being one of the first non-Western cultures that were respected on equal footing (Holden, 2002; Magaziner & Patinkin, 1990; D. C. Thomas & Peterson, 2016). While Hampden-Turner and Trompenaars (1993) stress the similarities between Germany and Japan, the latter is also the only non-Western country included in the book's title, "The seven cultures of Capitalism: Value Systems for creating wealth in the United States, Japan, Germany, France, Britain, Sweden, and the Netherlands." Stressing the similarities between both cultures was also done by Viney (1997), extending one element, the similarity of high-trust cultures, which both take comfort in sustaining a network, being long-term and deep relationships built on mutual trust. This element appeared in the data, where one top manager was saying that this is the difference between American-German and Japanese-German business relationships, that even in times of trouble, the Japanese manager would rather stand by their German counterparts than break up the relationship to search for another manager. Synergies in intercultural communication can be found through various complementary approaches. For example, Barmeyer *et al.* (2019) report empirical data about synergies between German and French employees. The diversity of the teams allows for greater flexibility because of a broader range of capabilities. For example, projects that must be very reactive are managed in French and very complex in German. Even though intercultural conflicts do occur, their outcome is seen as creative. This is exemplified by a project where aggressive attacks and difficult discussions lead to a project that wins a prize in creativity.

However, even though culture is often simplified on a national level, the case study of a Japanese-German joint venture (Brannen & Salk, 2000) shows that this interaction cannot simply be reduced to this level. Furthermore, there are other levels to be considered, for example, the Indian-German interaction between the headquarters and the supplier. As well as the interaction between workers is not a monocultural block of Germans but has to be seen in a heterogeneous society (Bjerregaard *et al.*, 2009). One of the main goals of this work is to sufficiently describe the intercultural processes because only such a text can express the dynamism and deep contextualization of culture (Søderberg & Holden, 2002).

Culture and nationality are separate concepts here but can arise from each organizational unit, may it be expressed explicitly through subsidiaries/teams or more implicitly as parts of teams that group through, for example, technical know-how (of a particular system), or networks of friends cutting through the organization's official structure. All of those groupings can

develop a distinct micro-cultural, interacting in the broader organizational context, but bound to insider moves, e.g., a special kind of vocabulary, a certain kind of way of speaking, preparing presentations, how to organize themselves, and even working hours. These uncommon groups make the company more diverse, contributing with all of their different viewpoints to a multifaceted view of reality, in the best case contributing positively through cultural synergy to the company's success (N. J. Adler, 1980; Barmeyer, 2012; Stein, 2010).

In general, engineering culture can be seen as an own sub-group with a specific terminology, and values as a group, mutual recognition (Chevrier, 1996, 2002). However, the diversity cannot be reduced to the profession, but has to be seen embedded in a cultural context, as the individual draws its characteristics from their own culture (Chevrier, 2002).

The positive impact of cultures interacting with each other is well documented in the literature (e.g., Barmeyer et al., 2019), where French and German employees cater to the strength of each sub-group, using French teams for fast-paced, reactive projects and Germans for ones with a high level of complexity. Even if cultural conflicts occur, their outcome, if resolved, can contribute positively to the project. In the case of the French-German team that resolved a conflict with aggressive attacks and challenging discussions, the project ultimately won a prize in creativity.

1.2 Diversity

Drawing from diversity research in psychology, the lack of handling only intercultural communication becomes obvious. While communication arises via communicative actions, messages sent between sender and receiver, parts of intercultural stay in the self. Mead (1985), as a pioneer in the field of cultural studies, and by extending intercultural management, sees the self as something constructed through social processes. In symbolic interactionism (Blumer, 1986; Mead, 1985), culture emerges as a system through an interchange of signs. The self or the individual remains. This cultural locus then explains our differences, even when located in the same culture.

Corporate strategy can deliberately include diversity (Ely & Thomas, 2001). In MNEs, the integration of diversity has the goal of organizational flexibility and the capacity to change and face global complexity (Bartlett & Ghoshal, 1989). This interplay between the organization and its environment is vital in the positivist paradigm of transnationalization. In

line with the goals of the critical paradigm, the focus on diversity should equally encompass that of the actor. It focuses on the individual performing different tasks within different roles (Argote & McGrath, 1993). This shifts the stage of enacting a company's transnationalization towards actors and their praxis, representing the tasks requiring ethnographic research and micro-level orientation (Geppert & Mayer, 2006).

Two major academic categorizations to research diversity are the cognitive dimension through social psychology and intergroup relations, where the research is deeply sociological. However, to understand diversity, the dichotomy of the individual understanding of diversity and the group's emergent properties has to be seen holistically because one cannot understand without the other (Tajfel, 1982). How the world is seen through the eyes of the individual is the base level, from where the group, as a complex system, can emerge.

Therefore, let us first look at the socio-psychological terms of how diversity can be defined: as the variance of the salient in-group-building characteristics (Williams & O'Reilly III, 1998). This means that individuals have salient characteristics, i.e., they can be used to influence the behavior of other individuals (Oakes, 1987).

In general, diversity can concern any attribute of the individual, if the difference on this attribute is perceived. At the same time, there are particularly visible and, to some extent, apparent criteria, e.g., age, gender, ethnicity, individual background, what kind of education was received, or which career paths were crossed (van Knippenberg & Schippers, 2007).

In general, these salient categories can be anything that can be perceived. However, we would refine this to the "values, beliefs, and cultural styles" of individuals to better reflect cultural studies' research perspective and cultural diversity. In organization studies, these terms are essential because they contribute to "conflicting viewpoints among members and groups regarding goals, strategies, and plans of action" (Argote & McGrath, 1993: 336).

The others perceive these attributes of an individual and then act upon them. Whether these characteristics are attractive in a group depends on the individual's attraction toward the salient criteria. The phenomenon is called homophily bias, which means that likeliness attracts. Byrne (1969) laid the foundation for research by formulating an "attraction paradigm," theoretically grounding the folk wisdom of the similarity attracts. The research was done in a positivist manner, boiling attraction down to being a linear function of the number of rewards and the number of punishments received towards the object of attraction. Therefore, people's attraction towards another subject is measured after measuring attitudes

towards an object, be it values, e.g., religious values. Moreover, this is a way to discover that subjects are attracted to each other whenever they relate similarly to an object. However, attraction toward likeness is mediated by the surrounding context. McPherson and Smith-Lovin (1987) show that the surrounding context profoundly influences diversity. The more the surrounding organization is diverse, the more dyadic relations are diverse.

Diversity can be further categorized according to observable and non-observable (Milliken & Martins, 1996). For example, a not directly observable attribute is a cognitive disability, e.g., an anxiety disorder, in a group, especially if the individual is newly entering a group. This attribute is not as readily available as salient characteristics like gender or race. Further diversity can be clustered into its consequences, be they short or long-term. In the shorter term, they can be affective, cognitive, symbolic, and communication-related. In the longer term, they can be on different levels, individual, group, and organization (Milliken & Martins, 1996). Therefore, diversity can affect the mood (affective), the intellectual work performance (cognitive), how the organization is perceived (symbolic), and how the organization can represent itself in the outside world (communication).

Harrison and Klein (2007) differentiate in another way between three types of diversity: separation, variety, and disparity. While the individual's integration into society categorizes separation and disparity, variety is the fitting theoretical framework matching the data most directly, putting diversity into a positive perspective because of its focus on a variety of expertise and an informational advantage because of this broad spectrum of perspectives. Separation fits our observations of social psychology's concept of diversity of social categorization, defining an in-group by attraction and attrition. The disparity is relevant because it looks at status and social hierarchy. Diversity and power will be discussed in detail, and diversity in different roles will become relevant. Mainly because we adopt a critical perspective on cultural diversity within organizations, looking at how diverse organizations work and how they influence in-group and inter-group power structures.

Diversity can positively and negatively affect work. Three influential reviews trace the development of diversity research (Guillaume et al., 2017; van Knippenberg & Schippers, 2007; Williams & O'Reilly III, 1998). Williams and O'Reilly III's (1998) review summarizes the following points. In diversity research, one can identify two significant streams corresponding to their methodology. While lab conditions favor diversity, fieldwork disfavors the concept. In the fieldwork, one can develop the concept that diversity is positive

when viewed organizations are diverse on a functional level. What can be observed is a us vs. them perspective, which shows the positive effect on team performance through social cohesion. Members perceived as in-group are then more to be trusted, and collaboration is eased. Whether the in-/outgroup is formed through attraction or shared attitudes and values is unimportant.

On the other hand, diversity is seen as something positive where divergence and innovative thought are needed. The critical question in diversity research is how differences between workgroup members affect group process and performance, as well as group member attitudes and subjective well-being. Jehn *et al.* (1999) found that the performance of a group is enhanced by diversity in the informational background of the group.

However, social categories and value diversity lead to dissatisfaction, turnover, and a lack of commitment. Stressing the point to make a distinction between the different types of diversity. To address this question, diversity research has primarily been guided by two research traditions: the social categorization perspective and the information/decision-making perspective. The former is pessimistic about diversity, concentrating on the relational aspect, and the latter is positive, focusing on task performance (van Knippenberg & Schippers, 2007). These two aspects can also be compared to two research lenses. On the one hand, we have the static aspect, synchronic, where we look at society and how we find our differences, and the other one, dynamic, diachronic, where we search for how tasks are being moved from started to done and how we work together, bringing our information perspectives into the picture.

Both perspectives are essential and contribute to a picture of how diversity influences work, but they do not work separately from each other. A comprehensive perspective is essential to holistically grasp the situation. Van Knippenberg *et al.* (2004) developed a model centered on group performance. However, it's essential to also consider other facets influenced by diverse groups—such as cohesion, commitment, and turnover—with a comprehensive lens. When reviewing the data, it is not easy to establish empirically how the two perspectives can act simultaneously. It is paradoxical to imagine a group with a high diversity and low cohesiveness, low group interaction, but performing well because of a different informational background and better decision-making (Williams & O'Reilly III, 1998).

In this spirit, Knippenberg and Schippers conclude differently from the reviews of Milliken and Martins (1996) and Williams and O'Reilly III (1998). The positive connotation of

informational diversity and the negative of social categorical cannot be established empirically. Therefore they disregard a typology of diversity and stress the before mentioned integrative process model of diversity (van Knippenberg et al., 2004). In reviewing the research for van Knippenberg and Schippers (2007), it is clear that the time has come for complex models, concentrating on the main effects and shifting the focus on moderating variables.

Pelled *et al.* (1999) formulate a connection between diversity, conflict, and performance, where each concept shapes the other. Functional background diversity is then related to task conflict, while all other dimensions of diversity drive more emotional conflict. Race and tenure positively affect emotional conflict, while diversity in age groups negatively influences emotional conflict. In turn, task conflict and emotional conflicts influence task performance, the former positively, the latter negatively. The authors conclude with a complex relationship between diversity and conflict.

This contrasts with the optimistic view of the “value-in-diversity hypothesis” (Cox, 1991). The hypothesis-defining paper established this by mapping culture to groups racially defined in the US: Asians, Blacks, Hispanics, and Anglos. It was tested scientifically by testing for the dimension of individualism/collectivism. The result was that more diverse groups were also the most cooperative. In general diverse teams contribute with complementary views and competencies (N. J. Adler, 1980; Barmeyer, 2012; Stein, 2010). The diversity of a team enhances its creativity and innovation capacity.

The acceptance of diversity is part of the well-being at work. The SLAC framework (Dagenais-Desmarais & Savoie, 2012) tries to model well-being by defining four key elements: sense, links, activity, and comfort. Diversity can be assumed to be part of the social links, meaning to be supported in one’s identity (Karasek & Theorell, 2009; Veiel & Baumann, 2014). Well-being can be linked directly with innovation (Corbett-Etchevers et al., 2019). For innovation, there is the MICE framework (Defélix et al., 2015). Diversity can here be linked with competence and environment.

A complex image is warranted by Jackson and Joshi (2004), who put the team’s context into focus, for example, who is the manager and the regional demographics around the team. Is it embedded in a diverse, or more in a homogeneous society, all acting as moderating? Exactly our fieldwork can enlighten this relationship by showing how diverse teams work and how their advantages can overcome the challenges of group diversity. In the data, we can see this,

too, with the workers coming from cosmopolitan cities such as Calcutta, Hamburg, Paris, and others. Models that try to have enough explanatory power have to consider the group's contextual embeddedness into society, which is crucial for a work's success, as well as how cohesion in the group is being built. One example and another outcome is the low turnover in the diverse group, with the same original, very diverse team members in totally different geographies forming long-lasting bonds and generating new projects out of the need of the organization to develop the underlying concept further. Here it can be seen that the shared vision and the joint work structure are essential. The success of former projects and the ongoing work together form an antagonistic force against diversity to in-group similarities through everyday rituals and a typical style of working again. This contextualization is essential in understanding how relational diversity is. There are different dynamics to be accounted for between majority and minority groups at a societal level and those embedded in a single group. An individual woman embedded in a group of men will not have the same experience or affect the group in the same way as an individual man in a group of women. The man will have less group conflict but feel like an individual negatively, while the woman will experience more group conflict and oppression (van Knippenberg & Schippers, 2007).

Another aspect of diversity is that it is not just a static aspect of a team on several levels but moves dynamically from surface aspects toward deeper-level diversity. In the beginning, teams are confronted with their readily perceived diversity, then later on, finer psychological differences start to increase in importance, while the outwardly perceived ones are lessened. Surface level diversity is here demographic data and deep-level attitudinal (Harrison et al., 1998, 2002). Priem *et al.* (1999) stress that demographic data does not cut for top management teams. Successful different constructs such as time, process, and judgments must be included to argue for the diversity performance relation.

Bourgeois and Brodwin (1984) formulate three different modes of operating the firm at the highest level: (1) Commander, centrally planned, biased, (2) Change, use of organizational resources to implement strategic change, (3) Collaborative model; consensus-based model, where senior managers decide together. This positioning of how power is executed is another form of diversity that enriches the view of the heterogeneity of the organization. In the same way, Mintzberg and Waters (1985) formulate the eight strategies, forming a certain base level of diversity. We will list them to enumerate and visualize the organizational context in which diversity can form. (1) Planned, down centrally, relatively rigid, following a strict plan. (2) Entrepreneurial, which is very much tied to the one concept that entrepreneurs define.

Instead, like the former concept being bureaucratically determined, it is more determined by the leaders in person. (3) Ideological, the vision is central, and organization is planned around that ideological component. (4) Umbrella is the leader embedded in the organizational context. They are just in partial control. All action is contingent on the surrounding mechanisms of the organization. (5) Process, this strategy in its ideal type, is void of leaders in a personal capacity but focuses on the organization's process. (6) Unconnected, here, no strategy is given; if there is a strategy, it just emerges from personal intentions. (7) Consensus works with the emergent consensus of different actors. (8) Imposed, the actual lead is taken from outside the organization, and the strategy is imposed.

In a group, in general, there are different types of consensus, and there is a process going on about how the consensus is formed, with diversity being a key variable here, especially considering the tenure of a team, which shows a learning process of former consensus making (Mohammed & Ringseis, 2001).

Faultlines are a physical metaphor for the open ground between individuals or groups Lau and Murnighan (1998). The concept describes significant differences that form stark contrasts. For example, a group with two young male employees who are newcomers to the company and ten middle-aged women with much tenure. These faultlines can also produce differences in power when for example, in a group with typically equal power, one group has overwhelming more members. In the example, the group of experienced women can then overwhelm by decision. However, those faultlines are also dynamic. For example, both groups can approach and bridge the differences but make space for other factors, conservative or progressive values. Li and Hambrick (2005) found that those fault lines led to emotional conflict and made it harder for the group to communicate well, causing behavioral disintegration and worse performance. Sawyer *et al.* (2006) found how crucial information sharing is, especially across fault lines, finding this was not affected by race but by job function, stressing the point that the informational structure of diversity is the vital thing, meaning the ability of the group to function as a whole. While the findings of Lau and Murnighan (2005), in general, support the fault line concept, one interesting finding is that work communication, e.g., meetings, will only help performance in groups with weak fault lines, not with strong ones. Phillips *et al.* (2004) make the difference between congruent and incongruent groups, the former meaning that an outsider of the group shares new information, the latter meaning that a diverse information horizon is present in the group, and this is

shared with a stranger. The two situations have different outcomes in that congruent groups outperform incongruent ones.

Earley and Mosakowski (2000) find a curvilinear relationship between how heterogeneous a group is and the resulting performance. Once heterogeneous groups find out how to work together, they have better outcomes than groups with slight heterogeneity but on par with homogeneous groups.

Chattopadhyay *et al.* (2004) establish a theoretical model of why individuals might avoid working hard when they do not belong. However, there is a nuance to this. Context matters, e.g., high-status employees do not mind the dissimilarity.

To some degree, technology can enable diverse groups to communicate more equally. For example, email is a qualitative change in communication (Sproull & Kiesler, 1986), leading to more excellent gender-equal behavior (Bhappu *et al.*, 1997). Sproull and Kiesler (1986) conducted a field study showing some disadvantages. The email was shown to contribute to a loss of the surrounding context, i.e., the text does not contain all the information that should have been embedded, and the messages were more self-centered. However, at the same time, the text was in the same time equalized across hierarchies, and the electronic form was preferred for complex messages. This observed abstraction can then lead to what Bhappu *et al.* (1997) observed, that in and out-group behavior is adjusted. Women were asserting less dominance, taking fewer turns in 1:1 speech. However, with the introduction of email messages, this behavior was eliminated. However, Bhappu *et al.* (1997) also warn that this works in the technological-facilitated context. The moment the information leaves this environment, the surrounding organizational and societal context influences strategies employed by workers to enforce gender norms.

When researching interpersonal congruence, Polzer *et al.* (2002) discover that in diverse groups, when there is a big gap between how others see the individuals and how the individual thinks it is seen, this negatively affects task performance. However, if this is fixed, then this improves performance. The authors conclude that it is crucial to be transparent and somewhat better to communicate diverse views than to suppress them. This is the difference between the perception of the self by itself and the perception of the self by others. Coming back to my previous ethnographic field notes, just after I realized that my perception was wrong about how IT is here perceived as a failure, I was motivated for the

follow-up projects to work together when realizing that the faults are not perceived as solely on the shoulders of the technical specialists.

Then there is also the incongruence, how the individual perceives diversity, individuation, and actual diversity. The work of Swann *et al.* (2003) shows how the concept of self-verification, i.e., checking in on their views of themselves and how others perceive them, can be used to explain the effects of task performance and practical implications of how to better that. The team members must check their incongruence between the perceived and actual diversity by communicating common goals.

The surrounding context is essential for the salience and how diversity is perceived in the organization. Whenever there is already a very high diversity of race in the organization, race itself as a categorization is less of a diversity criterium perceived by the individual (Martins *et al.*, 2003).

In the same way, and maybe more negatively formulated, the surrounding society is an influential factor in this perceived diversity, too. Harmful in the sense that in the study of Brief *et al.* (2005), the perceived harmful racial conflicts in the community outside the organization affected the conflict inside the organization. Joshi *et al.* (2006) show the importance of the in and out-group member composition. Whenever the out-group had higher numbers, the adverse effects of diversity were lessened. However, this abstract dynamic relationship of diversity is not universal for all demographic factors. For racial equality, more PoC in the team helped equalize payment, while more gender equality did not, i.e., more women in the sales team did not affect equal pay. Another finding of the researchers was that those dynamics are less salient in small and stable teams.

Pettigrew's (1998) Intergroup Contact Theory stresses that prejudices can be reduced by more prolonged contact with the out-group. This shows implication to the before-mentioned lesser effect in stable teams. Here diversity will be reduced because one was in contact with the other group and could adjust incongruencies. However, deeper-level conflicts can surface after prolonged tenure (Harrison *et al.*, 1998).

However, how can diversity be bad for personal relationships while being suitable for performance? Conflict among team members is destructive to their performance and satisfaction. This is equally true for relationship as well as task conflicts. The more complex the task is, the more the conflict is detrimental to the performance (De Dreu & Weingart, 2003). However, in line with the hypothesis that there is value in diversity because of the added information, conflict is always negative for routine tasks. However, for novel tasks, it can be beneficial (Jehn, 1995). Another finding (Jehn, 1995) is that encouraging conflict through open discussion is almost always harmful. Again, there is a distinction between relationship and task conflicts, the latter being able to trigger effective, the former poor decisions. An explanation is how the conflict is interpreted. It is detrimental when interpreted as a personal attack (Simons, 1999). Bowers *et al.* (2000) support the notion that if tasks are of low complexity and repetitive, then homogeneous groups perform better. As Webber and Donahue (2001) cannot find a relationship between diversity and task performance, they suggest not treating diversity as a general concept but concentrating on the underlying values, beliefs, and attitudes. The experiments of Kruglanski and Webster (1991) stress the importance of an environment for diverse groups with deviant input to be positively perceived. Whenever there is a stressful environment, conformism will be received in a better way.

This, in turn, supports our inferred definition of diversity and method to analyze diversity not as an abstract concept but look at a deeper level at the underlying ethnographical workings, how diversity as a cultural construct is actively produced in groups. Not all diversity characteristics are equal among each other. Riordan and Shore (1997) found only race-ethnicity of having significant effects, gender, and tenure less so. In the study, race relations had such a strong impact that they were overwriting what would be expected as the relational demographic effect. This stresses the point of considering culture's more comprehensive meaning and symbolism to understand diversity. Tsui *et al.* (1992) also show the effects of attachment of different groups when diversity is increased, especially white males who were less attached to the group than to a homogenous group. This cohesiveness is another important factor one can imagine is hindered by diversity, i.e., the attraction of staying/not quitting the group. However, a direct relationship between cohesiveness cannot be established. Ultimately, tasks are performed well because of the interpersonal attraction of pride in belonging to the group, especially for small groups. However, this is primarily a means to an end, not because of cohesiveness (Mullen & Copper, 1994).

Doz and Prahalad (1991), in their review paper about Diverse Multi-National Companies (DMNC), identify from the theory seven demands of what a theory should address to be helpful in this context. We use this review to cross-check our conversation with the literature for the emerging theory.

1. *Structural indeterminacy.* Power relationships constitute a self-adjusting network rather than strict organizational networks. This can be seen in the data by how the officially defined role is negotiated at the beginning of the project and then transformed according to the demands. It might not even be clear initially what the organization's intended role was.

2. *Internal differentiation.* It is a constant struggle for the company under study, and the theory of complexity is used, with system theory, highlighting the information flows and communicative action, showing the interpretation of such systems of communication by individuals. As well as the second theory stressed that of power, with adjusting power relations just according to the context, a strategy that the individual has to renegotiate anew in each new group context.

3. *Decision trade-offs between multiple priorities.* System theory will describe how regulating those priorities works, and the theory of power will show how various actors' different intentions shape the priorities.

4. *Importance of information flows.* This is the main reason for using a contingency theory to describe how information is communicated and flows, and with theories of power, how much information is used as a strategic advantage.

5. *Emergent linkages.* Relationships are formed in a system between different elements, especially between actors, communicating and therefore extending their world. Especially in power relationships, a new linkage can signify new power over or within the company.

6. *Fuzzy boundaries.* Those theories consider power and open systems as an open system, which can widen or tighten its border. This demand is illustrated through the implementation partners joining the projects and the groups and bringing in their exceptional power dynamics.

7. *Repeatability vs. change.* This theory demand describes the dilemma between innovation and the need to perform. From a learning perspective, this aspect converses well with the literature, i.e., many times, especially with external partners, a long-term relationship is built up, which maybe hinders a fresh view on the matter. Also, it brings in already built-up

baggage of power relationships, but the need for IT teams to perform to fast-changing market requirements shows the need for this dilemma. System theory, with its complexity, models this. It is one of the perspectives taken when looking for the advantages of a diverse organization.

Roles have a dual role in representing informational expertise and different power relations. Diversity can mean, on the one hand, that there is a diversity of tasks that have to be performed by different roles (Argote & McGrath, 1993). A hierarchy is in the collected data, often justified not by a social hierarchy but as a different set of (managerial) tasks. However, in the actions taken often, this justification is invalidated or revealed, as having power over individuals, in the sense that specific individuals in the upper power levels finally take decisions. On the other hand, the official organizational hierarchy is undermined by robust expertise. They are making it possible for individuals to exert strategies of power over official power. This fits the definition of roles in the paradigm of Social Interactionism, where individuals communicate in society while expecting specific behavioral patterns as part of a social structure (Stryker, 1980). Diversity then abstracts individuals into roles that enable (and restrict) the execution of specific tasks.

However, role theory has its dark side. Crozier and Friedberg (2014) characterize them in the following way. Roles are a form of power, especially in a social hierarchy, with inferior relationships. In structuralist-functionalist thought, every piece in a system plays a particular role. The negativity for society is only seen when there is role conflict, and role ambiguity, that the individual perceives as harmful. However, system theory ignores the inherent oppressiveness of roles, with its normative, static form and injustice in how roles are formed. However, the human being is seen as an element in a system, not unlike a cog in the machine, and not in humans' inherent liberties and contingent nature.

1.3 Complexity

The projects used as cases for the study faced paradoxical tensions of the need for diversity on the one hand because of the need to handle complex business processes and the need for standardization and reduction of complexity, on the other hand, to be able to manage the processes. A key issue is the diversity of different subsidiaries. The headquarter management's perception is to handle complexity only by standardizing, thus forming consensus. In general, the relation to complexity theory arises from the data itself and, *a*

priori, from societal trends, where complexity takes the central place in how managers theorize about their role. Where before management was perceived as something to be managed in rigid, static, synchronic, and localized narratives, now it is focused on complexity that arises naturally from the complex situation (see Thrift (1999) for the development of the concept of complexity). In our section beforehand, complexity came into view through task complexity.

An instance of project work where this problem arises is when new ideas for handling processes better emerge. As the projects were initiated centrally, the team members were deeply interwoven in local processes, and there was a back-and-forth between a global, or supraregional, and a localized view. As the case study is embedded in the implementation of information systems, there was a special kind of directional communication from the headquarter to the subsidiary, the transfer of globalized technology. However, this technology was not perceived as a neutral given but reinterpreted according to the local context. The downside of such reinterpretation is that each deviation from the existing globalized intent is a divergence that adds complexity that must be managed. For example, an innovation valid for Germany but not applicable to France would make the different steps of operating and enhancing the information system equally more complex.

The two primary outcomes of diversity are the need to reflect a complex society and the negative perception of diversity through less likeliness and lessened performance because of the translation of concepts. This paradoxical situation of wanting and avoiding diversity can be linked to system theory with the key terms “requisite variety” and “diversity-consensus” dilemma. The added complexity could be justified by the law of requisite variety (Ashby, 1956; Greve et al., 2009; Lane et al., 2004). Organizations exist to reduce complexity, but the requisite variety states that a team as a system has to have at least the same complexity as the processes it tries to control. Bartel-Radic and Lesca (2011) show the validity of the argument but also the limited predictive value. Weick’s usage (1987, pp. 112–113) of the term “requisite variety” sheds light on the complexity of the communicative act itself. In-person, the act is highly complex, while talking over the phone is less so because of the loss of information. Complex processes need a variety of inputs. In the same way, we need rich language to describe rich processes (Weick, 1995). Argote and McGrath (1993) problematize the central question of this thesis, how diversity in an organization, as an abstraction of the dynamics of culturally diverse IT projects that influence algorithmic and organizational outcomes, is handled in an antagonism inherent to open systems (Katz & Kahn, 1978). The

system needs to extract energy from its parts, and this extraction explains the conflict of centralization vs. decentralization of management, the process standardization vs. specialization (Argote & McGrath, 1993). To be specific for the *diversity-consensus dilemma*. Each subsidiary incorporates many tasks to be performed through its differing cultural context, even if the core meaning is intercultural, i.e., a meaning communicated by different organizational roles and interpreted in a common understanding that enables day-to-day work. It is assumed that conflict arises through cognitive dissonances, misunderstandings, and different values. Decisions are taken with this baggage that is not always visible to each individual because those are underlying assumptions (Mohammed & Ringseis, 2001). Conflict arises when diverse groups have to arrive at consensual decisions, and all those underlying assumptions and values are not explicit. However, for each individual clear, they become a hidden stage of conflict in the emerging social interactions. Alternatively, in some cases, the decisions make hidden values explicit and drive conflict. In homogeneous groups, this work of revealing hidden conflicts or miscommunication through hidden information is missing and therefore helps to communicate and work. This is the explanation considering diverse groups' individual properties and emerging complexity. System theory abstracts these problems toward the diversity-consensus dilemma by looking at the elements of a system and their relations. The complexity arises when each individual is seen as a different type of information provider, leading to emergent behavior. Requisite variety is then grouped into the information/decision-making perspective of diversity, where diversity is advantageous because it provides a richer set of information for decision-making.

This exploration delves into three pivotal concepts: culture, diversity, and complexity. In this section, we navigated through these notions, wherein culture is established as the cornerstone of the interpretive approach. It acts as a lens through which the impacts of diversity are elucidated. Meanwhile, complexity remains a core concept, instrumental in comprehending the emerging features of organizational outcomes. Each serving as a foundation upon which our subsequent investigations are built. Now the study restarts our theoretical conversation, and build the theoretical concepts from the ground up, employing an inductive research design.

2. METHODOLOGY

This research aims to study the experience of technology workers in their highly intercultural project work. Methodologically, ethnographic studies are well aligned to enhance our knowledge concerning the intercultural dynamics within technology organizations. This particular ethnographic research fills the gap in our knowledge by directly observing how workers articulate themselves in their professional environments. Such expressions are deeply influenced by their respective positions within the organizational hierarchy, whether they are internal or external workers, or distinguishably, a manager as opposed to a software engineer. It is through these nuanced ethnographic insights that we can understand the multifaceted layers of intercultural complexity in tech establishments. From this lack in knowledge, we can formulate our research question, **how the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes.**

Data was gathered using ethnographic methods, specifically through field observations and note-taking. From the notes, three central themes were identified: power, space, and algorithms. Echoing findings from our literature review, the foundational concepts of culture, diversity, and complexity are discernible as the bedrock beneath these three primary themes. From these themes, it becomes evident that understanding the intricacies of technology organizations requires more than a mere surface-level analysis. To delve deeper into the complexities and challenges embedded within these entities, it's essential to adopt a theoretical lens that can scrutinize, unpack, and challenge established norms. This leads us to the chosen paradigm for our approach: Critical Management Theory.

We aim to delve into and elucidate these three principal concepts (power, space, and algorithms), by laying the groundwork for an emerging theory on how critical work functions within technology management. Instead of merely providing a detached description of the work and adopting an impartial theoretical stance, we align our approach with the tenets of Critical Management Studies. This perspective propels us to not only describe and interpret but also evaluate with the overarching goal of instigating positive change, ultimately striving for a more equitable and improved workplace.

2.1 Paradigm and epistemology

In general for management research, there are four primary paradigms, each with its distinctive agenda and foundational principles (Romani et al., 2018):

Positivist Paradigm: This approach is fundamentally oriented towards establishing laws and principles that aim to better govern and predict cultural phenomena. Positivism seeks objective truths and often employs empirical methods to uncover universal patterns within society.

Interpretive Paradigm: Taking a contrasting stance to positivism, the interpretive paradigm prioritizes understanding over predicting. Its core mission is to “understand the other”, diving deep into the subjective experiences, meanings, and interpretations of individuals. This is achieved by immersing oneself in the cultural or social phenomena being studied.

Postmodern Paradigm: This perspective seeks to deconstruct the narratives of culture. It challenges grand narratives, established norms, and conventions. Postmodernism emphasizes the fragmented, transient, and decentralized nature of contemporary societies and often critiques overarching structures or ideologies.

Critical Paradigm: Among these, our chosen approach for this thesis, the critical paradigm, distinguishes itself with its quest to uncover power dynamics, ideological manipulations, and structural injustices. Rather than merely accepting actions or phenomena at face value, it endeavors to delve into the underlying motivations and structures that drive actors and institutions.

The exploration of Critical Management Studies (CMS) is fundamental to the motivation and functioning of this thesis for two primary reasons. Firstly, by building upon the critical paradigm literature, this research seeks to move beyond superficial examinations. It aims to delve deeper into the underlying motivations driving actors' actions, eschewing a mere acceptance of these actions at face value. This approach is inspired by the works of Alvesson and Willmott (1992), Kemmis (2008), and Steffy and Grimes (1992), who have previously emphasized the importance of such a critical lens in management studies.

Secondly, the intrinsic motivation steering this study is the quest to unpack the intricacies of power dynamics in organizational settings. More specifically, this thesis aspires to understand the phenomena that underpin these power plays and to discern the role that digital technology

occupies in this landscape. In an era where technology is intrinsically woven into the fabric of organizational operations, its influence on power structures is a critical area of exploration.

In adopting the critical paradigm for this study, our objective is to discern the power interplays and the role of digital technology therein. However, it is crucial to recognize that each of these paradigms offers unique lenses through which to understand and analyze cultural and organizational phenomena.

Each of these approaches should not be viewed as seamlessly complementing one another; instead, they offer unique perspectives on the topic. The positivist method risks oversimplifying by emphasizing general laws and neglecting specific contextual details. The interpretive lens, while delving into the meanings of symbols, may overlook broader geopolitical contexts. The postmodern approach, with its focus on discursive elements, might neglect the structural facets of an organization. Moreover, a purely critical stance can sometimes overshadow positive and constructive aspects of an organization.

But we think despite their weak spots, we need more critical studies. They provide depth, nuance, and a challenge to established norms and structures, ensuring that research is not only descriptive but also transformative in nature. They are essential for fostering a more just, inclusive, and equitable society.

While the theoretical foundations of critical studies provide valuable insights, there's a noticeable underdevelopment in certain areas due to a lack of empirical grounding. Purely theoretical approaches, although informative, can sometimes be distant from the real-world complexities and nuances that empirical data unveils. This potential gap emphasizes the importance of our chosen methodology: the case study approach. By grounding our analysis in concrete, real-world scenarios, case studies offer a tangible context that enriches the theoretical insights of critical studies. This symbiosis between theory and real-world data allows for a more comprehensive and nuanced understanding, ensuring that our research is not only robust in its foundational theories but also closely attuned to actual practices and challenges.

In line with Spicer *et al.* (2009), inspecting the performativity of daily business is fruitful. For that, it is essential to understand that only some studies have to be forced into producing a productive output, therefore, are forced to perform a specific role in the discourse of

academia. That means, in concrete terms, that when uncovering the narratives, one should not automatically route for a certain kind of managerial advice. But leave space for a mere description and further a particular understanding. Our study enhances theory with an empirical grounding to root for an ongoing discussion of the empowerment of workers on different organizational levels. But it will not forcefully try to extract advice or counter-narrative from the data. As the study is routed in Grounded Theory, there will be a circling back to the data to stay true to the points made implicitly by the individuals in their communicative actions.

Central to our methodological approach is an appreciation for the foundational tenets that drive our understanding and interpretation of knowledge. This is where epistemology enters the fray. As we remain committed to grounding our study in empirical data and resisting the temptation to enforce preconceived narratives, it's paramount to explore the underlying epistemological stances that influence our research choices. Critical Theory, with its unique lens on knowledge and understanding, offers invaluable insights into this endeavor.

Epistemology is the study of knowledge – its nature, origin, and limits. At its core, epistemology examines the relationship between the knower and the known, addressing questions concerning what can be known, how it is known, and the boundaries of human understanding. This area of philosophy plays a significant role in shaping the methodologies and theoretical foundations of various academic disciplines. For instance, Critical Theory, which has its roots in Marxian and Hegelian thought, provides a unique perspective on knowledge acquisition and representation. It critiques and challenges traditional epistemological frameworks, as we will explore further.

Critical Theory is often characterized by its foundation on Marx and, to some extent, Hegel (Whitebook, 2004). Hegel can then be seen as a reader of Kant that tries to improve the Kantian system. Most theories in the social sciences can be seen as epistemological bound to the Kantian worldview. There, a clear difference between the subjective view of the individual can be seen, which explores the world of objects and then tries to construct a theoretical picture that accepts the distortions of the real object by each individual's subjectivity. When the social sciences use a more realist epistemological stance, then, as in the Positivist paradigm, a more primitive view of the world of what we can know is assumed. There we would see the world of objects and believe we can experience and research them

without any intermediary. Kant then clarifies that direct access to the object is always refused. That is why he constructs those two worlds, the subjective and the objective, where the individual's mind constantly forms the individual experiences without direct access. Then another distinction is made to construct a fault line between what we can know and what we can only assume to be accurate until we have intersubjectively found another truth. Those two buckets are then the analytical truth and the synthetic truths. This means that when we have empirical facts, we can experience synthetic ones. And then there is a world of our mind alone, analytical propositions (Kant, 2022). But Hegel comes into the picture as the destroyer of those buckets, and this view of what we can know is foundational to Critical Theory and then implicitly for Critical Management studies. Hegel assumes that when Kant makes this separation between the subjective and objective worlds, he is doing something that he is already doing with his mind (Hegel & Bertram, 2020). Therefore, the faultline between the subjective and the objective world is always already something constructed by the mind. What does this mean for our study? This is especially important when looking at objects and intersubjectivity. Hegel sees everything as belonging to one absolute substance. Therefore there is no, and cannot be, a difference between the objects of our mind and the outer world or of reality, as also thinkers of space like Lefebvre (2014) would align to so when a subject is talking about a “reality check” when describing the use case. Fundamentally those descriptions are limiting, as they are never a neutral description.

All of this will be constructed entirely in the mind. Let us take a concrete example emerging in the data. In a wholly naive realist view, we can view the project time and budget constraints as occurring naturally because the company has money and how much it can invest. With a Kantian worldview, we then extend that and see that capital is socially constructed, as well as budget constraints. They are only really there with an individual creating this reality. There are project managers and accountants that make that reality. But then there is the object of time that we observe, and while a Kantian or social constructivist view can see how those objects of reality are constructed, we still assume that they are somewhere. Hegel is now more radical and logically stringent here. In that, he would say that even natural objects are not genuine or not more accurate. Let us take time and space. Not only are they perceived differently by different individuals, but they are also different. They don't exist outside of the mental image of the individuals. For example, the end of the workday is not physically defined. The end of a workday is up to the individual. Will they work overtime? Will they perceive the time as something synchronous, asynchronous, dense,

and passing fast, or empty and taking much effort to make it pass? And in the same way, space cannot be perceived as simply being there or entirely something to be interpreted. In the Hegelian view, even though space only exists in the mind, it is pure thought. This becomes clearer when space is vanishing. Because of technological connectedness, space becomes, on the one hand, empty. We cannot physically relate, but more fully because of our personal, individual space coming into the forefront, intruding or enriching our workspace. Strangely, the Marxian concept doesn't change so much on the fundamental structure of that thought but turns it around by perceiving everything not as thought but as material, even though itself becomes determined by the underlying material realities, which means that a worker's narratives are fundamentally build up through the underlying dialects of its physical space.

2.2 Ethnography

Critical Theory is one central research paradigm that provides novel epistemologies based on specific methods, including critical ethnography (Romani et al., 2018). Critical ethnographic analysis was chosen as a research method because it permits discovering management's micro-politics (Forester, 1992). This form of participant observation is beneficial for getting a long-term view and finding the process of everyday interactions (Lüders, 2017). The method aims to “unveil the every day” in terms of Lefebvre (Lefebvre, 2014). Especially regarding the inescapability of this life-world, the researcher must be aware of their own sense-making involved in the process. Things are connected causally because of our understanding of the life world (Corbett-Etchevers, 2011). Especially our emotions are essential in ethnography (Robert-Demontrond et al., 2013). Critical ethnography distinguishes itself in ethnographic practice by positioning itself in a middle ground between the positivist notion of objective ethnography and subjective political action (Foley, 2002). It has an “ethical responsibility” inherent to the work, an explicit value-laden presentation (Madison, 2005). Considering the ontological turn, the author's values will be examined with the major hint of being critical of my own critical stance (Holbraad & Pedersen, 2017). Through autoethnography values of the author as a researcher shall be made transparent (Adams et al., 2015), but should also be critical of such exposition itself.

This alludes to Geertz's “thick description” (2019), which could be mistaken for a more detailed description of the context of the interactions. But the “thick” refers to the description

of the description itself, not from the subject position itself but from the reflective position of the individuals themselves. Every communication is already up to the scrutiny of the people interacting. They will reevaluate what they said and can, from this point on, make a communication about the communication. And in this context, culture has to be evaluated. The “thick description” has to contrast with the static description of culture established through communication by providing a dynamic image that considers meta-communication. But there are problems with Geertz’s contextualization in that it is too localized (Roseberry, 1989). Culture has to be again contextualized in the broader context of society. In this way, we can see three levels of reflection that must be taken into account: the communication and its symbols, the society surrounding the communication, and the author's position.

Strathern (2005) a paradoxical relationship between wanting to know more and then more questions arise. This can be compared to the hermeneutical circle (Danner, 2006). The hermeneutic circle derives from the philosophical tradition of interpreting the text. One fundamental insight is here that understanding itself has a particular flow. There is a movement between preconditional understanding, with its arising questions, the understanding, and the added understanding. This movement of asking more questions and getting better at asking questions contributes to a closer understanding of absolute knowledge. But Strathern (2005) means something different, a post-reflexive (O’Doherty & Neyland, 2019) understanding of the world as an ethnographer. They include and problematize the generated questions in the created knowledge. Creating a complex subject/writer relationship, where the knowledge the writer explores is a symbiosis with the question they generate, forming the knowledge themselves. A different writer would ask additional questions, producing other knowledge. In this process of enriching data by asking more and more questions, a fundamental impossibility has to be understood that there will never be enough context provided. Each drilling down into a specific topic produces more questions, and the writer has to focus, but with the focus finding the holes in the knowledge, strolling away from the original question. So even when one tries to include the embeddedness of the social situation in greater society, one must consider that this takes away the focus from the original subject. This has to be understood as a fundamental paradox, not possible to be resolved. Even when taking the postmodern position as a sophisticated reflective position, it is tainted by the general mood of the irony taken by the paradigm of postmodernism (Deetz, 1996; Strathern et al., 1987). For our chosen paradigm, the perspective would be very unflattering, suspicious (Deetz, 1996).

I wrote down field notes while in a meeting, directly after the meeting, or for interactions that occurred more spontaneously in the evening at the desk. The data were collected through observation and ad-hoc interviews, following two separate projects through their phases. At a later stage, memos were written to structure the raw field notes and remember the crucial context. As I am directly involved in the company, the ethnographic approach is that of Goffman's authentic participation (1996), and its use in the company situates itself in the framework of Action Theory (Zhang et al., 2015). Goffman's calls for authentic participation (1996) convey the importance of getting into a situation and getting attuned to the lifeworld of the subjects of the study. The reflections from an insider's perspective can enrich the understanding of culture in context. Therefore, the empirical grounding of this study includes the notion of auto-ethnography. Answering Mahadevan and Mayer's call (Mahadevan & Mayer, 2012, p. 10) that "[o]nly the interpretative analysis of emic micro-cultural sensemaking will deliver the emic social meanings of technology in a specific context."

That means that the collected field notes and memos were then joined and marked up with identifiers for what constitutes a line and the respective code of the line. The codes were found in the first iteration by using the meaningful context and trying to associate a familiar concept. After doing this, the codes were listed and compared for duplicate entries and close distinction to see a theoretical framework emerge that can be used for further development. Then categories were found that built a bracket around those codes. They were filtered for meaningfulness to answer the research question.

Kitchin (2017) suggests ethnography to discover the underlying reasons for the algorithm's creation and its mechanisms. Specifically, critical ethnographic analysis was chosen as a research method because it permits the discovery of the micro-politics of management (Forester, 1992). The technology section of the multinational company I studied has an iterative process of algorithmically creating and enhancing its business process in diverse forms. Through my work as a technical consultant and software developer, I am in daily contact with the field, observing projects while being an actor in the process of the projects. Kitchin (2017) stresses that such auto-ethnography has to apply to products in use by several people, which is granted in this study because it is used globally in a multinational company. Therefore, the concerns of algorithm governance are real and can be examined. In the exact text, Kitchin (2017) criticizes the inherent subjectivity of such work. These concerns were already addressed in the results of Goffman's authentic participation (1996) and Action Theory (Zhang et al., 2015). The former addresses that it is a way to experience the same

thing the workers are experiencing, the latter stressing the importance of the relevance of the work and application of theory. Participant observation is beneficial for getting a long-term view to discover the process of everyday interactions (Lüders, 2017). The method aims to “unveil the everyday” (Lefebvre, 2014). While ethnography is generally concerned with the application of abstract concepts, so “doing” algorithms, Critical Ethnography is concerned with how power structures are actually done. In the context of algorithms, it is more about how organizations create algorithms as something performed, communicative action.

An important form of ethnography is the vignette used in 5.1 —Research Finding. The vignettes are presented as common occurrences. The vignettes exemplify common series of actions that were found in the data (Miles & Huberman, 1994). With actions we mean here specifically behaviors that were recorded together with their meanings (Erickson, 1986). Especially in an ethnographic mode of working the interpretation of one’s own behavior as well as that of others is important, to find out why individuals behave that way and how the everyday is interpreted. On the basis of the field notes exemplary, “archetypical” situations were extracted to make common structures visible, and render visible situations that are hard to understand from an outsider’s perspective (Miles & Huberman, 1994).

In all recorded sessions, I participated as an engineer participant and researcher. I collected the field notes and wrote memos for the data collection. The core team knew I was writing notes for this thesis in all projects. In some situations, this was only known by some actors. shows how often a specific role was present in the sessions. Taking the example of the first row and the first column, subject matter experts were six times current in the recorded scripts for Virtuoso.2, representing 75% of the total recorded time. In the second row, meaning this presence was even more stringent for the second project. In 89% of the recorded sessions, the subject matter experts were present. This shows the importance of the role. The minor current role was the software architects, which are essential main decision takers, but because of their specialist role, they need to be present. At the same time, my role was the typical software architect added to my senior engineering role, which meant I did many tasks myself and then reconnected with the architect. On the other hand, as I now have this role officially when writing this thesis (2023), many specialized architecture meetings would have been missed because of the need for a title.

Table 1: Percentage of the recorded roles in the detailed sessions (Absolute numbers in brackets)

	Virtuoso.2 (8)	Virtuoso.3 (9)	Momentum (14)
Subject Matter Expert	75% (6)	89% (8)	71% (10)
Functional Project Lead	88% (7)	0% (0)	0% (0)
Product Owner	38% (3)	0% (0)	0% (0)
Engineer	100% (8)	100% (9)	100% (14)
System Owner	38% (3)	0% (0)	0% (0)
Implementation Lead	25% (2)	78% (7)	0% (0)
Technical Project Lead	50% (4)	0% (0)	50% (7)
Software Architect	13% (1)	11% (1)	0% (0)

When the projects are split into just three different phases, to simplify, then the distribution of the data collection can be seen in Table 2 below. The table shows where I could record the most data and how in Virtuoso.2, the focus was clearly on the Design Phase. In Virtuoso.3, more equal, and in Momentum, more emphasis was on the Build Phase.

Table 2: Percentage of the recordings per phase for each project (Absolute numbers in brackets)

	Virtuoso.2 (8)	Virtuoso.3 (9)	Momentum (14)
Design Phase	75% (6)	55% (5)	29% (4)
Build Phase	25% (2)	44% (4)	64% (9)
Maintenance Phase	0% (0)	0% (0)	7% (1)

2.3 Case Studies

Ethnography can be seen as pioneering case study research with its exploration of foreign cultures, e.g., Boas' study of the polar people (Lowie, 1944), but also the pioneering studies of the Chicago school, e.g., *The Polish Peasant in Europe and America* (W. I. Thomas et al., 1996). Case studies can be defined loosely as a “[...] a research strategy that examines, through the use of a variety of data sources, a phenomenon in its naturalistic context, with the purpose of “confronting” theory with the empirical world” (Piekkari et al., 2009, p. 569). From this definition, we can confer that using the case study can be justified by using the research approach to keep the theory checked by looking at real-world use cases. But this picture gets more complicated when considering that the case study, as something that researchers do, is done explicitly or implicitly with the paradigmatic background of the writer. So in the positivist (and most influential position), Yin (2014) justifies the usage of case studies by explaining why a theory works in practice and showing the process of this work so that you can explain in-depth the theory's concrete instance in the world. Eisenhardt (1989), another influential positivist researcher, builds on top of Yin but is more concerned with using case studies to construct theory. Even building on top of the concepts of Grounded Theory by inductively deriving theory from the facts of the world observed in the case study. She (Eisenhardt, 1989, p. 534) defines case studies as “[...] a research strategy which focuses on understanding the dynamics present within single settings.” Two terms are essential to stress here, the “present dynamics” and the “single settings.”

Case studies are more of a research approach than a method (Hillmann & Hartfiel, 2007; Lamnek & Krell, 2016), containing different paradigms which address specific questions and stress different aspects of the social world, with a different mood of research as well (Deetz, 1996). Welch *et al.* (2011) see here different dimensions of case research, inductive theory building, the natural experiment, interpretive sensemaking, and contextualized explanation. While the positivist world-building tradition tries to infer general laws or the causes of a social phenomenon, the interpretive stance seeks meaning. This brings us back to Dilthey's (1990) separation between the natural and the social sciences, where positivists ignore the basic humanity in our research that we don't see abstract objects in our research but understand the actions of the individuals while being an individual on our own.

Unit of Research

A case study wants to say something about something, and this object of research is called a unit of analysis, a central aspect of case study research (Grünbaum, 2007; Patton, 2015).

There is a certain ambiguity about a unit of analysis, as this is highly dependent on the research paradigm. For our study, the unit of analysis of the case study will be the project. Generally, the dynamics of culturally diverse projects can be viewed as a process. Fundamental presumptions regarding processes include: context, duration, the transition from context to action, a holistic approach, and spatial/location considerations (A. M. Pettigrew, 1992). All of those show the complexity of separating social events from another, and the interpretation of projects. It is essential to incorporate the spatial *and* temporal element when defining any social fact, necessitating a focus that is not merely synchronic but also diachronic in nature (Abbott, 1992).

In total, three projects were observed from April 2019 to July 2021. The project is seen as a basic unit through its boundedness, but also through its construction of several social units as individuals, groups, and the whole organization. They constitute building blocks of change in the organization. Going back to ethnography as a method and critical management theory as a paradigm, the project is then something that is delineated through the project members themselves to shield the projects from the demands of the organization, but at the same time extended to take in additional demands to achieve the objective or actual goals that the individual actors establish.

Typology

Positivism is called positive because it tries to abstract rules about social phenomena without explaining the conditions that brought these rules into place (Rose, 1995). Welch et al. (2011) contest positivism's prevalence with different, less popular ways of theorizing in case studies. They add Constructivism, Critical Realism as alternatives and distinguish between Empiricist Positivism and Falsificationist Positivism. While the positivist schools stress objective knowledge about objects by using induction from the specific case towards many cases (Empiricist) or towards a theory (Falsificationist), the Constructivist school searches for meaning and tries to understand the individuals in the social setting. The critical realist stance tries to better Positivist approaches by looking for the cause-effect relations while considering the context. The contextualization is crucial in case studies, and as such this study is positioning itself as an "Extended Case Method", where the context is used to

explaining not just the local but also the wider societal context of each interaction (Welch et al., 2022).

2.4 Grounded Theory

Grounded Theory is used to analyze the collected data. This implies already a certain way to collect the data. Longitudinal data were collected through participative observation and ad-hoc interviews of two separate projects. I wrote down jottings during or directly after meetings or about interactions that took place more spontaneously, for example, in the evening at my workplace. Then in the evening, I transformed those jottings into field notes (see in the appendix Example 1: Recorded Field Notes Virtuoso.2, Example 2 : Recorded Field Notes Virtuoso.2, Example 3: Recorded Field Notes Momentum, Example 4: Recorded Field Notes Momentum, and

Initial Interview Guide for the first chosen interview approach). I wanted to put in much detail in the first stages and enrich the material in the consecutive steps. At a later stage, memos were written to structure the raw field notes and remember crucial contexts. The collected field notes and messages were then joined and marked up with identifiers for what constitutes a line and the respective code of the line. See Figure 1 to view a complete overview of how many lines were coded. Green shows that a code was existing. The lighter the shade of green, the more codes were listed for those lines. Please see Table 3: Overview of recorded data for details of how much data were recorded.

Table 3: Overview of recorded data

Type	Number of Recordings
Sessions	35
Codes	376
Lines	347
Transcript Lines	2197
Transcript Words	12089

Figure 1: Overview of the Coded Lines

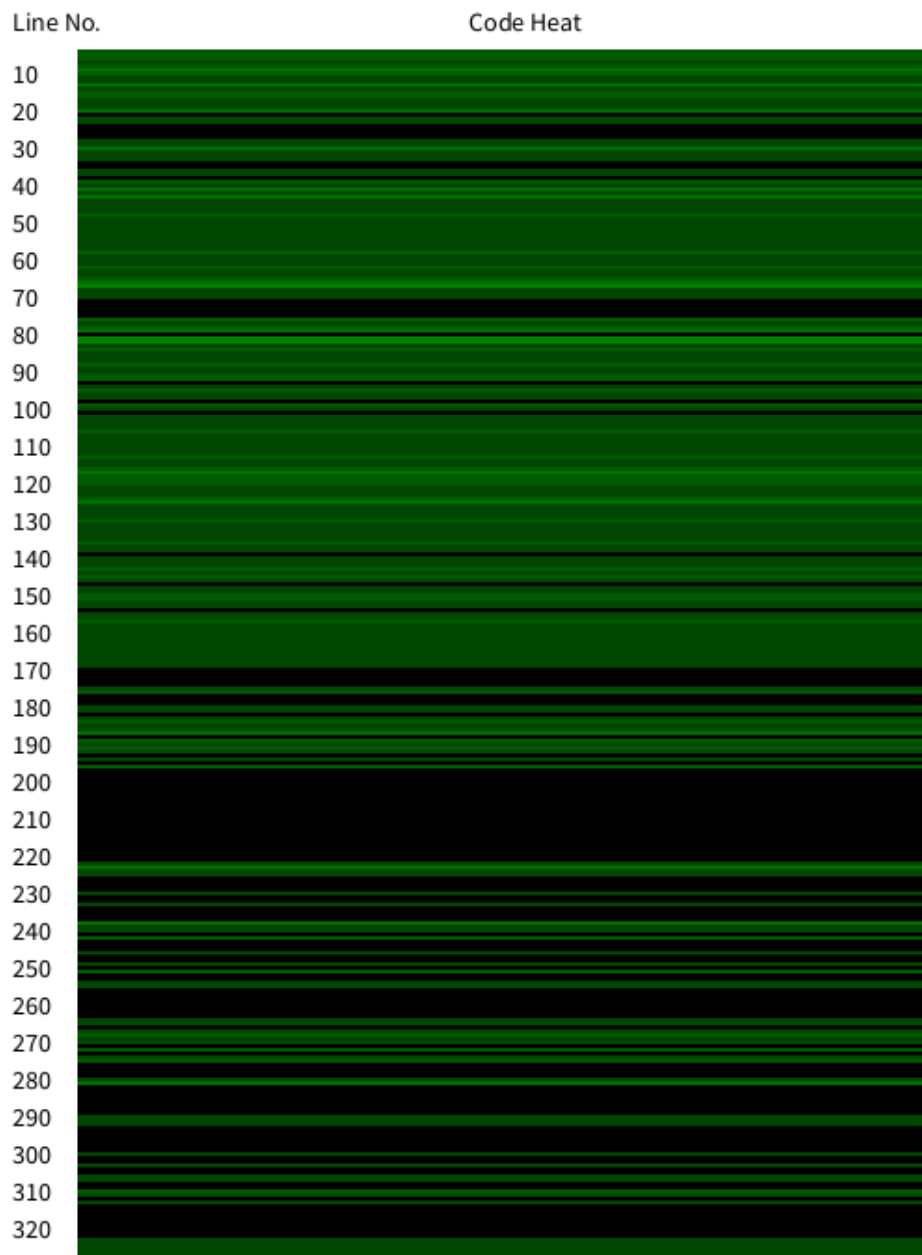
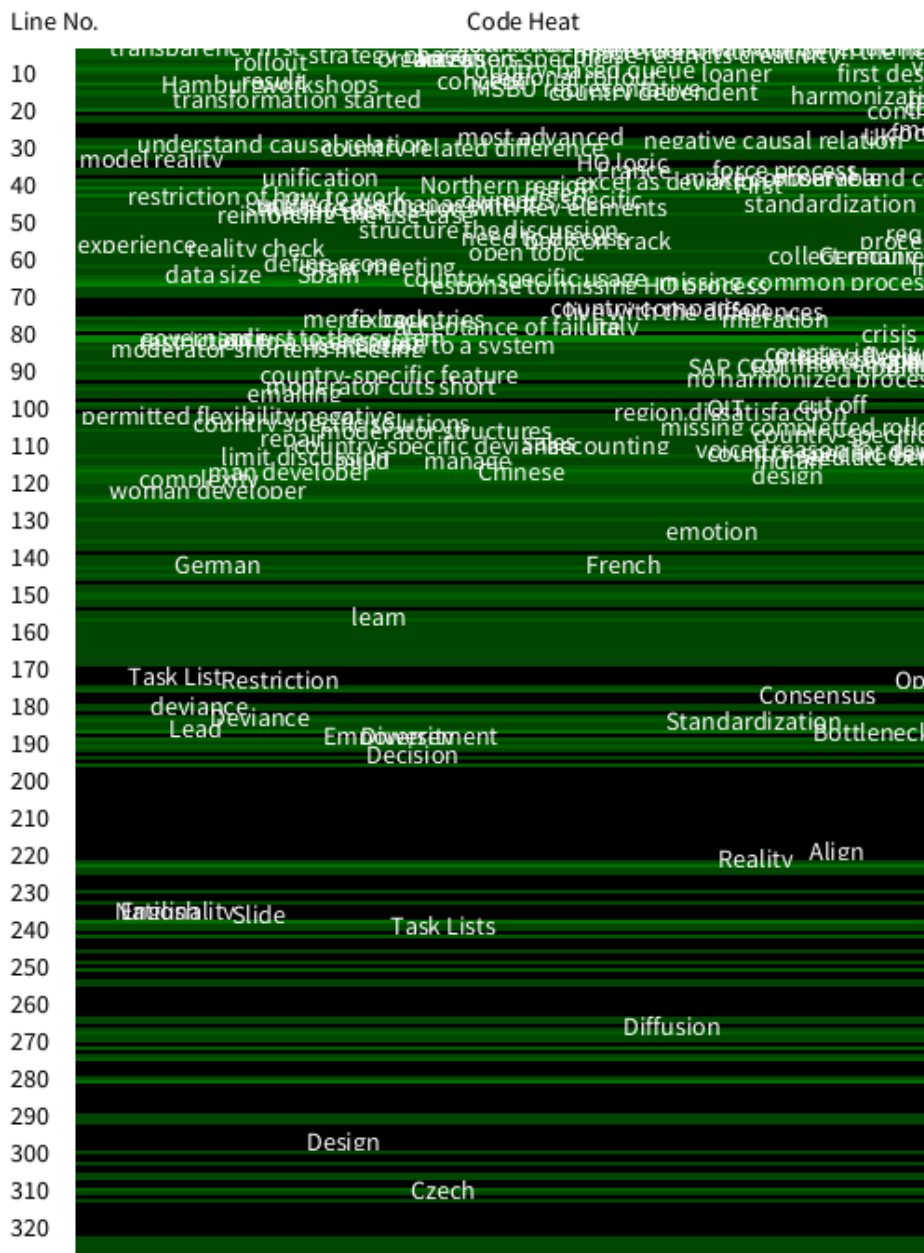


Figure 2: Heat Map with new codes displayed



Undertaking data analysis without the use of conventional Computer-Assisted Qualitative Data Analysis Software (CAQDAS) tools, our work recently found its entire coding being conducted within an XML file. The decision to deviate from utilizing a CAQDAS tool stemmed from the intrinsic need for a method that was not only expedited but also possessed a greater degree of flexibility.

Our method's increased speed can largely be attributed to the direct interaction with the text which XML allows, preventing any partition in the coding process. The conventional

methods employing CAQDAS tools often introduce a separation between the textual data and its coding. On the contrary, our XML-based approach ensures that interaction with the text remains undivided and, thus, more efficient.

Furthermore, our approach leans into being more flexible, primarily because it is not tethered to the protocols of a specific software. This decoupling from software restrictions grants our methodology the liberty to be open to flexible coding and restructuring. It enables us to manipulate, extend, and redefine our data analysis model dynamically, especially when further analysis is necessitated by the evolution of the project.

In terms of extendibility, the utilization of open formats like XML becomes particularly advantageous, especially when future analyses are algorithm-driven. By developing in the open, where the algorithm's structure remains transparent and visible, it facilitates easier verification of the appropriate treatment of the data. This approach is already being mirrored in various machine learning models that train and verify their models not by relying on the closed data emerging from computer-aided analyses but by analyzing open formats of massively coded data.

Moreover, adopting XML as a coding medium serves as a judicious compromise. This is due to XML's inherent ability to easily inline the data, aligning it more effectively with our analytical approach. Unlike the simpler tabular data often used in machine learning, which is usually given in a comma-separated structure, XML introduces a fundamentally hierarchical data structure. This hierarchical nature of XML coincides well with Grounded Theory's approach, working efficiently with tree structures to, for instance, assign "nationality" as a top-level code, and structuring subcategories like "French", "Chinese" underneath it.

In an era that critically necessitates taking the power of transparency and cooperation with algorithmic structures seriously, this approach demands we remain at the forefront of integrating technology and method. Through using XML, we strategically embrace an approach that blends potent technological strategies with a transparent and cooperative ethos in dealing with algorithmic structures.

To facilitate the editing of text within this framework, we employed a simple text editor, Emacs, which offers extensibility through its programming language, Emacs Lisp. A bespoke program was developed (see in the appendix the Code Listing for parsing the codes from the transcript file) capable of extracting the codes, in a manner facilitating subsequent structuring. The text editor itself inherently supports writing correct XML, which, as a data

format, inherently backs the data analysis by providing the required hierarchical structure. See

Figure 3 for a visualization of the coding environment, with one part of the screen showing the coded text in XML in the top left, in the bottom left the developed algorithm for generating the codes, and on the right the coding list. Figure 4 is showing how with a simple Jupyter notebook, another platform for scientists to develop code, which is very popular in the Artificial Intelligence community. Here a heatmap of the coded structure is shown, providing insight in the coding progress of the transcript. Figure 5 shows the code list in its finalized state, after the codes were systematically reduced.

As for the specific structure established, we created a system wherein the code “transcript” envelops the complete thesis at the top level. The “session” demarcates each recorded session in the field notes, corresponding to distinct meetings or days, while “line” designates the smallest unit of coding, predominantly a sentence. Each line can subsequently harbor several “codes”, providing a structured, hierarchical, and thus efficiently analyzable data set.

Figure 3: A screenshot of the development environment

```

<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
<transcript from="2019-08-14" to="2019-09-11">
<session data="2019-08-14">
- A new introduction round, T. does the introduction.
- N. is new asks for
- J. does introduction again
</line>
N. introduces himself. He wants to enable the uptime delivery from a European perspective,
so that the countries are able to achieve their promised uptime,
<code>uptime</code>
<code>European perspective</code>
</line>
- He has a background in aviation consultancy background.
K.
- Virtuoso.2 intro,
- T.: transformation part, cust exp, support, future org, tools SF, techno and transf
org element
- Release no 1, 1st trial, basic complaint handling
<line>N.: Focus on Iberia and Italy (lead J), because they have nothing in place yet
<code>country development</code>
<code>slow rollout</code>
</line>
U\*- thesis-data.xml Top (16,18) (nXML Valid)
(require 'xml)
(require 'subr-x)

(defun is-code (node)
  (when (listp node)
    (string= (car node) "code")))

(defun get-lines (node)
  (xml-node-children node))

(defun get-code-category (node)
  (xml-get-attribute node "category"))

(defun construct-category (node)
  (mapconcat 'identity
    (list "*" "
          (cdr (assoc 'category (car (cdr node))))
          "*" "
          (car (xml-node-children node))) ""))

(defun visit-code (node)
  (if (null (cdr (assoc 'category (car (cdr node)))))
      (mapconcat 'identity
        (list "*" "
              (cdr (assoc 'category (car (cdr node))))
              "*" "
              (car (xml-node-children node))) ""))
      ""))

-\\-- coded.el Top (1,0) (Emacs-Lisp ElDoc)
Chinese
* EMEA
* European perspective
* First
* France
* French
* German
* Germany
* HQ logic
* Hamburg
* Indian
* Italy
* MSBU representative
* Northern region
* OIT
* SAP CRM
* Spain
* UK
* acceptance of failure
* access
* accounting
* adjust to the system
* back on track
* build
* collect requirement
* common emailing
* complexity
* concept
* contractual restriction
* country comparison
* country dependent
* country development
* country example
* country involvement
* country related difference
* country specific solutions
* country system availability
* country-based queue
* country-specific deviance
* country-specific deviance hurts projects
* country-specific feature
* country-specific usage
* crisis mode
* cut off
* data size
* deferr
* define scope
* design
* emailing
-\\-- *codes* Top (1,0) (Org)

```

Figure 4: The visualization capabilities of the approach

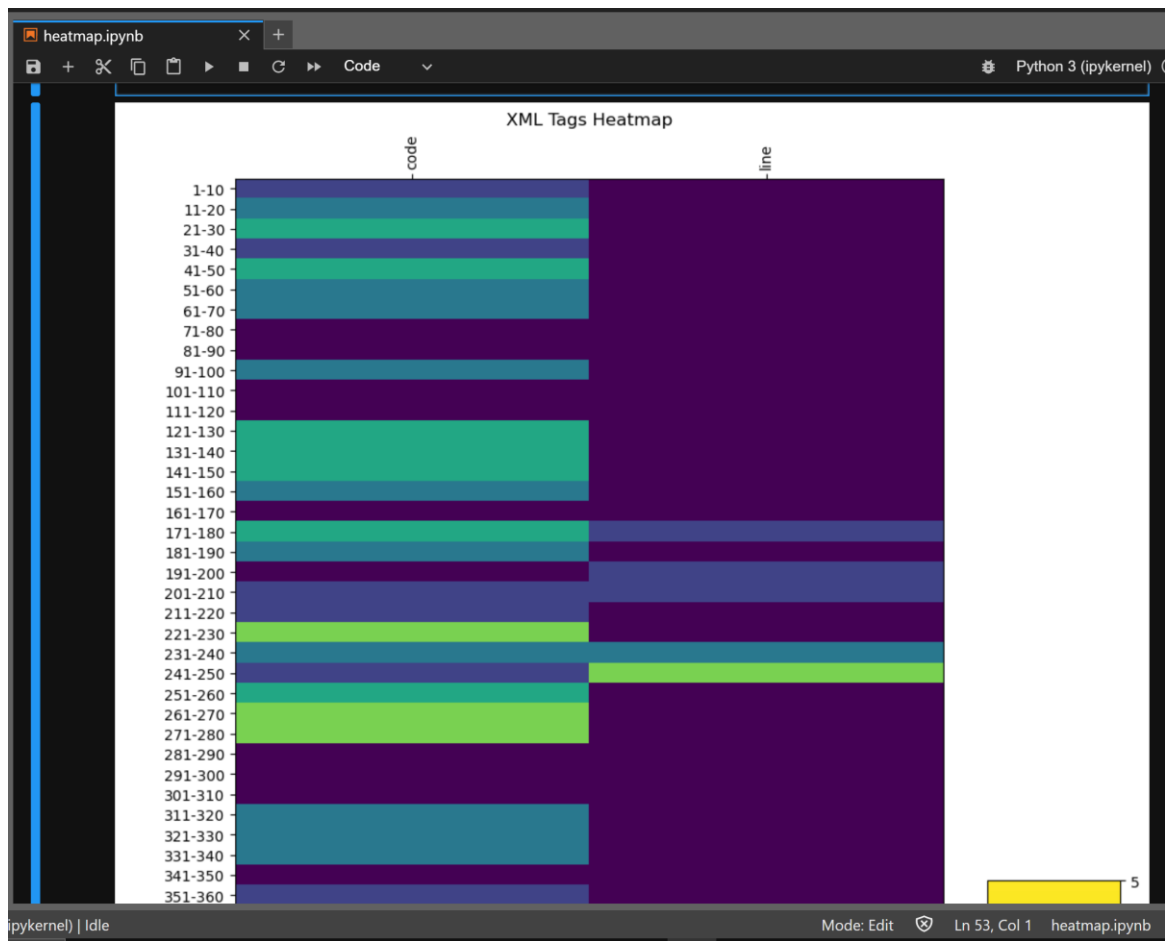
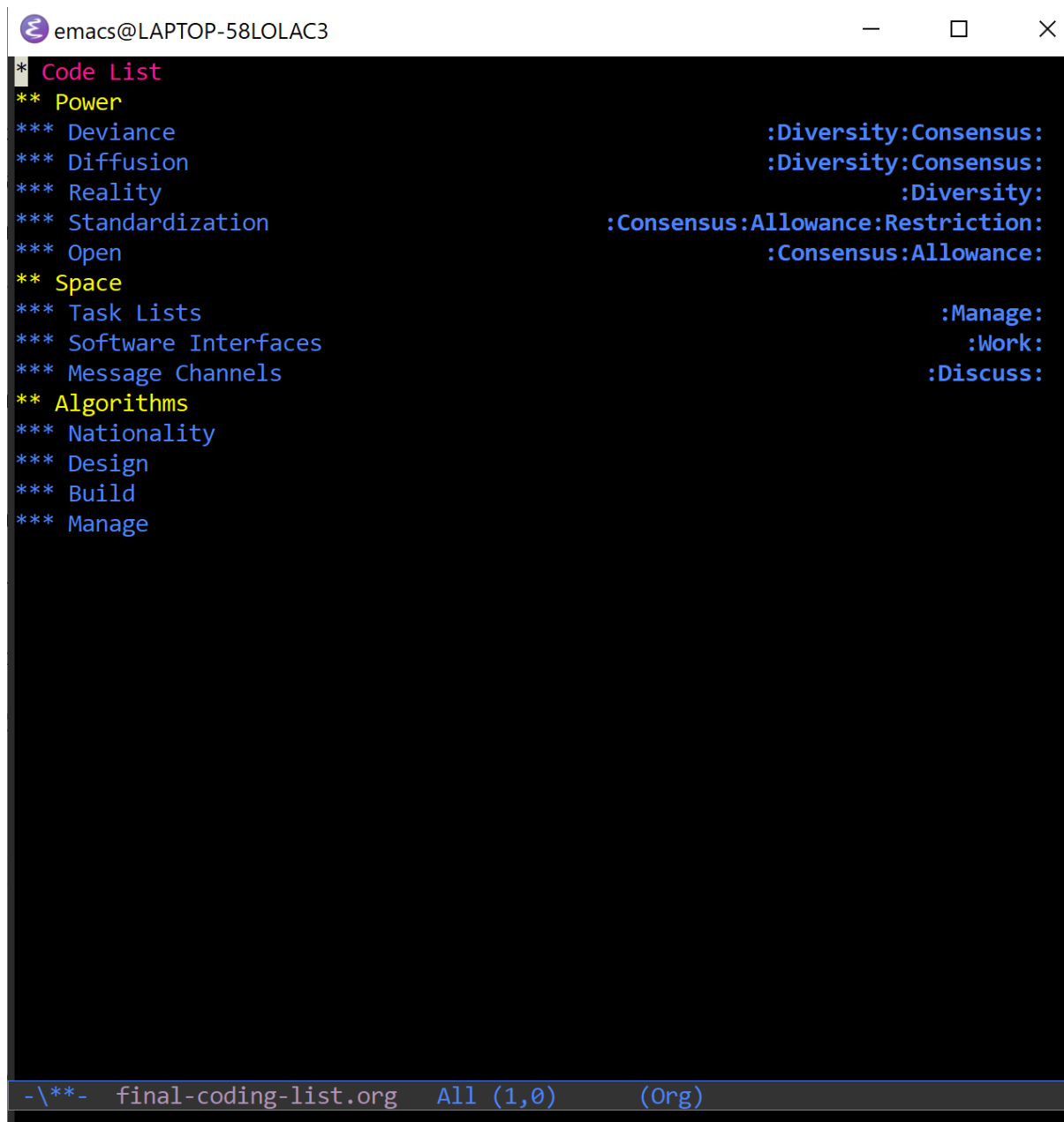


Figure 5: The visualization capabilities of the approach



```
emac@LAPTOP-58LOLAC3
** Code List
** Power
*** Deviance :Diversity:Consensus:
*** Diffusion :Diversity:Consensus:
*** Reality :Diversity:
*** Standardization :Consensus:Allowance:Restriction:
*** Open :Consensus:Allowance:
** Space
*** Task Lists :Manage:
*** Software Interfaces :Work:
*** Message Channels :Discuss:
** Algorithms
*** Nationality
*** Design
*** Build
*** Manage

-\\*- final-coding-list.org All (1,0) (Org)
```

The codes were found in the first iteration by using the meaningful context and trying to associate a familiar concept. The text was worked through line by line, with the sentence forming the atomic unit of the text. After doing this, the codes were listed and compared for duplicate entries and close distinction to see a theoretical framework emerge that can be used for further development.

Even though it is important to stress the openness of GT, Strauss defines three steps of doing GT (1987), which are also used in this study:

1. Open coding, free association of codes in the beginning.
2. Axial coding, deriving associations between the codes
3. Selective coding, re-coding based on now more firmly established core concepts.

These three steps are ongoing, passing to step 1 after finishing step 3, therefore stressing that each emerging theory in the form of categories with their codes is not a fixed hypothesis once established and then thoroughly tested in the course of the study, but rather propositions, bound to change in the course of the research.

Those facts derived from data have a particular nomenclature in GT. In general, theory emerges from the data according to the scheme: data → codes → theory. And this is where one can see that GT is also something of how research is done through coding, a central concept used to organize the data and make the mechanism of looking up cause and effect data to compare or ground the data constantly. Through the mediation of the codes, the theory emerges from the data. Another concept is that of the category in GT. A category is a concept of theory derived through codes. The theory has as its inner structure the codes and their relationship of them themselves.

The data established is not in a positivist approach to be understood as a complete sample of the research subject but has to be theoretically saturated (Charmaz, 2006). Different data points are first coded during the research, and then the same codes are compared. Fundamental is looking at the broader range of expression possible of data coded under one code. The researcher then looks if the data capture the entire spectrum. If this arises, then the theoretical sampling is said to be saturated. The same thing is analogous for the categories. The codes underneath should represent the full spectrum of the theory derived. It shows how critical the theory is also for the data. The theory is then related to the data in that it is established when enough data is collected.

In this way, GT looks very positivist in its outlook. It is assumed that the more we search, the more we find a core representing the truth. Codes and categories are refined until they fit reality. But GT can also account for the instability of Critical research. In that, the instability and locality of the code have to be stressed. Findings and codes are always just findings at the time, dynamic in their nature. The method's dynamism can also reflect reality's dynamism,

which can shift in its meaning, and the emerging theory when embedded in a different context, might take another form. The open-mindedness of the method makes it only partially positivist.

Grounded Theory has a certain tension in its relation between theory and empirical data. On the one hand, theory emerges through the data. On the other hand, data is bridged toward theoretical concepts. In general, GT is a qualitative method, but as GT is more of a conceptual frame of mind for research, it can also be used with quantitative data to enrich the context around the research project (Glaser & Strauss, 2009). Especially in the verification step quantitative data can help verify results derived through qualitative research, especially in the verification step. When one thinks again of the thick description, i.e., the report's description, quantitative data can enrich the meta-narrative, especially around societal constraints or the larger embedded context. We can think of two things here: an index showing the diversity by analyzing the members of a group Simpson index (Simpson, 1949) to describe diversity in thick strokes or population/demographic data around minorities to put diverse cultural backgrounds into a societal context. In another context, quantitative data can constantly question the derived conclusions, using quantitative facts to examine results and pose new questions. The mission of Glaser and Strauss (1967) was to close the gap between theory and empirical research. Often Grounded Theory is characterized as an explorative method, especially for a research object that is hard to grasp theoretically. But GT can equally be used to verify, a crucial step in the pragmatic cycle of deriving knowledge (cf. Dewey et al., 2008). As the primary motivation for using GT is to build up the full spectrum of the behavior of the individuals and the code through theoretical saturation, it is explorative in nature. At the same time, it should be stressed that qualitative research should not be assigned the role of an early research exploration phase, then be verified later with quantitative methods. As this research establishes itself as critical in paradigm, the reductionism implicit in an explorative study should be made explicit: Instead of seeing ethnographical data as something only enriching the theoretical viewpoint, this perspective can be seen upside-down. The theory enriches the data. In the same way, the positivist generalization of hypotheses, therefore, collecting data points to derive a higher-valued theory, has to be explicitly criticized. For qualitative research, in general, the order should be inverted. The data points are the core of the study, to turn to again and again at a later stage. Then one can see the generalized concepts as further away from the body, enriching the theory from another perspective. And then, as a counterpoint, whenever qualitative empirical

research puts individual collected data at the core of the study, does it not engage in some “logo-centrism” (Derrida, 1967)? Therefore, both views should be deconstructed, centering around core data points of collected data, abstracted concepts, and generalized hypotheses. In this study, we try to engage with the literature on the level of eye-to-eye. Neither approach should be preferred. If we see this in a dialectical tension, then shifting their meanings is to resolve the clashing of both concepts. When collected, data is already a theory on its own, as subjects experience the world through theory. So, whenever we think of only collecting data and coding as close as possible to the data, we’re engaging with ad-hoc theories and using another theory engaging with the literature. When shifting the meaning of empirical data, to theory in the small, versus theory in the big, we discover no contradiction but a movement from the localized knowledge to the inter-subjective knowledge of the other. When we research, we try to understand the ethnographic localized knowledge in general terms for the community of researchers. When reformulating the paradox in this way, we see how the movement from ethnographical data, the generation of codes, and the transformation of those codes into concepts that make sense for a general social scientist, be a movement from the subjective to the objective knowledge (Mead & Joas, 2009).

The empirical data and the literature together make it easy for a researcher to fit into a narrative structure that generalizes the results in a way that makes it easy for a fellow researcher to understand. But this interaction with imagining another co-worker that tries to understand the research makes it harder to do an explorative study that generates novel theory and mainly produces an approach that can, on its own, break away from anthropocentric concepts. The researcher always already understands the world as a human being. Still, this study tries to value non-human actors in the same way, to break away from a reductive and normative structure by focusing on the algorithm and the object's life cycle.

The codes derived from the data are used to, in turn, derive a theory. Even though we are using Grounded Theory, in a greater view of how to situate the study, it is not used for inductive theory building as (Eisenhardt, 1989) situates the individual case study. GT is used to build up an initial framework to advance from and let the discourse of individuals be expressed in its terms.

But even this approach doesn't guarantee a blank slate of research. When taking the data to the center stage, the observer, i.e., the coding social scientist, is bound to employ narrative devices, which makes it easy to fall prey to specific bound patterns of the observer. The

anthropocentric nature of the observer will impose a structure on unstructured object relations.

On the other hand, if one focalizes on the algorithm as an independent actor and object, then the narrative structure can be broken. This kind of ethnographic study tries to break away from common analysis patterns and see things that count, too, like the machines doing the calculation on the trading floor (Beunza, 2004). Maurer's (2005) work has been influential in bringing non-human actors into ethnography in the posture of side-stepping the already known decentering positions.

It is neither inductive nor deductive but rather a framework of how to do research in a constant cycle, oscillating between three states, inductive, deductive, and verification (Glaser & Strauss, 2009).

The idea of GT is that we should confront the research object without preconceived notions and slowly work toward knowledge embedded in the real-world domain. But this is impossible, as we already have theoretical background knowledge as a researcher. This ideal concept is then softened by establishing a research posture of confronting something new and being sensitive to bringing in too much theoretical baggage that does not reflect the reality of the data. The importance of that issue is becoming more apparent in that the two founders ("discoverers") of Grounded Theory split over researching inductively with a theory emerging solely out of codes and categories, Glaser and Strauss admitting the theoretical embeddedness of all research (Strübing, 2014).

We assume for this study all three types of how to derive new data. The theoretical notions must be explained in detail here as this logical approach toward knowledge is sometimes stated differently. Fundamentally there are three types of deriving new knowledge, inductive, deductive, and abductive. To understand each mode of reasoning, we have to establish three research objects, cause, effect, and rule. When we reason inductively, we observe a cause and an impact and derive a rule, our theory. Here we can see why Grounded Theory was early on characterized as inductive research because we start with the data, which states causes and effects, and then let a theory emerge. But the process in Grounded Theory continues beyond the deductive movement. To deduct can be described as observing an effect and using theoretical knowledge to deduce a cause. For the research, after we complete the first step and find a rule from cause and effect, we look at the impact in our data, check with the rules we derived in the previous step, and then deduce causes. Then comes the final mode of GT,

the verification. Here we'll then check if the deduced causes fit the observed causes. Therefore, the explanations should provide the data of the study. The final mode of reasoning is abduction (Strübing, 2014). Here we have two unknowns and the effect, but we neither know the cause nor the rule/theory behind it (Reichert, 2013). This might also happen and must be approached by systematizing our existing research data and proposing causes that make sense in the current context.

The philosophical basis of Grounded Theory is Pragmatism (Strübing, 2014). In the first contact between GT and Critical Theory (CT), Horkheimer, one of the founding members of the Frankfurt School, and therefore Critical Theory as an institution, positions the paradigm as being part of instrumental reasoning to delimit from subjective reason (Horkheimer, 2013). Instrumental reasoning means only acquiring knowledge because it is usable, not for the sake of it. But Habermas, who represents the next generation of the Frankfurt School, sees the emancipatory potential in pragmatism (Habermas & Shapiro, 1994) in that it starts in the well-meaning position of shared understanding. Grounded Theory, Critical Theory, and Critical Management Theory have common goals in considering local knowledge and rejecting a totalitarian view of making every form of knowledge universal (Denzin, 2007).

3. CASES

The study was conducted in a multinational, publicly traded corporation with approximately 32.000 employees, hereby with the fictitious name SalusVitrum Therapeutics. The principal seat of the headquarter is in Tokyo, Japan. The company is divided into several regions, with its own regional headquarter: Japan/Tokyo, North America/Centre Valley, EMEA (Europe, Middle-East, Africa)/Hamburg, China/Beijing, APAC (Asia Pacific)/Singapore. Those regions are then equally subdivided into 40 countries and sub-regions. North America and EMEA generate the most revenue, followed by Japan, China, and APAC. The data were collected mainly in the German headquarters of the EMEA region in Hamburg.

SalusVitrum Therapeutics strategically locates itself as a medical technology company. While observing the company, different parts of the business as the consumer branch or the non-medical business were either sold off or organizationally restructured. Medical equipment is designed, built, and shipped and entails a service part where devices with issues can be sent in and repaired, either in local repair centers or shipped to specialized central locations.

At the beginning of the projects for SalusVitrum Therapeutics, a strategic decision was made to transition into a global company. This shift changed the department's responsibilities from supporting a single region to assuming a more global role, and it led to the integration of global software within cross-regional teams.

The regional headquarter in EMEA is in Hamburg, close to the center. A close-by train station is one stop from the city's central station. The country's subsidiary is also in the same building as the regional headquarters. At the time of the writing, the manufacturing plant was moved to the outskirts, about 45 minutes away from the headquarter by public transportation.

While recording the data, measures taken against the COVID-19 pandemic started restricting access to the building complex. That is why remote work started in March 2019. The researcher was not in the office since then (August 2021), and went back the next year (August 2022).

Meanwhile, a new building for the headquarter was constructed. The new office building is close to the old construction. But the concept of the building is meant to express a new working attitude. One floor in the old building was installed for employees to use new working concepts. Instead of the fixed seating order, different chairs, seats, and couches were

provided to accommodate different working modes. In the new building, these concepts shall be then implemented for the whole building. Especially the non-fixed seating order troubled many employees that are used to a predefined seating order given by their manager. According to the new concepts, one can choose freely for every task in a new place. In anticipation of this unique working style, workers voiced the concern that their special equipment, e.g., fixed phones and multiple monitors, won't find a place or is unavailable. Another concern was the perceived lack of space for each employee.

But the researcher could never visit the building because of the pandemic. Several workers had already entered the building. However, a maximum of 50 percent of the workers are allowed to work simultaneously. That number is fixed, and there is a list that the worker with their manager in advance decided.

Apart from the spatial differences, the company was not that negatively affected regarding the revenue, even though this was expected by senior management. This was possible because of reduced marketing and sales costs, because travel was restricted, and fairs could not occur. However, serious cost containment measures were started in 2021 to have the budget to retake lost marketing and sales potential that would affect the company in the long term.

The researcher was collecting data in the IT department of the EMEA regional headquarter. This department supports the functional user with various software that enables the business. This entails websites that sell consumer devices and the governance of standard software tracking sales, services, or general customer data. For all systems, the developers, analysts, and managers are working on extending and rewriting the systems to be compatible with new regulatory requirements and internal process adjustments.

Groups are defined mainly by their systems, and a senior manager also once noted that a group's responsibilities end at the system's borders. While recording the field notes, the researcher was spending time mainly between two groups in the IT department, for the first year CRM service and later the integration group. The observed projects are in the context of most groups in the IT departments, and that's why it is essential to describe a rough picture of the complete context, not just the one the researcher was directly a part of. There is also a difference between project teams and group members. For example, did the researcher work on one project in the context of Sales with a functional user from the Sales department as an

engineer? Even though the researcher was doing this as part of the integration group, but was part of his project role.

The sales group handles the SAP ERP system, where sales contracts, products, and prices are stored. The group's software architect was very much involved in two observed projects. The ERP system supports the sales of the devices by holding quotes made to the customer, having the most actual prices. The system is built on top of the SAP stack, which means a particular eco-system that includes the programming language but is a complete platform with different ways of creating and managing the code.

The service group handles the SAP CRM system. This system again has the same platform as the sales group. In this system, the installed devices are recorded, e.g., where an endoscope is used, in which hospital building by which customer. The critical point is that there is much movement for these approximately three million devices. The system contains all data relevant to the service business, e.g., service contracts and repair orders. Many machines are sent, for example, from the hospital in a box to the repair center, where the device is cleaned, inspected, repaired, and shipped back. All different states, the tracking of how much a repair costs, how the device is shipped around, and what service contracts are valid to bill the customer are recorded in this system correctly. So each repair center has a web screen open while working on the devices. The system supports the repair process.

There is a master data management system that is supposed to govern master data. Master data are the data that form the basis on which transactions are executed. For example, the customer contact information is master data, and the quote for a customer would be transactional data. The system is newly set up and governs accounts and contacts, nothing more at the moment of taking the field notes, even though later on, more master data is planned to be taken into account. Therefore, contacts and accounts are fed to and transferred from this system to other connected systems.

While the other systems were more back office systems, meaning they are there to organize processes in the background, the front office system is the Salesforce system responsible for being used for all customer interaction. This can be imagined in how the Salesforce system finds the correct information when the customer calls an agent or when a salesperson visits a customer in the field. The system will then help get the data from the back-office systems and display the information so that customer-centric service is possible. In the field notes, this was called many times by the external company's implementation team as the 360° view of

the customer, meaning this system is responsible for providing all information surrounding the customer, so to say to provide a rich contextualization of the past interactions. Additionally, automated price quoting is executed in parts of this system. As quotes are getting more complicated to provide to the customer, those systems support the sales representative to automatize calculating the price of an offer. This Salesforce system has a different technology platform behind it, meaning the code written for this platform differs significantly, with a different programming language and the complete way to create and manage code. That is why it has a special place from a governance point of view.

The integration group is responsible for connecting all of those systems. As with the Salesforce system, a different platform is used here. However, as SAP supplies the product, the ecosystem is more integrated into the SAP ERP, CRM, and MDG systems. This difference is not only significant from a technological point of view but equally from the point of view of actors with specific careers and the companies and their concepts behind the provided products. But equally for the researcher, as his role is also to provide development governance. As the code platforms differ, so has the governance to account for the differences. Moreover, one of the biggest challenges is the difference between developer cultures that are not the same, depending on the platform.

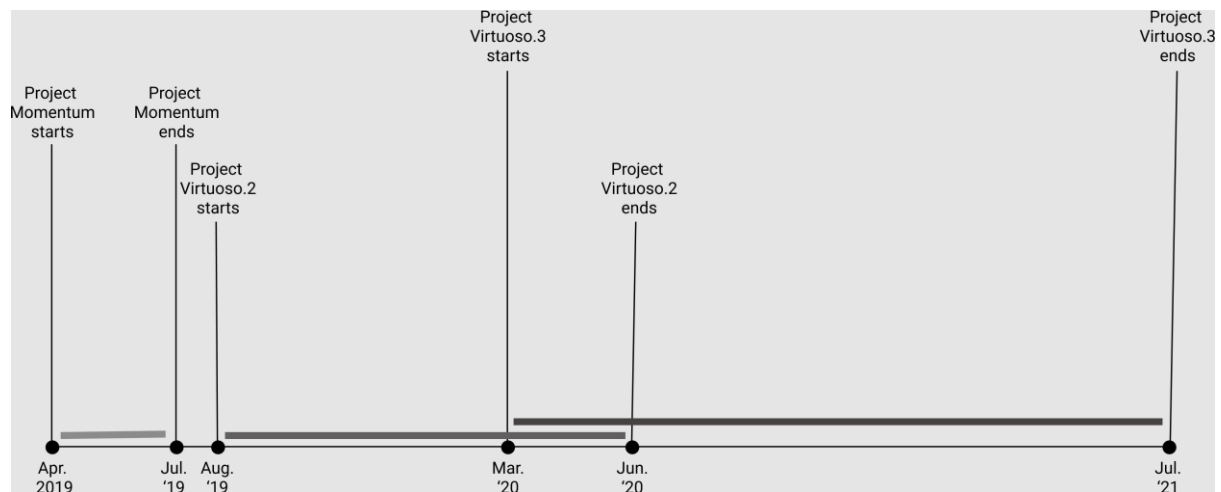
Each group has internal employees mainly responsible for the task, described by a senior manager at the top of the value chain. External employees are there for the repetitive task, the internal worker would work more on a proof of concept or design, and the external to implement or scale the changes.

External employees are from a big multinational consulting company with a seat in London, United Kingdom. Other external employees are from a consulting company that is based in Bombay, India. The former is used solely for projects. The latter provides employees for projects and also for support tasks. The latter company is more integrated into the groups, as the management of the external employees is then for projects and support under one manager integrated into the group. The former company is more concentrated on the projects, and the workers will mostly be known to project members but unknown to the group.

The researcher was part of the CRM group for the first year and then transferred to the integration group. In the integration group, he also took the lead developer role, writing guidelines for all development teams and taking care of overarching concepts for the development teams. At the same time, he was still a specialist in the SAP CRM system as

part of his project's role. One can see here the difference between group and project management, which are not always aligned.

Figure 6: Timeline of the observed projects



Project Momentum is about the design and implementation of an algorithm. This project is handled more in isolation. Only the CRM group was involved. It was recorded in the timeframe between April 2019 and July 2019. This project was the earliest recorded one, entirely on-site, without the pandemic.

Virtuoso.2 and Virtuoso.3 are connected as if they are part of the setup of a new system, a new interconnected platform. The Salesforce group was new and part of a more comprehensive customer engagement strategy. All other groups are, in some part, involved through interconnected technological system interfaces in setting the stage for the frontend customer engagement platform. Virtuoso.2 started in August 2019 and ended in June 2020. Virtuoso.3 was in-between the timeframe of March 2020 and July 2021. When referring to the projects Virtuoso.2 and Virtuoso.3, we will shorten both with the abbreviation *Virtuoso.x*. Between March and June 2020 was a difficult time, because both projects were intersecting with each other, putting stress on the team to finish one project while starting another one and simultaneously handling the new situation of the pandemic, which started to have workplace restrictions from March.

Each project went through five general phases, independent of whether the project was deemed to be agile or waterfall: (1) design, (2) implementation, (3) testing, (4) go-live, and (5) hyper care. The three first phases are more clearly defined as project phases because they are more embedded in the organization's daily work environment. Phase 4 is more of a rupture of daily life, the special event of the go-live. For this event, weekend work has to be mostly done not to disrupt the day-to-day operation of the business. The go-live means that

the developed software will be finally transferred towards the productive system where the daily business of the workers has to be done. Before, in the other phases, only test systems were changed. This transfer is stressful to most of the participants, especially the technical team because certain kinds of errors can occur, and there is a limited timeframe to fix those errors. Then after a stressful weekend, a phase of two weeks follows where the developed software is not maintained in the usual way, a ticket is opened, and a special service team is taking care of it, but the project team will directly take care of it.

The first two design and implementation phases are the most significant distinction of whether it is an agile project. When a project is deemed agile, the design and implementation happen simultaneously after a short while. At the beginning of the design phase, the more abstract architectural decisions are being taken, e.g., the object design, the process flow, and the system's capabilities. Then the team starts to create requirement documents, called user stories, which are refined until they are ready to be implemented by the software engineers. This contrasts with how the waterfall project would proceed, where all requirements are designed upfront and are only touched in the implementation phase. But even then, requirements are changing, and it is just through the practices, but not the guidelines, that these are handled.

The two releases, each a separate project, are structurally and content-wise very much the same. While the latter project was riskier, according to a manager, and verified by co-workers because it concerned the sales process, the former was more complex because it had to handle the complex backend processes. The repair process of Virtuoso.2 has many different eventualities. Virtuoso.3's sales process is more straightforward. The two processes are very different, sales is the thing that comes in acquiring the customer, service processes are utilized later for repairing faulty products, or routine maintenance tasks.

The project Momentum is very different, even if it concerns the same organization. The project's scope is minimal. The team is small. But at the same time, less agile. Requirement documents are set up beforehand; there is just one significant development phase. At the same time, many things are changing while in the building phase, and those changes are adjusted. However, this happens in an ad-hoc unstructured way.

Both Virtuoso projects concern many more people, and the agile development style of planning based on small design steps is used. One can say that the more significant project,

Virtuoso carries prestige in the organization, which is why a novel methodology is valid just for advertising the project.

To show the difference between the projects, the Simpson index (Simpson, 1949) was used. This works by classifying the group members by role, and then calculating the probability that two randomly drawn individuals are of the same type. For example in a project we randomly chose a team member, and then do again a random selection, then in both cases it is an engineer, we will calculate how likely that is. This has to be done for all roles. It would be for example if the group would only consist of engineers, and very unlikely if there would be just one engineer. This shows that a group with less diversity, only engineers, would have a very high index, and a group with a lot of diversity very low, as it would be very hard to choose an engineer twice out of a group with a very small percentage of engineers.

Different categories are built up by combining region, department, and function. Virtuoso.2 has an index of 0.08, Virtuoso.3 of 0.07, and Momentum of 0.42. An index of 1 would mean that there is no diversity. That means Virtuoso.3 was the most diverse project, followed by its sister project Virtuoso.2, with almost the same amount. The smaller project Momentum has a very different index and the least diversity, which its significantly smaller size can infer, and therefore lessened complexity. Table 4 below shows the different persons involved and the computed Simpson Index.

Table 4: Involved Persons and the Simpson Index

	Virtuoso.2	Virtuoso.3	Momentum
Involved Persons	65	48	7
Simpson Index	0.08	0.07	0.42

3.1 Project Momentum

Date: April 2019—July 2019

Number of people involved: 7

Simpson Index: 0.42

Project Momentum was a differently-sized project where an algorithm was designed. The design was done mainly by just one subject matter expert from the headquarters with the verification by two subject matter experts from the West region. Four persons from the IT department supported the project, meaning they were based in Hamburg. This four-person team comprised a process expert, a project manager, and three engineers. Two of the latter are external employees.

The project's content was to create an algorithm that makes it possible to predict the time a device will be repaired. Part of the project was implementing methods to constantly feed the algorithm with new data to adjust the expected times. So that whenever a worker receives a device for repair. Each machine has to pass through different stations until it is ready to be shipped back. The algorithm will then determine how long it will take until the customer returns the device.

Table 5: Distribution of functional project members for project Momentum

	Momentum	
	Subject matter expert	Techno-Bureaucratic
Germany, Austria, Switzerland	1	4
Iberia	0	
Italy	0	
West	2	
North	0	
East/Central	0	
UK	0	

There is a conflict being played out between technology and business teams, in a way. This is especially clear for the smaller project Momentum. Here one has to consider the classical model of software development. Classically, the requirements should be finished early on in the project. Then the implementation phase starts, where the development team can start working on those requirements. Later in the test stage, the business team only compares what was required and if this fits the real developed system. But in the observed project, the requirements were constantly changed and adjusted according to what could be observed from the current development. In this working mode, which resembles the agile way of working, business and technology teams work closely together, with changing requirements until the end of the project. The conflict arising here is that there are expected timelines, which pressure the development team because each adjustment in the original requirements means a new timeline is emerging. In the end, this has to fit into the overarching communicated timeline.

This conflict mostly plays out only between the technology team and the business team. The external workers are here very well integrated. The only thing is their vulnerability. One conflict arose when Andrew, a Swiss freelance engineer of Chinese origin, was finishing his development task, and once the code was ready, handing this over to an internal German technology team member Stefanie, which organized the testing with the business group of the team. Then the quality was not on par, and adjustments were needed. After noticing several back and forth between Andrew, Stefanie, and the business colleagues, Stefanie started to take over the testing tasks herself, getting irritated by the delivered code quality. After the end of this project, the contract of Andrew was not extended. Internal employees have the power over external employees to judge and guarantee further employment.

Roles

What follows, is a short description of the different roles found in the project.

Subject Matter Expert

[Jan, Dirk]

Jan was a Polish engineer responsible for project Momentum. He was speaking German with all his German colleagues. He was known for his hard work, especially in this project, because the other similar roles could not finally join in the project. That's why most of the

work as a business counterpart was done by him. He was supporting as an expert for the repair process in the workshops around the SAP CRM system.

Dirk is a senior integral part of the IT team as a business process expert. But as he is from the IT team himself, his stakes are different than other before-mentioned experts. He often interprets his role as supporting the IT side of the project, and because of his seniority being able to influence put the project on track for engineering quality. He is German.

Engineer

[Andrew]

Andrew was a Swiss engineer of Chinese origin. External employee, not of a different employer but self-employed. For the project Momentum. Later let go because he was giving the impression of not testing his code enough before letting internal employees try the code.

3.2 Project Virtuoso.2

Date: August 2019—June 2020

Number of people involved: 65

Simpson Index: 0.08

Virtuoso.2 was about the introduction of the Salesforce platform, a customer relationship system, for the service processes. It is very different from Momentum. All Virtuoso.x projects, comprising Virtuoso.2 and Virtuoso.3, represent a more complex project type. They encapsulate the challenges of synchronizing multiple teams, overlapping timelines, and for Virtuoso.2 the volatile environment of a global pandemic. These projects were pivotal in reshaping the customer engagement platform and stood out, not just for their size and scope, but for their agile approach. The agility infused into the development processes allowed the projects to continuously evolve, adapting to the shifting needs of the stakeholders and the organization at large.

This can be contrasted with Momentum, which differs in its singular focus and streamlined approach. Momentum has a pre-defined structure and a less agile methodology. It exemplifies projects where simplicity and clarity take precedence over adaptability. Yet, every project, irrespective of its scale or methodology, has its unique importance and

challenges. Whether it is the prestige associated with Virtuoso or the precision and clarity of Momentum, these projects underscore the multifaceted nature of organizational projects and the diverse methodologies that steer them to success.

The two Virtuoso projects (we clutched them under the moniker Virtuoso.x) form one initiative, to enhance the quality of the customer interaction. Content-wise, the initiative can be mostly seen as an enabler in an algorithmic system, to bring the algorithm itself to the forefront. As Virtuoso.2 was about the introduction of the Salesforce platform for the service processes, a hub was established to provide data from different systems in a unified way. But additionally, existing processes were carved out of the old CRM system and established here. The project team had to analyze what was already there, and adjust the business process to the new technical system. On the other hand, the new system also enabled new processes. For example, before a repair process was only recorded in a fine-grained way by recording the repairs, but now the contact with the customer itself started to be tracked. As an enabler of algorithms that were implemented in the spoke system of SAP CRM, the power of those algorithms was equally enhanced. One important algorithm that determined how long a device was “down”, meaning it was broken, and couldn’t be used. The new system more comprehensively showed this status, so that a territory manager could directly determine the speed of the repair workers.

For Virtuoso.3, the Salesforce platform was enhanced, so that now the sales processes are down in this platform substituting an old system. Here, in the same way, algorithms of the SAP system were empowered through connecting the data. The old system was a separate system, that didn’t have the service system integrated, but now with the connection of the data, even of, for example, prospective customers, the system’s algorithms could be made more powerful. Taken the example before, the up and down time algorithm could now be used to create new contracts by comparing the repair times of existing and similar customers.

The initiative started with project Virtuoso.1, where the researcher was only slightly involved. Both projects, Virtuoso.2 and Virtuoso.3, had a setup in two parts, the functional team consisting of a product owner, panel members, and a subject matter expert. The functional team had external support that was crucial to structure and manage the implementation of the standard software. Salesforce is software that should work in a wide variety of business contexts. External consultancies then can provide expertise in the product itself, even if the business process itself for the client is unknown to them. Then there is also

the knowledge from implementation with former clients, which can be used, too. The external consultancy was not just providing business analysts, leading in choosing which aspect to discuss, but also future state consultants, providing insights into what can be done with the software. Furthermore, the “agile” framework was provided as a mode of working, and by also making individuals available with specialized roles, like Scrum master, which was with a project manager.

In addition, the project included a technical team, which involved the rough distinction between program management, stream leads, technology enabler, and external workers. Even though the individuals changed between the two projects, structurally, it remained the same. Both projects’ mode of working was “agile.” In the context of this study, that means that the implementation and requirement were not definitely fixed. The timeframe was set, the technical team was chosen, and the goal was to implement the product owner-prioritized requirements in the given time with the given individuals. The project differed in implementing the Agile methodology in that the more oversized frame was given as requirements, just not in an operational, detailed way.

The general project template remained the same for the two releases that I could observe (see Table 6), with program management on top of managing the fundamental outside communication. Then stream leads containing logical units of the projects. And then a division of external labor provided by a supplying company and internal employees responsible for specialized in-house knowledge and general sustainable governance. All individuals have different specialist roles, e.g., IT owner of an epic, being a group of related stories, which means requirements that form a coherent narrative form.

Table 6: Virtuoso.x Role Template

Actors	Structure
4	Program Management
7	Stream Leads
34	External Team
27	Internal Technical Team

Project Virtuoso.2 was divided into two parts. I could observe service and sales. This corresponds to two functions in the product cycle of the SalusVitrum Therapeutics, the service group with the SAP CRM system and the sales group with the SAP ERP system.

The field notes were taken mainly during the design and build phases, from mid-August to mid-September. As the project was implemented Agilely, the design phase recording appeared in one instance after the build phase. The design had to be reinstated several times as the technical reality became more apparent with the first developments.

As mentioned above, the business team was structured into a product owner, expert panel members, and subject matter experts. The product owner belonged to the headquarter. He was responsible for managing the functional requirements and prioritizing the things that could be implemented by the technical team in the given time frame. Each work stream, sales, and service had a separate product owner.

Meetings had, in general, at least one engineer in the room. The most crowded meetings took place while doing review sessions. Those were sessions where the work results of a “sprint” were discussed. It is an Agile expression for a small timeframe, in this project to two weeks, set to be a mini project inside a project. The review sessions are then like project-end presentations. One can imagine a room of people from functional areas who wrote specifications and engineers trying to cobble together something presentable.

Then there were medium-sized sessions with functional and technical team members trying to work out the design together, introducing the new system, what would be missing, and how this extension could be technically implemented. Sometimes, a more significant decision had to be made. Then, the researcher had to prepare some slides with his manager, which were presented in the steering meeting to more senior management, deciding on this aspect. To go on with this example, the element to be selected here was if the legacy system should be integrated as a smaller window into the new system. The minor meeting was between engineers, e.g., to find out how to design protocols between systems or stress test the systems.

Table 7 shows the project’s structure, divided into the two recorded work streams, service and sales, and then into different roles, e.g., expert panel members. It shows that the head quarter’s region is overly presented in the expert panel, with 41% and 55% as subject matter experts.

Table 7: Virtuoso.2 The Project's Regional Structure

	Virtuoso.2			
	Service		Sales	
	Expert Panel	Subject matter expert	Expert Panel	Subject matter expert
Germany, Austria, Switzerland (DACH)	8	4	4	7
Iberia	1	2	1	0
Italy	1	0	1	2
West	4	3	3	0
North	1	1	2	0
East/Central	2	0	1	1
UK	0	0	0	0

Service

The expert panel comprised 17 individuals from six regions: DACH (an acronym signifying German, Austria, Switzerland from Deutschland, Austria, and Confoederatio Helvetica), Iberia, Italy, West, North, and East/Central. The board had initial workshops and regular meetings to steer the project's direction by creating requirements, checking existing designs, and de-prioritizing other tasks deemed too challenging to implement in the given timeframe.

Thirteen individuals, of which three were expert panel members from four different regions: DACH, Iberia, West, and North, were subject matter experts. Those workers supported the specification set for a specific part of the resulting product. They were meeting up regularly, multiple times per week, with the technical team members to answer questions or make decisions that affect the business value.

Sales

For sales, were 15 individuals in the expert panel from the DACH, Iberia, Italy, West, North, East/Central regions. Additional experts from Germany were tasked to be experts in manufacturing and surgical/scientific solutions.

Ten individuals were subject matter experts from DACH, Italy, East/Central, and specialists for surgical and scientific devices.

There are two views on the participating individuals. First of all, the complete system of actors is more extensive than what I was able to record. The former official view, therefore, shows the complete list of actors with roles. The latter statement is the one that I could register as part of my daily interactions and the resulting field notes.

Twenty-nine core persons, each with different roles, were observed in the projects. First, I will describe the project Virtuoso with its other releases. Then I will tell the project Momentum, which will have similarities, but because of its size and role in the company, it is set up differently.







Figure 7: Team members' composition

Name	Association	Role	Project	Mother Tongue	Sending Ctry.	Region
Floris	internal	✨	Virt.2	German		HQ
Chantal	internal	★	Virt.2	German		DACH
Isabelle	internal	🍌 ¹	Virt.2, 3	German		HQ
Linh	external	🍌 ²	Virt.2, 3	German		HQ
Sofia	Internal	★	Virt.2	Spanish		DACH
Noah	Internal	🚩	Virt.2	English		HQ
Shaan	External	🌟	Virt.2, 3	Bengali		HQ
Hakan	External	🏠	Virt.2	German		HQ
Achim	Internal	🔧	Virt.2, 3	German		HQ
Sebastian	Internal	★	Virt.2	Czech		DACH
Susanne	Internal	★	Virt.2	German		DACH
Maria	Internal	★	Virt.2	Portuguese		West
Elias	External	🔧	Virt.2	German		HQ
Jan	Internal	★	Mom.	Polish		HQ
Andrew	External	🔨	Mom.	Chinese		HQ
Praveena	External	🔨	Mom., Virt.3	Tamil		HQ
Dirk	Internal	★	Mom.	German		HQ
Clara	Internal	🔗	Mom.	German		HQ
Salomé	Internal	★	Virt.2	French		West
Jochen	Internal	🔗	Virt.3	German		HQ
Jakub	External	📁	Virt.2, 3	German		HQ
Hendrik	Internal	★	Virt.2	German		DACH
Irmgard	Internal	📐	Virt.2,3	German		HQ
Constantin	Internal	📐	Virt.2, 3	German		HQ
Armin	Internal	📐	Mom., Virt.3	German		HQ
Adar	Internal	★	Virt.2, 3	Norwegian		North
Marie	Internal	📐	Virt.2, 3	German		HQ
Martina	Internal	🚩	Virt.2	Spanish		Iberia
Adhi	external ³	🔨	Virt.2	Tamil		HQ

¹ Belonging to the subgroup *program management*

² Belonging to the subgroup *stream lead*

³ Changed later to internal.

Deva	external ⁴		Virt.2, 3	Tamil		HQ
Shayana	External		Virt.3	Tamil		HQ
Vasikaran	external		Virt.2, 3	Tamil		HQ

Legend














Release Owner: , SME: , IT Lead: , Scrum Master: , Product Owner: , Salesforce Implementation Lead: ,
Integration Lead: , Tech. Integration Lead: , Build & Implementation Lead: , Engineer: , Project Manager: ,
Business Analyst: , Software Architect: 

Figure 8: Map showing the team member's mother tongue



Legend: All blue shaded countries have team members with the country's associated mother tongue, the darker the blue, the more team members with that characteristic.

Each individual can be categorized according to their role at several levels in SalusVitrums Therapeutics, the project, and a particular group inside the project. Those are all specific criteria according to the company-dependent cultural context, an internal context. Then there is the external context, a macro context of being a country's citizen, as the headquarter of many different countries are the source of the project's human resources. Germany, the UK, France, Switzerland, Norway, Spain, and India are different countries. Germany and France have here a unique relationship in requirement engineering. They have much influence in the decision-making process of the product because those two countries are leading in sales and the number of repairs. Spain is important as it is part of a grouping with Italy and Portugal, the countries where the new CRM system was first rolled out to the workers. India is mostly

⁴ V. S.

the country of origin of external workers in technology. There Tamil is the primary language of the CRM team's implementation, with Chennai being the most prominent hub, but people are working remotely from different parts of southern India. But this Indian region is not exclusive. Also, some workers are from the Northern part, with Delhi as a center, but not exclusively. In these two regions, the speakers are either speaking each other southern Indian (Dravidian) languages, i.e., mostly Tamil, but also Kannada and Telugu are spoken. The Northern Indian speaker uses Hindi, which some Southern Indian speakers also use. German was a dominant language, and incredibly complex technical discussions were switched several times to German from English while excusing the use of a language that not everybody could understand. And more so, German was used in many interactions whenever all of the speakers were Germans, or also with the speaker where German is not the mother tongue, e.g., two subject matter experts, one originating from Colombia, the other from Poland, speaking German.

Program Management

Program management was only given for the two more significant projects, Virtuoso.2 and Virtuoso.3. The role of the program management was more to make sure fundamentally the project was moving in the right direction, and communicating critical decisions while having an open ear for the feedback of functional workers, how the product so far is received. Two persons are responsible for the program management in general. Two more are split between a) information technology management and b) business lead.

Four names are associated with the program management, each with a specific role. Especially notable in our recordings is Isabelle. She is German and has a function explicitly concentrating on information technology management. She is a long-term employee at the company and is one of the project's prime movers, at least from the IT perspective, organizing the weekly meetings for the engineers' feedback on how the project is running.

Stream Leads

The word *stream* refers here to the *workstream*, another group inside of the group split by the function. Seven persons are part of the stream lead in the project Virtuoso.2 and Virtuoso.3:

1. the release owner governs the release as a whole and not just individual products.
2. The stream lead for the program management is leading the effort of the before mentioned institution.
3. The business lead checks specifically on the business/functional workers about their needs and requirements.
4. The IT stream lead is doing what the business lead is doing, but for technical workers, supporting the project's governance of IT-related activities. Making sure that impossible requirements are changed so that they become possible, engage in gathering crucial requirements when they are provided late or incomplete.

There was a pronounced difference between external and internal team members in their role and performing this role. As explained from the company's perspective, internal employees are there so that certain functions can be governed, and it is made sure that external employees are not just extracting values for their own company disregarding the importance of the researched company, especially in technical matters to be able to create sustainable products. Otherwise, in digital projects, the risk is there to create code that runs fine for the tests but is not fit for the wealth of situations encountered in long-term use. In the same way, the criteria of software quality might not be visible in the project to the business users. Still, they are equally important when creating a software project because of the beforementioned long-term use of a highly complex functioning 'behind the scenes.' For the three projects, external workers were employed by two different companies, and in my notes, I recorded the action of one single, but essential in the data, self-employed developer. One of the supplier companies of external employees is responsible for the complete maintenance of the systems anyways, extending the code whenever a function doesn't work as defined beforehand or doing more minor extensions if the product misses some more minor functionality that was not anticipated in a project, and is small enough to not merit a whole project, with all of its overhead costs. The same company also provides project employees who are different from the support workers. They are mostly more efficient employees and are on-site. Even though the latter parameter changed during the pandemic, more employees returned to their sending company's country, i.e., India. But the project employees are generally better integrated into the teams than the support workers. But this separation is not working in a clean break. When the tasks demand it, there is an exchange of support workers working for projects and project workers doing work for the support. Especially the distinction between a Change Request,

which is a minor change, not meriting a project, a bug, meaning a malfunctioning or even a project is blurred. With these borders, it is played with and adjusted as fitting. Both companies are interested in a well-functioning relationship between both parties.

The other provider company for external employees was only responsible for projects, namely in our recordings for both projects Virtuoso.2 and Virtuoso.3. They came as a complete team already, and with the way of working, in this case, a more 'agile' methodology. Especially for the implementation of Salesforce, a standard software, the external company managed the implementation, i.e., the specialized adjustment of said software to the company. That also meant structuring the implementation effort, presenting what is already there, and structuring critical decisions.

Their structural divide was the source of many conflicts because of different organizational goals. The central dispute concerns the long-term implications for the internal team, having a maintainable product, being valuable and complete, and clashing with the external company's goal to confirm the agreed product in a minimal, most cost-efficient way. That means implementing the standard software in a way that is just about finished in the agreed time frame without stressing more resources or finding a way to speed up the work. One example would be that the internal promotion of requirements was blocked because it didn't seem feasible in the given timeframe. The internal teams tried to push for features that would make the product easier to use in the future or answer the users' needs.

Functional and technical roles

As an observed differentiation between functional/business and technical roles. For example, in the two projects that have to be seen together because they have the same structure, there was the functional and the technical project lead, each answering to a different group. In software terms, the functional project lead will be responsible for defining the specification of what needs to be implemented and why. The technical project lead will instruct different roles on what can be implemented at a specific time and how. There is a close interaction, a back-and-forth between both sides of the project. In the design phase, certain things that should be implemented are deprioritized. Other things have to be added on top of the functional specifications. The technical roles will refine and consult. The project leader is responsible for defining and defending the projects at a higher organizational level, managing expectations and interactions outside the project. This is different from the project manager.

Design and Implementation Lead: Elias, Andreas, and Hue

Elias, Andreas, and Hue were all three German employees of the external consulting company. The first two individuals changed while the project was in Virtuoso.2 ongoing. The switch followed that Elias was changing jobs, so approximately after the initial design phase finished, Andreas started their career. Then for Virtuoso.3 Hue was taking a double role of being Scrum Master and Design and Implementation Lead.

They all had the role of the *Design and Implementation Lead*, concerning only the project Virtuoso initiative, i.e., Virtuoso.x. The position was part of the team setup template brought in by the external provider. In this function, the individual had to do the boundary spanning between the business sub-team members, the Salesforce implementation team, and the integration team members, meaning the team members representing the other systems. The focus was on the Salesforce implementation team, which belonged to the same company. The implementation team here was providing the actual product. This role's boundary spanning can be imagined as traveling over three different step stones toward the actual product. The business team members start off the project by specifying the product's properties and behavior, the implementation team for Salesforce adjusts the platform to fit the business team's requirements, and finally, they align with the integration team to make it possible for the product/system to find its role in the existing company ecology.

To illustrate this aspect, the Design and Implementation Lead specifically walked the business users through the expected functionality of the Salesforce standard process. That meant that for the project Virtuoso.2, which was taking place in the office, a projected screen of the Design and Implementation Lead's laptop. Here a development system was shown, which was set up with all the factory settings without any adjustments. In the same room were also experts of the legacy SAP CRM system and business analysts. Together they were clicking through a standard process and noting what would be missing in the process for SalusVitrum Therapeutics. The gathering resulted in tasks being taken up by the business analysts, who then took those higher-level instructions up to translate them into requirements for the lowest level of description, making it possible for the implementation teams to start working on this. This was mainly done by putting the work into logical pieces, e.g., service functionality, and then putting one software architect on the task who then manages a team of engineers underneath who do the most significant part of the implementation. This work then

culminated in the central review sessions, “demos” in the agile nomenclature. After the development, they would again support the walk-through of the done development sprints, i.e., the effects of the 2-week development cycle. This was not a one-way process but resulted in a back-and-forth between the business analysts and the business experts, i.e., the subject matter experts of the process. The Design and Implementation Lead role was here to manage all of those different roles. Being able to collect the other tasks to be done, checking on their status, if they are blocked, somebody is unable to go on working, to escalate the problem to a higher level, to be able to find a solution. The conflict mainly arose between those boundaries, business users wanting more features, the boundary between business experts and the implementation team, and the integration team's unable to integrate and cope with the change in the company's system ecology.

The three individuals had different aspects of their personalities, which also changed the matter of the conflicts. Elias was more of a leader of Salesforce and business processes, managing the boundary between business experts and analysts very well. But is often unable to cope with the non-fitting parts of the system ecology. With his background in SAP technology, Andreas was more able to understand the system landscape in its legacy dependencies and was managing here more successfully. The timing of his entry into the project could have been more optimal, as it was in the middle of the project. But on the one hand, this was playing to his strengths as the design was in some advanced state, and the most pressing issues were the integration of SAP systems. As an example of such a conflict, there was the problem of service order creation. When a customer calls and wants to have a device repaired, the new Salesforce system will be the point of entry, and here certain things have to be developed to handle this business case. But at one point, it will be post-processed by another system, the SAP CRM system. From this business case, we can collect requirements for two sub-teams. Individuals of each group have to have certain expectations of how the other system will react and specific standards of how it should respond. Whenever those expectations still need to be met, the problem has to be well communicated. In this case, some system limitations were met, where one team had to put in more effort than expected. The problem to be managed that arises is who will have to invest more effort and formulate in a way that provides conflict, but is quite typical to arise, whose system is at fault here. Andreas, with his experience in the SAP system, symbolizing an actor with a stake on the other side, can therefore transverse his classical standpoint of belonging to the external and Salesforce team and argue equally from the other side.

Description of the roles

This section will describe several different roles, to better understand the content of the project, and how interactions were taking place as a system of intercultural interactions.

Integration Lead

[Hakan. Andrzej. Pavith]

The integration lead was a role concerned with the interplay with the other systems from the view of the Salesforce system. This was an external role for the projects Virtuoso.2 and 3. In our model of the three sub-teams, and their boundaries, this role's concern was between the Salesforce implementation team and the surrounding system ecology. The three groups that had to be mediated were (1) the implementation team for Salesforce, which was mostly technical, and (2) also the business analysts, that had to take now the low-level requirements to the integration layer, specifying what data has to be processed in the other systems, which events have to be triggered and so on, and (3) the technical team of the SAP sphere that needs to understand the Salesforce counterpart. The integration lead has to collect these tasks and lead the effort to establish successful communication, technically and between all of those subgroups.

Hakan was an engineer that we got to know after he was already in the project Virtuoso.1. So the first interactions were marked by understanding technical decisions. He performed the role of Integration Lead in the technical meetings by reminding them of the technical limitations. He was an older engineer with a firm understanding of SalusVitrum Therapeutics' problems and a noticeable consulting experience.

In contrast, Andrzej was a young Polish engineer that jumped in for the release of Virtuoso.2. Hakan was more of an interim to ease between the project phases. Andrzej was busy coordinating between the technical architects and the new requirements.

Pavith was an Indian young engineer that came in with the rollout of the development for the project Virtuoso.2. Hakan and Andrzej were more technical-oriented and deeply involved in the design. Pavith had to exert his role differently as he came in later. His role was more managerial than technical, as he had to coordinate the rollout.

All of them were firmly situated in an engineering culture, and even though mediating between business requirements, they mostly worked with the researcher on technical topics. For example, which technical objects can represent the business domain, but also, in the later project phases, how to transfer vast amounts of data from the old systems into the new ones.

Salesforce Implementation Lead

[Shaan]

The Salesforce platform needed a specialized lead for the technical architecture. This was more of a software architect role, deciding which objects to extend, which technology to use, etc. This role was filled by an external engineer, who was also, at the same time, a manager for a whole sub-team that was responsible for the implementation. At the same time, this engineer solved several problems and ad-hoc implemented so-called proofs of concept. Such proof is a technical implementation that shows how a technical implementation works in principle, without any edge cases, just enough to present the feasibility.

Shaan was a central person, the central engineer for the Salesforce implementation. Originally from India, Kolkata, now living in Germany and working for an external supplier consulting company. He also had the role of a manager, especially internally, taking up mostly the technical concepts and implementations meant for trying out what works. He was a fixed point of contact, mainly because he kept the same project for all three projects under the program.

Technical Implementation Lead

[Achim]

The technical implementation lead was an internal role concerned with implementing the Salesforce system for the projects Virtuoso.2 and 3. Similar to the software architect role, but in the context of the projects, this was mainly about the implementation of Salesforce especially governed. It was the check-in place to control a sustainable implementation of the system. The role was also meant to manage several recurring meetings that discussed the project's current problem.

Achim was a longer time at SalusVitrum Therapeutics already, and of the few internal employees with an intensive knowledge of the Salesforce platform. With his experience outside of the project, he was leading both internal sub-teams for support of existing and for implementing the new functionality.

Project Manager

[Jochen, Clara.]

The project manager is mainly responsible for internal organizational measures. Additionally, the product manager has to take over the project lead role to handle the team's external communication. Internally, for example, they will be looking for allocation of the employees for the project, ensuring that the employees are officially taking part in the project. In the project, the project manager will organize the key milestones communicated between functional and technical team members, what has been done, if something was omitted, defends the technical decisions, or push forward specific requirements. In this way, at the beginning of each project, an estimation is demanded from the technology workers so that the project manager can communicate with the business users what is possible and set the correct expectations. A project manager in this more classical way was given for the project Momentum.

Two project managers can identify Jochen, responsible for managing the technical team for Virtuoso.3, and Clara, accountable for managing the section of the project Momentum. The roles there then acted according to the differing project structure. Jochen had to take part between many leading/managing governing bodies in the project and the program's design. Clara's part was integrating more elements of the project's managing and handling roles, e.g., communicating chances about the new character of the project and working with stakeholders. Clara was relatively new to the company and had no specific knowledge of the systems, bringing in her skills primarily as an experienced project manager. Both project managers were about the same age, reflected by their seniority in project management.

Product Owner

[Noah, Martina]

The product owner differs from the project manager in that they are responsible for a product, a clearly defined value proposition for the customer inside the project. We can see how power relations are changing because of the different roles through different organizational backgrounds. The product owner has a business background (an organizational difference, contracting technical) and organizes the requirements openly through a project management tool (Jira). The requirements are packaged into different 'user stories.' Based on these stories,

the technical team is then doing estimations. The product owner's responsibilities are like the project manager's to check that these requirements are met and to decide what can be done and what not. But the difference is that it is transparent, and the decision is taken from the standpoint of the people identifying or directly depending on the users. In the *classical* way of project management (contrasting with the *agile* view), the project manager would be employed now by the technical team and therefore was making some of their decisions. Elegantly, the product owner will argue between peers that this and that implementation was not possible. The originating role changes the power relationship. It changes the organizational context.

This pair of product managers and product owners can be seen in its (1) contrasting properties, of each emerging out of their different organizational context, and (2) their similarity in the function of the managing figurehead of a project, keeping together the functional pieces.

For this thesis, four product owners were recorded. For project Virtuoso.2, one for sales and one for services, for Virtuoso.3 for Lead-To-Account and Account-To-Opportunity, all within the program Virtuoso.

Noah was a very engaged and experienced PO, covering most of the part of the counterpart between the technical and business teams. His role in the project was set to take care of the service processes, but because sales processes were not covered in the beginning and because of his constant presence, he also covered the sales processes. He was not directly from the headquarters but sent from the UK.

Martina's presence was less felt as a PO in the sales processes of the release Virtuoso.2. She was in many meetings virtually, but also sometimes there in place. Sent from the Spanish subsidiary, she was a specialist for the first region where the product would be rolled out.

Software architect

[Irmgard. Constantin. Armin. Marie. Roman]

The software architect was responsible for implementing interfaces for the respective system. This interface design, making the systems "talk" to each other, included the governance of the new approach to play nice with the older processes. Therefore, this role was not only concerned with making it possible to access and create data in other systems but also with

deep knowledge of the processes happening right now, which in this detail is often not evident for the responsible business persons.

Irmgard was an internal employee whom the researcher knew from several projects involving the SAP ERP system. She was an experienced engineer that knew the business processes and the technical background behind them well. She was German and from the Hamburg headquarters. She was involved in the design and architecture work but also implemented an interface for which the researcher chose a novel technology, demonstrating her technical knowledge.

Constantin was an internal employee responsible for the new Salesforce system. He was experienced in Salesforce, being an architect and engineer, but not experienced at SalusVitrum Therapeutics, where he started at the same time as the researcher. His technical knowledge was mainly used for code governance but less for direct implementation.

Armin was an internal employee responsible for the CRM system. The researcher knew him well from several projects. He was equally experienced in technology and SalusVitrum Therapeutics. He was not directly involved in the project as a team member but more as the general architect for the system. The researcher was responsible for the architecture but had to let the available architect review the designs. In practice, the questions mainly arose about requirement engineering, and through trust, the architecture was mostly skimmed over.

Marie was responsible for the SAP MDG system, an internal employee, and German from the headquarters. Her role mainly enacted for business requirements and architecture design, but only a little in the implementation itself.

The researcher himself belonged to this group even though his title was not, in general, an architect. Being relatively new at the company, his strength mainly lay in his knowledge of the source system SAP CRM and the public interface architecture. In the same way, he mostly led the implementation, writing code for the implementation.

All roles were enacted differently according to the team's background. For example, the MDG team, as it was newer, had a much more structured approach between design and implementation. While the groups of CRM and ERP were more orientated about implementing the design themselves with help from external employees. A standard engineering language mostly shaped the similarities between the roles. Most of them specialized in SAP, so they had more similarities in the design and requirement engineering

approach than Constantin, with a different technological background. Another factor for the homogeneity in the system could be that all of them were internal employees from the headquarters and German.

Subject Matter Expert

[Chantal, Sofia, Sebastian, Susanne, Maria, Salomé, Hendrik, Adar]

Subject Matter Experts were responsible for the projects Virtuoso.2 and 3 to help the product owners and the business analysts to provide knowledge and advice about data and processes. Another aspect is enabling developers to advise if their implementation is correct or to gain direct access to specific knowledge. Most of the time, these people are much closer to the day-to-day business and will be directly working with the system later or are responsible for people working with the system. That's why they have a stake in the implementation and a responsibility for their area where they are responsible for.

Chantal was a subject matter expert the researcher had contact with during the implementation of project Virtuoso.2. She was a young/middle-aged German woman, mainly responsible during the sessions recorded in the fieldnotes for the installed devices and their structure.

Sofia was a well-known protagonist for the researcher, as he had contact with her before for many different projects. Sofia has a Ph.D. in engineering but is now primarily responsible for business requirements and project management. She is originally from Latin America but speaks mostly German with German colleagues. Sofia was supporting Project Virtuoso.2.

Sebastian was helping with the project Virtuoso.2. He was also a frequently met colleague because of his new role as innovation manager. But he was supporting the project as an expert in his old position of being an expert for device allocation, or for a better description of misallocation, and cleaning up the data. He is from the Czech Republic and shares his home in Prague and Hamburg. He speaks English with his co-workers.

Susanne was a German expert for SAP CRM, one of the engineers' business counterparts to develop with. Here she was advising on how to correctly implement the new system in Virtuoso.2 from the perspective of the old system, where integration is needed and old functionality is replaced.

Maria was another expert like Susanne to support the business in questions about the industry evolving around the SAP CRM system. She has a Portuguese background, then lived in France, and still speaking French with her French colleagues, and now working on many projects for SAP CRM. Here she supported Virtuoso.2 in this role.

Salomé is a French expert in the repair business around SAP CRM and here primarily responsible for the customer-facing side of the application. She supported the project Virtuoso.2 and Virtuoso.3. She spoke French and English when fitting.

Hendrik was an expert representing the German region for project Virtuoso.2.

Adar was an English-speaking expert for the Northern European region. He was very engaged in both projects, Virtuoso.2 and Virtuoso.3, arguing for the business side of the project, trying to promote the project and enhance the functionality to fit the business user's need.

Engineers

[Praveena, Adhi, Deva, Shayana, Vasikaran]

Software engineers (here, short engineers or developers) are the executing parts of the projects, the actors that implement the software. Different engineers have different roles. Some are sitting together in business meetings and take the requirements and are a crucial part of understanding how processes work out right now. Because of their implementation knowledge, their edge case knowledge is essential here, contrasting with everyday business. Because the implementation always happens on the level of the headquarter, the understanding of the original meaning of the process, and because of constant interaction with misunderstandings, because people are complaining about things not working, the headquarter and the edge case perspective is more potent present for engineers.

Then the technical role also differs according to the individual and their team. Some engineers are implementing code in a programming language of the platform for SAP, ABAP, and Salesforce APAX. But even here, the programming language is not the only differentiating property. Some are doing interfaces towards different systems that require knowledge of those technologies and platforms, and some are building user interfaces that require different skills. Some engineers only do a fraction of the code to prove the concept

they designed is correct and then let other people implement the complete system that will be in use.

The software engineer will mainly start later into the project after the initial discussion, but not too late because an engineer is a crucial element of the design, to give the initial ideas technical legitimization, to consult of what can be done, not just in general but also given the project's constraint, the most important being time. But also, in the project, the acquisition budget was often a critical component. As software production becomes more of an act of adjusting existing packages and platforms, those building blocks must be obtained. These can be huge sums because of the scale of a big multinational company.

Praveena was a young Indian external employee of the supplier company. Closely worked together on two projects under study, Momentum, and Virtuoso.3. She was joining consulting for the company under investigation while working on the project Momentum. Several people inquired how the quality of the work, and it was all positive feedback from me because the project was done on time without much explanation. She was working remotely in the beginning. Then later, joining for other projects on-site. As the project Virtuoso.3 was done entirely remotely, we were working together remotely but with the background of already working together on-site.

Adhi was first an external employee of a supplier company. Later internal. Closest engineer CRM interfaces. The counterpart engineer for the CRM system with whom the researcher had the most contact. Originally from South India, now living in Hamburg. A lot of experience with the company under research. He worked closely with the researcher and had many synergies because he had much knowledge about SalusVitrum Therapeutics by being an external project employee for a long time. Because of this, he was well respected and could later be hired as an internal employee. The researcher's strengths were more with analyzing and designing the new system's interplay with the old system. Because of working close together under stress, there was also some tension in this working relationship. Especially when migrating the data, the researcher was much more positive, and Adhi was much more conservative. Adhi was part of the CRM team, and the researcher was a former team member, but now only in this role for Project Virtuoso. That's why tension was built up by arguing holistically vs. for the CRM system.

Deva was another Indian external engineer who later became an internal employee. He was in the interface team and had already experience at the SalusVitrum Therapeutics but for the

Americas as a region, where he used a different technological platform for the same job (Mulesoft) interfacing Salesforce. This experience was necessary for implementing the projects under the initiative Virtuoso.

3.3 Project Virtuoso.3

Date: March 2020—July 2021

Number of people involved: 48

Simpson Index: 0.07

Project Virtuoso.3 was then concentrated on marketing and sales processes. The project was cut into different work streams according to the process steps. The process started with a simple lead, getting to know a potential customer until the sales contract was signed. The researcher could observe and was tasked to, be the technical counterpart for the two first process steps, lead-to-account and account-to-opportunity. The former describes the process of getting to know an individual interested in a product until the creation of an account as a customer in the system that could be potentially billed. The latter is the process of generating a sales opportunity from the account. Each work stream was seen as a product and had a product owner. In the two products, the researcher's role was to be a subject matter expert for integrations, i.e., for the connection and data transfer to the other systems in the SalusVitrum Therapeutics' IT landscape.

Table 8: Distribution of functional project members for the initiative Virtuoso

	Virtuoso.3			
	Lead-To-Account		Account-To-Opportunity	
	Expert Panel	Subject matter expert	Expert Panel	Subject matter expert
DACH	3	3	3	5

Iberia	0	0	0	1
Italy	1	1	1	1
West	0	1	0	1
North	2	1	1	1
East/Central	2	1	2	1
UK	0	0	0	1

Lastly, for the project Virtuoso.3, Hue, who was formerly already Scrum Master, was put in charge of also handling the role of Design and Implementation Lead. This double role represents that the role of Scrum Master was extended and twisted to fit more of the Design and Implementation Lead role, therefore having a dual occupied role, so merging those roles lifts the veil of implementing a SCRUM project by dismantling the SCRUM roles. The role of boundary spanning and its conflict played, on the other hand, the strengths of Hue in her experience with the project, being already around for the other project, knowing very well the team members in each sub-grouping, resolving conflicts by navigating through a known landscape with using her resources with the built-up trust.

Lead-To-Account

This product had seven subject matter experts from Italy, DACH, North, West, and the headquarters in Hamburg. Eight experts from Germany, North, Italy, and East/Central regions formed the expert panel.

Account-To-Opportunity

Twelve subject matter experts from Italy, East/Central, Germany, UK, North, West, and Iberia. Seven for the expert panel, from DACH, North, Italy, and East Central.

Special Roles, new product owners

Most roles were already described in the section 3.1.2 Project Virtuoso.23.2, as both projects were consecutive with the same team members.

Product Owner

[Annalena, Hugo]

Annalena and Hugo were part of the second project of the program, Virtuoso.3, which was entirely online. The researcher got to know them mainly through the daily meetings that followed each other. Both employees were German and experienced at SalusVitrum Therapeutics. Because of the changed conditions, their leadership style for the product was much less pronounced and with less conflict than the other two product owners.

Conclusion on cases

In this chapter, a detailed exposition concerning a Medical Technology company and the author's placement within its EMEA headquarters has been articulated, laying the groundwork for the subsequent inquiry and analysis that spans from April 2019 to July 2021.

Through the lens of three distinct projects, Momentum, Virtuoso.2, and Virtuoso.3, each forming the basic unit of the respective case studies. The projects, though varied in their scopes and objectives, unravel distinct facets of algorithm implementation and system adjustment within corporate structures and operations.

Project Momentum, albeit smaller in scale, presented a notable instance of algorithm implementation in its most pure form, yielding insights into the efficacies and challenges embedded in technological integration. Virtuoso.2 and Virtuoso.3, on the other hand, delineated a journey through adjusting and extending a customer relationship management system to align and further cater to the company's service and sales processes respectively.

Collectively, these cases not only shed light on the diverse project endeavors of the company but also furnish rich contexts from which deeper insights into project management, technological integration, and operational enhancement within the Medical Technology domain can be drawn in subsequent chapters. Moving forward, the cases are explored in an inductive answer the research question.

CONCLUSION OF PART I

This part took us on a journey, synthesizing comprehensive explorations across three pivotal chapters, each contributing distinct yet interwoven strands of this research. The convergence

of these chapters tells about the deeply embeddedness of culture, diversity, and complexity. It posits the system of methodological diligence, and the case study approach, framing a precursor for the ensuing inductive research.

Chapter one situated the exploration within the rich topography provided by a literature review, unearthing key concepts of culture, diversity, and complexity, and erecting them as crucial backdrops against which the research unfolds. Moving from the foundation of established concepts, the research envisions a restart, wherein the profound explorations of these concepts from extant literature provide the basis from which the inductive research can be conducted.

Transitioning to the methodology chapter, the research is firmly situated within a critical paradigm, delineating its epistemological stance which, while resonating with a Hegelian perspective of subject-object positioning, also ventures into the realm of neo-materialist thinking. This expands the dialogue by acknowledging objects not as passive entities, but as active elements within the research narrative. Employing critical ethnography, this approach seeks to delve beneath the superficialities of daily practice to unearth meanings and understandings that percolate beneath. Notably, the research methodically embraces a case-study approach, viewing projects as the basic units of research, not as illustrative examples within a positivist tradition, but as rich entities from which theory can be inductively constructed. This approach, while enriched by real-world knowledge, simultaneously engages in a critical reflection of its own stance, avoiding romanticization of recording the “real world”.

In the ensuing exploration of cases, namely, Momentum, Virtuoso.2, and Virtuoso.3, a various diverse actors and scenarios were introduced, presenting rich, varied, and complex contexts for exploration. Each case with its own narrative, providing the necessary grounding upon which the subsequent analyses will be done. Employing grounded theory for data analysis, this research innovatively applies open algorithms and an open data format to the coding of data, thus embedding the analysis within a framework that is both robust and transparent.

As we move forward, these three chapters collectively provide a thorough, nuanced, and critically reflective foundation, serving as a springboard from which the ensuing research will delve deeper, exploring, analyzing, and constructing knowledge from the collected data by applying Grounded Theory. We will first discuss Power and how it permeates throughout the

organization. Space in its material manifestation, how taking account time and space as a fundamental turn in how to structure and interpret data, and organizational dynamics. And finally, algorithms as an outcome of the dynamics of the projects, but equally as a key organizing matter of the organization.

PART II: POWER, SPACE, AND ALGORITHMS

This part presents the research findings, and discusses the results. As a reminder, the general research question of this thesis is: **How do the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes?**

The three sub-questions are:

1. *How do power dynamics emerge and evolve in culturally diverse IT projects?*
2. *What role do organizational spaces play in the dynamics of culturally diverse IT projects?*
3. *How do algorithms developed in culturally diverse IT projects affect organizational outcomes?*

The findings of this research are structured into three chapters, entitled power, space, and algorithms, reflecting one sub-question each, and the respective partial findings. Each chapter includes separate research findings, and the related discussion. All are concerned with some elements of the dynamics of culturally diverse IT projects, putting a spotlight on each of those.

Power

Two main processes were identified that use power strategies to create power dynamics, (1) diversity-consensus, (2) permission-restriction. Diversity and consensus are paired because they group two different actions of individuals, when we have a culturally diverse group with different voices, at one point to move the project forward, these voices are combined through a built consensus. Allowance and restriction, on the other hand, show two strategies of how to limit diversity and in some way prevent a consensus of all individuals. In one strategy, allowance, questions or key points are left open; the other strategy, restriction, tries to extract a minimal core of the question by restricting all broader terms.

Space

Spaces play a fundamental role in IT projects, reflected by their division into different forms, each with a different function, spaces for (a) management, (b) work, or (c) discussion. The different spaces all have different audiences and, in some way, reflect the hierarchical social structure of the organization. Spaces to manage are inhabited by managers who assign tasks, spaces to work are mostly just for workers to write code, and spaces to discuss are liminal and are for interactions that need to happen even though projects are tightly managed through specific spaces and it is not yet directly the space to work.

Algorithms

Algorithms affect organizational outcomes by developing the status of a culturally diverse actor in the organization. The study shows the life cycle of how, at each stage of the algorithm's development, different individuals, each positioned differently in the social structure of the project, shape the algorithm with different outcomes for the organization. The algorithm can be thought of here as an actor, because a behavior emerges from a complex system that is not fully intended by each individual involved.

Critical Management Studies

The overarching framework of this study is power, which connects all the sub-questions. The goal is to use the language of critical management studies to make an argument for (1) the usefulness of making these processes transparent, (2) to evaluate the processes behind the scenes and how they undermine their official goals, going back to the management data point of our study. Officially, the project communicates to take mainly the regional experts to bring in an informational advantage, in their diversity, to contribute positively to the project. But then, due to naturalized constraints, such as lack of time, this diversity is pushed back and disempowered by the homogeneous mass. This repression and "naturalization" of the forces that constrain the individual is a crucial feature of Critical Management Studies, which exposes narratives as ideological, even when contextualized as objective (Alvesson & Willmott, 1992; Kemmis, 2008; Steffy & Grimes, 1992). Using critical studies means focusing on power dichotomies and power structures. As culture is one of the core concepts that emerge in the data, it is a site of struggle and contested meanings (Romani et al., 2014; Sorrells, 2013), among others, in management (Boussebaa & Morgan, 2014). With this

research, we aim to contribute to the critical algorithmic studies literature through the lens of cultural diversity embedded in power structures.

To go one step further and evaluate how helpful those “official” narratives are, we can extend our counternarrative against the structures analyzed and made apparent. One of that is the narrative of a democratic society, where Alvesson and Willmott (1992) call for greater embeddedness of businesses into a democratic society. The claim could be extended to the micro level to let all meeting participants structure the discussion, not just let one project manager decide on the agenda. If creativity emerges through diversity, as theory fundamentally claims, then this diversity should be able to lend itself a voice. The implications of the result are to give more space for creativity. The power structures that want to create a creative process restrict that space.

As with every narrative, the counter-narrative cannot be freed from every organization's inherent power structures, which can never be obliterated completely. But it is crucial not to take a cynical stance, especially when confronted with the daily reality of work. The empowerment towards an equal voice will reduce the one-sidedness of consensus-building. What remains is the struggle to fulfill the individuals' agenda.

To resolve our example, we can imagine a more democratic company, with the imagined reality of the service workers substituted by face-to-face interaction to uncover missing valuable information. Communication should be unfiltered through the unconscious structure of one's cultural understanding. Even though managers try to consider the different regions in a universal solution, the requirements of the individuals should be accepted. A consensus should be searched through an open discourse.

4. POWER

This chapter answers the research sub-question: **How do power dynamics emerge and evolve in culturally diverse IT projects?** The question is answered by interpreting the result of the analysis through Grounded Theory, i.e. based on the codes and categories. Those last two parts were the result of based on the collected data through field notes.

Power structures determine which parts of the organization are invited to give input to the creative process and which points of view are retained. That leads us to the approach of using critical theory, explicitly incorporating power, i.e., we adopt a critical perspective on cultural diversity within organizations, characterized by addressing the problems of domination and consent (Romani et al., 2018), and specifically for management research, unequal power structures in multi-national organizations (Mahadevan, 2020). Organizations can be seen as undermining themselves in a constant dialectical movement. Each feature of the organization is contradictory (Benson, 1977). One can take here the example of the power of the headquarter over the subsidiary. On the one hand, the headquarter follows, in our case, a globalization strategy to maximize efficiency, eliminating unnecessary duplication of the same structures inside every substructure. But this is contradictory because there is a regional distribution of power. Only in this way is it ensured that the correct decisions are taken with the right amount of information. This can be seen through the lens of intercultural complexity and diversity. The complex system is made simpler by division into smaller parts. The system is diverse because of cultural diversity. But in this way, power is lost because it becomes decentralized at a lower level. Now the globalization strategy pushes back the power to the upper level but is confronted, in a contradictory movement, with added complexity. In cross-cultural management, a critical approach implies focusing on hidden power structures at play in our approach to cultural diversity.

Another instance of a contradiction is the inherent oppressiveness of teamwork itself (P. S. Adler et al., 2007). The individual is put into the group and now must adjust their personal goals toward the group's goal. This oppression arises from the data, too. Individuals come into the project often to push certain features that are important for the daily business in the region or, more essentially, in the relevant workshop. But because of time and budget constraints, this goal is subdued towards the general goal of adjusting an overarching process that accounts for all regions and workshops. This might be a successful implementation for the organization at large but disadvantageous for the individual. Therefore, teamwork is

oppressive. But in this mode of argumentation, power, and oppressiveness are used as general vital words, not to be mistaken about day-to-day usage. The individual might not perceive the oppression that way, but instead, there is an inevitable disappointment, or it is not noticed. Sometimes, the team processes are perceived as something that occurs naturally.

In projects power emerges through four different kinds of categories: (1) Diversity, (2) Consensus, (3) Allowance, and (4) Restriction. The codes all arose in the project work, and their chosen in accordance to their significance of subtly controlling or allowing behavior, while recognizing the surrounding environment, and working towards a productive use of the culturally diverse team.

Diversity arose from the recognition by the actors of the differences between the countries. An example from the field notes is:

“It depends on how the countries use the departments. We missed to set up a common process.”

This acknowledges the diversity of the company. There is a standard process to be set up. However, if the headquarter is not enforcing any rules, the different countries, i.e., subsidiaries, are setting up this process as they see fit. This contrasts with another quote:

“With the new project’s portfolio, all regional service contracts will be harmonized.”

This is the antagonistic movement. Here, it speaks that the power of the headquarter will be used to force the subsidiaries to use one particular kind of standardized contract. The first quote is to some extent in the same vein, as regret is felt that the headquarter forgot to implement a standard process beforehand. This is just one example of how power arises in an organizational context. One could read those two lines from my field notes differently, not in terms of power. However, often, power strategies are employed subtly. They are packaged in a way that power is rational.

Whenever there is an intercultural interaction that can be assigned a positive, intercultural synergy, negative, intercultural conflict, or neutral status, the exchange “just worked.” There is a specific power structure behind it. This power structure cannot be seen purely from an intercultural perspective but is embedded in a group and organizational context. In the data, we saw intercultural interactions between Indian and German engineers. While there were intercultural conflicts, e.g., regarding the desired autonomy of the workers by the Germans,

all those interactions are embedded in a specific power structure of the organization at large. Here, Indians are employed as subcontractors who always have a certain status of less power regardless of the culture. On the other hand, culture then transforms and readjusts, e.g., several Indian engineers started to work as internal workers, and their behavior changed accordingly while still maintaining specific cultural characteristics or behaviors.

In the introduction, we used a quantitative measure of diversity, the Simpson index. However, this information reduction does not consider the complexity of diversity arising from different power contexts. Taking the example of the Indian workers again, even though they can be seen as being the minority in a country/societal context, in other contexts, they dominated the groups by being solely responsible for all maintenance tasks, with little work done by the internal teams.

Bridging the perspective of organizational complexity through a diverse workforce, even here, power comes into play as a theoretical concept. The more complex the situational context is, the less clear the power structures are for the individual to understand. This is positive for a minority group because the more complex and more challenging to navigate a situation conceptionally, the more technology, or the work itself, is being pushed to the forefront of concern. When highly complex technical problems arise, and the stress levels rise in the same way for the workers, the stress of translation is pushed to the forefront. Then the diversity itself is questioned, why it is needed, and anger forms towards the translation issues. For the individual, the complexity is a constant struggle in the organization that is sometimes easy to manage and sometimes adds to the situational baggage.

As Romani *et al.* (2018) point out, many paradigmatic lenses enable a nuanced view of intercultural management. The critical paradigm chosen for this study's key concept is power (Alvesson & Willmott, 2012; G. Jack et al., 2011). Power is an essential factor in intercultural communication. It is not a fixed concept but can change its meaning and transform dependent on its context (Primesz et al., 2016).

One of those contexts is intercultural interactions, where powers are often linked to control *the other* (G. Jack et al., 2011). The other is a psychological concept abstracting the individual's thoughts about a diffuse other group, which is not directly defined. It relates to concepts like othering, which means to make somebody in a group turn into someone else instead of being part of the group, therefore establishing a thought process of excluding the individual. This can be based on salient cultural criteria. Another important use of the

concept of the other is that of the other that watches over our actions. Often, individuals think about some higher instance responsible for judging our actions. This does not have to be as abstract or metaphysical but even arises in plain sight in the data, e.g., as senior management watching the errors in the software system whenever the situation becomes too tense, or it can be the diffuse concept of the “business,” too. This was brought up many times when a solution was technologically valid, but it always referred to the business having to validate this suggestion to sanction creativity.

However, when thinking about where exactly the business and the senior management are located, then instrumentalizing intercultural knowledge has to be linked to the mechanisms of a postcolonial context (Said, 1993), where Western powers create the *Oriental Other* to be able to control the knowledge about the other. While there was a certain synergy, the external company brought general knowledge. Mostly, knowledge is transferred in a technical way (Prévoit, 2011), with a weakness in mastering the informal, only moderate engagement, but a very high effectiveness in the transfer itself.

From this understanding in the field, seeing the struggle of the employees to be creative and do what they see fit for the job, to be autonomous in their work, and at the same time, trying to adjust to an ever-changing conceptual adjustment from the headquarters to streamline. As said, this is packaged as a rational decision to make the organization more efficient. However, as the long-term view of the projects shows, control seems to be more critical, as for all of the participants, the rationalization is not questioned or even clear how exactly it was achieved. In the same way, this line of thinking has technological origins. The software that the organization is working with is delivered with prefabricated parts. Whenever there is an adjustment, work has to be done from the IT part of the organization. This work sums up the different phases of the software, as it is not just the initial work that has to be done but also later on, when understanding errors in the software, own new developments and adjustments must be accounted for. This connects to our other big theme, organizational complexity. Small parts, minor adjustments, at last, add up and give rise to a much more complex system. The organization is therefore transformed into a technological rationale.

In this study, power will be further defined in the way that Foucault (2020) does, i.e., it is not just juridical, restricting specific actions and acting as a negating element. However, as something that is also productive and positive. When workers use their power strategies to resist standardization and create new algorithms to improve their lives, even when senior

management uses its power to introduce new systems that are easier for humans to use, this is a positive, creative use of power. Moreover, when a company introduces technology to automatize standard processes, this power has a negative element because the automation formalizes a process that might have been more fluid. The shift to a machine execution lacks human contingency and governs a process more strictly. However, there is again also a positive, productive element. Workers can think beyond a specific process when a new technology governs the situation. Creativity might be filling in such spaces. Power acts here as a governing force, once negating actions, to deviate, and otherwise producing a technical way to do the job (Foucault, 2020).

4.1 Power—Research Findings

While coding the field notes, the following seven codes were found, (1) deviance, (2) diffusion, (3) reality, (4) standardization, (5) transparency, (6) open, (7) regulate behavior. They all relate to how power is exerted in organizational and group contexts. They are, in broad terms relating to how the organization employs power strategies to cope with the complexity of the diverse organizations on the level of its hierarchical structures, i.e., with a headquarter on top, divided into different, more prominent clusters. The study is mainly to be found in the EMEA context. Then the EMEA region will be divided into sub-regions, e.g., Iberia (Spain and Portugal) or DACH (Germany, Austria, Switzerland). All different regions, and also countries, may deviate in some way from the prescribed, or wished, imagined standard process. At the same time, whenever a standard process is found, it must be diffused and employed in different regions. While the first four codes make sense in the organizational context, they are similarly located on the group level, meaning those power structures are employed by individual actors working in a group. Alternatively, the power strategy appears as the big other, looking over the project, answering in the end to the final verification, judging the project, and testing it for its merits. This other can be then imagined or real. Another key word in the group context is transparency which can be clustered together with the organizational goal of standardization, being the rational target of the organization or the group's goal. Again, here is an interplay to be seen with the other, an imagined entity being watchful and needing all the information visible.

The last three codes are more related to the group structure. A group might be open to change and are allowing creative endeavors. Alternatively, on the other side of the theoretical spectrum, they might try to regulate behavior. These two power strategies are often found as something more implicit in the actions. In general, the narrative of the positive, being open, dominates the business discourse. The codes in detail were the following.

Codes

The following section describes the primary codes. Later the categories, as codes on a higher hierarchical level will follow.

Deviance

To comprehend the generalization process of the codes, we will evenly document the history of each code. This way, it is easier to relate to the data, as a code like deviance was not the first thing that came up, being more of an abstract concept. However, the abstract concept of deviance helps understand the organization's power strategies and the instrumental goal.

Deviance. From initial codes such as (1) *live with the differences*, (2) *missing standard process*, (3) *the permitted flexibility is negative*, deviance came up to cluster these codes where process standardization is not yet in place. An example from the field notes by a project manager illustrates how the code came into existence:

(1) We have countries ten times bigger than the North. So, we have to live with this. When we directly address this problem for Germany and France, we have a decent chance that something will happen.

(2) It depends on how the countries use the departments. We missed to set up a standard process.

(3) The user can do what he wants, and departments can do what they want.

All the statements refer to the same issue of deviance in the system. Until now, this was coded on the organizational level, where the organization fundamentally recognizes how it is deviant when comparing itself to companies in the sector, then further comparing how different regions or countries are deviant, and finally, how the techno-systems are deviant.

Diffusion

Diffusion is a code that expresses the spatial dimension of an innovation. Every new development must be implemented and spread over several countries and regions. This recodes instances where processes and data have to be harmonized or where countries are fixed as the first users of innovation. Every time, there is a flow of developments. It also requires acculturation when the headquarters' dominant culture tries to impose new modes of action. The initial code was here to *fix countries*.

Reality

Reality maps to the concept of the “mental” discussed above (Lefebvre, 2014, sec. III). A subject was coming back to a “reality check” when describing the use case. Fundamentally those descriptions are limiting, as they are never a neutral description. They can be initially the result of a “natural” intervention in one of the field notes written down. To cite from the filed notes, where an expert describes his experience: “*The real field service technician thinks that it is nice information, but not needed, because in most cases he is escorted around. So, it is not needed.*” The situation was the following: A meeting discussed whether the room information was needed. However, it was discovered that this information was not needed, as the technicians were escorted to the room with very little ability to navigate the hospital campus independently. This is the “mental” picture of a “real” field technician. The absence of the technician in such meetings shows the divide between the user of the application and the employees who plan to construct the system. The “every day” that so seamlessly builds the fabric of the meeting is this synthesis between the mental pictures and the reality interfering, in one way and another, after the innovation is diffused and spread throughout the organization. Insofar can reality never be mapping the complete picture when one assumes that the organization consists of several entities in different cultural spaces, with different cultures? The interpretation of “reality” never comes from an objective, neutral view but is shaped by culture. The headquarters are insofar a particular space, as individuals from different cultures try to shape the processes of a specific region, including Europe, the Middle East, and Africa.

Standardization

Standardization marks up all places where there is a call for enforcing an inevitable process by the headquarter. This makes it possible to exercise power and handle the complexity of a centralized process and digital management. An expert of a division describes: “What we do

now force France, theoretically it should be the shipment, we calculate that.” The initial code that emerged was the *force process*. However, there were several instances where forcing would be too strong, as the two codes: of *governance make comparable*. Those were all framed more neutrally to show what was happening in a more general way.

Transparency

Transparency is an observed code that seems to be a primary target of the project. One can interpret this as a control mechanism only if it is possible to control, to monitor the users. Also, in the form of self-control, the management mechanism is seen as working. To track this form of control, additional coding is needed.

Open

Open signifies a space left for discussion or is at least recognized as a topic to be discussed further. Nevertheless, little space is left for discussion in the two projects observed until now, especially in the ongoing one. In the analytical memos and interviewing the section manager and project members, it clearly appears that the lack of space came from the cultural element of focusing on the outcome. Talk is perceived as a waste of time. The design process should also be seen in context, as many parallel responsibilities and projects are in place. This tight schedule prevents any openness towards experimentation or creativity, leading in their nature to unplanned results. The focus is here set on delivering value fast while trying to move towards a faster pace. As one participant said, this “crisis mode” prevents the necessary space for innovation. Here are two quotes from the project manager in a meeting:

(1) *We have here a need to discuss!*

(2) *Let us leave this as an open task.*

The two initial codes were needed *to discuss* an *open topic*. Other codes were the request for a decision, steer meeting and workshops. While it would make sense to classify how an open issue is clarified, in the way of a meeting, as a formal request, or with workshops, here, the primary opening of a topic is of interest for the discussion. The framing code clearly shows how openness is deferred to another point.

Regulate Behavior

Regulate behavior codes the manager as a moderator for projects. This limits the creative process to save time and converge fast to results. An example of this practice is forbidding phones, especially private ones, and using your laptop. This call to focus is then extended to questions that need further discussion. Either those are deferred or put off as irrelevant. To illustrate the behavior, here are three quotes from a project manager in a meeting:

(1) *Let us first consider the sales order from the ERP, just the happy path.*

(2) *Fair question, but we do not want to go into detail.*

(3) *Let us focus on content first.*

The initial codes were (1) happy path, (2) moderator restriction, and (3) moderator structures. The rest under this code were a call to focus, limiting discussion, the moderator cutting short or shortening the meeting, restricting creativity, regulating behavior, reinforcing the use case, reducing scope, and restricting how to work. The code *regulation of behavior* was found despite the possibility of coding in a more project-related way. The rich data do not prevent the abstract case because all those actions prevent the full range of creative expression.

Categories

We display the study results in the order of the (grounded) data analysis process: The first subsection describes how we came up with aggregated codes from the initial coding. The second subsection goes further towards theory-building in linking the codes with categories. Finally, in the third subsection, we show that organization structure emerged as a meta-category.

The performance of restriction and allowance in the context of diversity and consensus

Table 9 shows the occurrences of codes in each category. It can thereby read how each category's mental image is constructed. "Open" is a code belonging to two categories: "consensus" and "allowance." It is relevant that the code "open" is absent in the category diversity. This lack shows that a constructive and positive discussion about this category is not happening. The category "consensus," which opposes "diversity," had the code "open." To some extent, the code is part of "consensus" because consensus needs to be driven by consensus-building events, e.g., open meetings and workshops, that are put to take place in the future. Consensus is something that has to be formalized by a board meeting that finalizes a joint decision. In general, the consensus has broad and saturated coding. This indicates a cultural element in the observed project and the organizational level. When there is missing flexibility or a missing harmonization of the process, then this lived reality is interpreted in terms of reaching a consensus. The category consensus means that the current faultiness found is not a permanent state but something that can be fixed in the future. The future state is then something that all parties agree on.

Another field note shows how the restriction of keeping roles separate, for "business" and "IT" teams:

"I receive a phone call from the former project manager. We are talking about our academic career, and just as a sideline, she mentions our former project's success. I was rather shocked by her positive view. I always perceived the project well done from the technical side, but I always considered it a failure from business adoption. However, the business users were enthusiastic when she told me about her follow-up meetings."

Reflecting on my notes, I can now clearly see the in- and out-groups forming in the project: the division between business and IT. Those words are used almost always when discussing two sides of a project. Moreover, it shows some points of how self-categorization theory fails to explain the nuanced dynamics and conflicts arising within these groups. While the theory may describe the basic cognitive process behind the group formations and general behavioral patterns, it potentially underrepresents external factors, individual biases, and specific organizational cultural elements that influence these inter-group interactions and perceptions. Consequently, the simplistic dichotomy suggested by self-categorization theory may not sufficiently encapsulate the multifaceted and layered nature of group interactions and

oppositions experienced in real-world organizational settings, like those witnessed during this project.

Table 9: Categories and Codes

Categories	Diversity	Consensus	Allowance	Restriction
Codes				
Deviance	It depends on how the countries use the departments. We missed to set up a standard process.	The new project's portfolio will harmonize all regional service contracts.		
Diffusion	This system we do not have for all countries yet.	Also, remember that you have to merge the fixes back for the already migrated countries if we fix it for those not yet migrated.		
Reality	The field service technician thinks it is relevant information, but it is unnecessary because he is usually escorted around. So, it is not needed.			
Standardization		We need an initiative to unify measurement. The countries are not comparable.	But in the future target picture, this should be mapped entirely to the project's contracts.	What we do now is force France. Theoretically, it should be the shipment. We calculate that.
Open		We need to discuss: A doctor's office is one and a single location.	Let us leave this as an open task.	

Categories	Diversity	Consensus	Allowance	Restriction
Codes				
Regulate Behavior		The first phase is just a strategy phase, just enough to hop on the train.		I: Can we clarify how it is created? T: It is stored in the system. We have not to lose our focus here.
Transparency			1) The first things to be achieved are speed and establishing transparency, not better service. 2) You will get updates on who has done what. You can submit it and send it across. For Spain, this contact would be the Spanish team.	

When a regional process expresses each cultural region, those cultures exert pressure on the global headquarter, which needs to understand the local processes. In the cultural system of the SalusVitrum Therapeutics, the categories “diversity” and “consensus” are opposed. Diversity is seen from a manager's standpoint who has to decide in a highly complex and culturally diverse environment. The standpoint from which the decisions are made differs from that of the regional centers. There, a consensus may exist regarding handling things differently from other regions. The managers desire consensus on how things must be done, a standard method from their point of view. The possibility of a consensus respecting the diversity of the different regions is not found in the data, or it exists as something to be changed in the future. This desire was voiced by a product manager when a new system was

planned to be introduced. The new system should drive the consensus by implementing a standardized process where the headquarters bring up the convergence of the different measurements. We linked both categories of diversity and consensus to the first iteration of code refinement after the initial coding. For example, one part of a field note described how the project managers tried to make countries comparable for measuring specific key performance indicators.

Diversity and consensus are both structural dimensions of the data. Allowance and restriction are additional opposed terms that show several ways power is used in the creative process. While diversity is seen as given and to be resolved, allowance and restriction concern the actual design through the different levels from the project to the global level (see Table 2). Allowance captures the codes that encompass transparency and openness; restriction concerns how to regulate behavior, as well as how to structure and how standardize. Standardization can be seen as a force that must be considered to allow equal measurement and openness for individual comparisons, where the organizations can measure themselves.

A theoretical framework emerges from the empirical data when we combine the categories two by two, in pairs, and compare those with the literature.

4.2 Power—Discussion

When power is used, this is not a static concept but arises through power strategies applied to the behavior of individuals, who are then actors and agents of power in the organization or the group. The communicative situations were found to be broadly to be categorized by their motivation. Moreover, especially when approaching the observed interactions from a critical theory point of view, one can see, were those interactions genuine to make the life of workers or customers better or was the application of power used to achieve a goal?

In this way, the literature generalizes this concept in Habermas' critical theory, where he distinguishes the teleological from the communicative aspect of communication. Communication, as well as culture, are not always used in the same way:

1. Driven by what Habermas calls *strategic reasoning* (Habermas, 1984, 1987), marked by functional reasoning. The teleological aspect implies the motivation by the realization of one's goals

2. The communicative aspect aims at forming a consensus (Habermas, 2011a).

Critical theory and the concept of culture are connected in that they describe social mechanisms of how the differences and commonalities are produced, maintained, changed, and eliminated. Individuals achieve their goals in a specific cultural context, and their actions are coded in a certain way. Communicative action then differentiates between the goals that are to be achieved. Integrating this approach into the analysis, the use and misuse of actors can be critically examined, going one step further from a neutral analysis towards an analysis integrating, making obvious societal goals.

Allowance, restriction, diversity, and consensus on different levels

In the third data analysis phase, the categories are grouped into meta-categories. The flow of innovation throughout the company is modeled as a macro system. Table 10 shows the mapping of the categories into the meta-categories. The creative processes start at the project's micro level, where different categories interplay. Only when the project is rolled out is the software usable in different regions, the meso level. In the last step, the whole company will be involved when the product is rolled out in all regions.

Table 10: Categories and meta-categories

	Project (micro)	Region (meso)	Global (macro)
Diversity			
Consensus			
Allowance			
Restriction			

This flow accepts an additional complexity in one way, as multiple regions have different technology. Through the acceptance of diversity, complexity is reduced for the digital organization. To implement the system in all regions simultaneously, a consensus would have to be reached with all of the stakeholders in those regions. However, for a slow system rollout, a consensus is only to be reached on a regional level, step by step.

The meta-categories are also involved in a reinterpretation of the meanings of the categories as such. For example, restriction works differently at each company level, even if the same group is involved in the system's design. There is the project level, where project managers restrict behavior, e.g., how a meeting should be done, but also how to not be distracted by emails, etc. Then there is the regional level with different actors, e.g., section managers, business architects, and key users with different cultural backgrounds. For example, by imagining real examples from the lifeworld of the individuals, the concept designer restricts a new solution based on his or her mental picture. Then there is the level of the global company when the project design is restricted in how the company is seen. How the company positions itself toward the competition and among peers can influence this. The company also tries to establish global core values that inform the design.

From the categories, diversity is not seen as a driver for creativity but in a spectrum of codes, where one is negative, formulated as deviance. Diffusion and reality act as a process of how the information flows through the corporation and how the new communicative actions are perceived.

When software is introduced first in just one country or region, and later rolled out to different countries, a whole range of codes emerge about the diffusion of innovation. This crucial process links back to the theoretical frame: in a broader picture, there is nothing special about what is perceived as *fixing* individual countries. It is about an innovation that is to be diffused globally. The technical reality of a new system veils the organizational intent. This has to be categorized as *strategic reasoning* (Habermas, 2011a, 2011b) and is marked by *functional reasoning*. The technological systems are presented as a functional necessity, indisputable. However, veiling cannot make the disconnection from the life-world disappear.

Therefore, from the point of view of the participants in the study, diversity is not something that enhances creativity. It could also be seen that, without the diverse input of colleagues, with their experiences, the whole process of designing the new software system could not be validated and, in the end, would not be accepted. This input is coded under the diversity category and with the corresponding code of reality. The reality of the experiences is crucial but restricted to specific roles that mediate between the end user and the product designer. On the other hand, creative input is again mediated by the process of structuring by the managers, coded in the categories “consensus” and “restriction,” and with its instances of “regulating behavior” and “structuring the discussion.”

While creativity may thrive through limitations in general, openness would leave space for a counter-movement to avoid the pressure to consent to a fixed viewpoint for the observed projects. The discourse of power dominates the interplay between several forms of organizations, from external suppliers to internal teams. Communication itself is highly valued but, at the same time, structured in meetings that a moderator leads. The behavior in the meeting session is regulated. When openness is seen as an existing cultural element of the organization, then the deviance of the subsidiaries can be seen as a chance to find creative solutions and a space for them to develop.

Framework of Dialectics of Power

A theoretical framework emerges from the empirical data when we combine the categories two by two, in pairs, and compare those with the literature. The categories creativity and diversity were found to be two categories that work against, but also complement each other.

There is “value-in-diversity” (Cox, 1991). Diverse groups are more cooperative, they complement each other with their distinct view and competencies (N. J. Adler, 1980; Barmeyer, 2012; Stein, 2010). The diversity of a team enhances its creativity and innovation capacity. But there is a dark side to that. From the found results the two categories diversity and consensus are mutually linked. Diversity is understood as an obstacle to be overcome through consensus. This dialectical pair is coherent with another theoretical conceptualization of diversity and consensus. Diversity in functional background contributes to task conflict, whereas other diversity aspects tend to cause more emotional conflict. Racial and tenure differences intensify emotional conflict, while age diversity diminishes it. Subsequently, while task conflict enhances task performance, emotional conflicts detract from it (Pelled et al., 1999).

The connection between creativity and consensus is mediated by diversity. Consensus emerges through the data as a mechanism to regulate diversity. An interplay between the two concepts could be observed. In the same way, as consensus regulates diversity, diversity regulates consensus. That means the diversity of how to form a task creatively is restricted to forming a consensus. Equally, the possibility of deciding with a team’s complete consensus is restricted by the diversity of the actor’s conflicting strategic goals.

A consensus can be formed through the enactment of several restrictions. Restrictions are imposed before a consensus in communicative action can emerge. The restriction category, on the other hand, is not the only instrument to exert power. For example, geographical

power structures in the corporation can be transferred by urging a need for consensus. The diversity that is met with a need for consensus is therefore restricted. Even though a team is diverse, its diversity is restricted. Through this mediation by the need for a consensus, the restriction that would not be consciously and decisively rationalized can be rationalized, as a technicality, e.g., staying within budget and scope. This also shows the explanatory power of the emerging theoretical frame. Some categories are not directly interlinked but regulate each other through its mediation.

Finally, allowance emerges as the category that leaves decisions open and is conclusively interlinked with creativity, opening up space for creative solutions to the project's problems. However, before this conclusive closure, it is paired with restriction because allowances are the countering actions for restrictive behavior. Creativity will be enabled only if specific actions are allowed. In the same way, restriction and allowance are two mutually linked concepts. The restriction is understood as something that closes allowance. What is restricted cannot be allowed.

The studied projects have failed in some aspects, not outwardly regarding the project goals, but as a creative enterprise, because of a narrative of corporate culture that cannot incorporate or empower the different voices of the subsidiaries. A less hierarchically structured organization is seen as impossible because of a linear narrative. The narrative is that the organization was starting as an autonomous one. Now that it has become a very large MNE, the perception is to drive consensus from the top of the organization to the bottom, with local workshops seen as having to follow a standardization effort initiated by the headquarters. The restructuring of power from decentralized and autonomous work processes to centralized and standardized ones is a narrative of the company's development.

Power—Key insights

Power emerged from the data and linked to the critical management paradigm that was considered for further research. Large organizations in particular struggle to balance the various power strategies employed and what is referred to in the literature as instrumental reason. Under the veil of standardization, organizational diversity is limited. This power is exerted in two ways, first in the form of line organization, then in the form of technological power, exerted through technological knowledge and through these technological narratives, which are perceived as neutral but are in fact value-laden. As a third observation, then, the algorithm itself emerges as a third power strategy that acts upon its users and the organization that created the code.

5. SPACE

Power strategies are not arising from the void. They are actions by individuals in a project at a certain time in a certain space. Often for example, social status is seen without a time component, providing only a static picture of the possibilities of an individual to employ power. But through the ethnographic data it can be seen that contrary certain times allow for leveraging the specific possibilities of the individual traversing strict hierarchies. The same is true for space, that has to be seen as an inseparable component of time. The dynamics of project work to happen in different spaces, allow for different strategies each in accordance to what the space allows or restricts for.

Virtual spaces are here not representing something fundamentally new. But they have special properties. Fulk and Collins-Jarvis (2001, p. 651) hope that “[v]irtual space may represent a ‘neutral’ territory in which individuals from different organizational sites can meet with an equal degree of comfort.” But this study shows the limits of this approach, when adding the concept of power to virtual spaces, showing the replication of existing organizational power structures to virtual spaces.

Therefore, this section of the thesis answers the second sub-question: **What role do organizational spaces play in the dynamics of culturally diverse IT projects?**

Space arose as a crucial factor that forms cultural interaction. Every interaction happens in a particular space, but culture a simplistic understanding of that culture is flattened when regarded through a virtual session and enriched through face-to-face workshops is not true. The simple distinction between virtual/real is not doing justice to the rich situational context collected in the data. Virtual spaces can make the text visible, for example, through typed-out concepts, non-work behaviors, lunching together, or meeting up after work. Another spatially dependent concept is diversity. Whether a person is even perceived as different, i.e., whether they are salient, is dependent on how the individual is embedded in the spatial context.

The diversity context is reduced when the work context is very technical and therefore taxing to the individual to take up cognitively all the different workings of the technical machines. When being in a physical context, this reduction is not as possible as when being in a virtual context, e.g., in a screen-sharing session. This way, the perception of diversity can be flattened, especially considering cultural extra- or introversion. With a group of introverted

engineers that all turn their cameras off, it is harder to experience. In this way, the fabric of the virtual space is becoming an important part, too.

At the same time the differences in space seem to influence the perception of time. What was taking a long time, can now be done in fractions of a second, but the different work environment with its inherent asynchrony is making fast tasks equally slow. Time and space are compressed, and are the start of a new contradiction in work (de Vaujany et al., 2021), with the growing autonomy through flexible working hours, choice of place, but in the same time a growing control over the practices of the employee, e.g. through the digitization of actions.

The data for this section was collected for the project Virtuoso.2 and Virtuoso.3. For the former project only in the last months, May and June 2020. Space became important to collect, as it became apparent that office workers had to digest a dramatic shift to something that was perceived as a loss of space. The shared office space, a shared experience of the lifeworld became a contested space, something that has to be restricted. This loss of space and its transition to the virtual space, a space standing in for the real space, might be perceived as a de-spatialization of the work life of the office worker. But this study shows the opposite: space, precisely because of it coming into the limelight becomes a novel fixture of management to be studied.

From the first spatial coding discussed in the Research Findings, and bridging those themes with the literature it became clear that space plays an important role for our general research question of how the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes. The relevant data excerpts, are mostly in the context of a globalization strategy in an intercultural environment. What role does space play, in its instance as not just physical, but virtual space? In the general ontological frame set in the Methodology section, it is to be stressed that space also is not seen as something static and passive, but rather as a subject actively playing a role.

5.1 Space—Research Findings

For this study Critical Ethnography was used to collect the data, and Grounded Theory to analyze the data. As such, the results are not abstracted into the codes themselves, and their respective categories, but those codes are just acting as a headline for the recorded activities, practices of the individuals, of the group. The research findings are in two forms, first, vignettes are provided to understand the emerging theory about places, and how in this framing power strategies are emerging. Then as an assembling of qualitative codes, showing how from the spaces, virtual places are emerging (see Figure 10).

Dynamic Power Strategies through Virtual Spaces and Specialist Roles

The two vignettes are concerning different parts of the work. As the organization under study has a matrix organization, meaning that the project team has not just one project to handle, but potentially several projects and also support work on existing running software. The first vignette concerns then more of looking behind the scenes of how a worker is perceiving the work in general, i.e. framed in an organizational embeddedness, a company that wants to globalize, as a team member apart from just one project with several projects to serve, and as a project member. The second vignette then zooms in to an aspect of the project work. And especially substantiates of how power strategies are not simply applied hierarchical, even if power is conceived as such. In the recorded episode an “undemocratic” decision is taken because the consensus would not fit the underlying conceived strategy of how to execute the project. It acts as a critique of the conception of the Agile methodology, that often is a veil of underlying power strategies, that are emerging through the lived experience of the project, and through the dialectical tensions between several expectations of the individuals in the group. Those expectations are not just part of the personal identity, therefore for example to further one’s career by implementing things fast and then be able to show the results of the work, but also are part of the social identity, namely software architects have a different social identity of taking care that the quality of the developed algorithms in the project are finally fitting the complete technological landscape. In the same way the social role of a project manager is to finish the project’s specifications, quality being something that is not of immediate relevance. Here, speed of execution is more important than the quality of the result.

Vignette I: Virtual Global Spaces

It all began with a townhall meeting. I came late to the crowded assembly of employees which I approach while opening heavy glass doors with my batch. As I was late I was pushing myself to the front, where I could hear a German senior manager talk about a new strategy was being implemented, to act more as a global organization. This was now some time ago, before the office building was completely shut down because of the COVID-19 pandemic. But it is still felt throughout the daily work.

I am located in a team that is mainly concerned with the fabric of the organization's digital processes. Interfaces between different technological systems are being developed. I am partly an outsider in this team, there is an official prescribed function of being responsible for providing guidelines for software developers, this is mainly my function, and the correct connectivity between different applications. The function of the team inside of the organization is more of a hub, where members from different teams in the most varied projects ask for information, not just about technicalities, but also about human networks, who is responsible for what.

Every four weeks there is a, now virtual, meeting with all internal employees going through the newly planned projects, the project portfolio. Two consultants are already online when I connect to the meeting. Both workers have their cameras on and talk about the weather in German. Five minutes later the team's manager S. joins. He is starting with presenting today's agenda. The first point is to show the project portfolio. A Powerpoint presentation is shared on the screen showing a matrix of the different projects running and planned. Something I remark is that nowadays the projects marked up with a little star are becoming more common place. That means the projects are global, meaning all countries are involved, not just our region EMEA (Europe, Middle East and Africa), is extended. S. reads a name of a project to be planned globally with a bigger budget, when M. tells that he is unsure if our team will be involved. S. tells, that this is very likely, as we are the ones with the best technology right now. The meeting finishes and it is time for the next one.

I am right on time for the daily status meeting with the internal and external employees. Two Indian developers have already joined. I unmute my microphone and say "Hello". They are both unmuting their microphone, and tell "Hello, Roman". Everybody has their camera turned off. I have prepared a list of my tasks that I have achieved, and what is to be done. Step by step different employees are arriving, the external Indian developers being mostly the

earliest and on time. M. arrives two minutes late but greets everybody loudly. The different soundscapes are audible. K. unmutes her microphone and street noises are appearing while she is explaining which tasks she will do today. An internal consultant W. unmutes his microphone and the clear sound is contrasting to the sound beforehand. W. asks if he should share his screen to show the Kanban board, showing everybody's daily tasks. K., the Indian developer, tells yes, and we are going through the projects. While W. moderates and asks name by name about what has been achieved today, and what has to be done later, I realize the sheer number of projects.

Vignette 2: Agile's "swiftness" overrules democratic consensus?

We are in one of those daily calls that last for one and a half hours. In the call are representatives for different kind of businesses and for different regions, especially A. from France is bringing in her knowledge about France, which as a big country needs special care. P. from Norway knows about industry products which are different from medical ones.

In the call is also a young business analyst from an external consulting company directly moderating to ground the ideas with technical feasibility. My role is to support and mediate the specifications with technical knowledge, but also as an internal employee to govern the process from a technical side. Two days before this specification was read to the subject matter experts, two of my technical colleagues, each one responsible for one system, were meeting up in a virtual call. I explained the different scenarios that the development should cover. Then I was explaining how I was right with my assumptions, but that we have to be careful about different processes.

Specifications are defined as user stories. Software is described in a way value is created. Right now, I can see such a story on my screen. T., the product owner reads carefully the text shared from his screen. This story is about the original purchase price. A. chimes in and explains that this is a crucial feature that we can use to negotiate a new price when the customer wants to acquire new products, or for contract negotiations.

Then he asks A. if she thinks this story is describing in enough detail how France is working. She tells that this is enough and very understandable. Then he asks P. if this is enough for the industry process, he also confirms.

I explain what is difficult here, depending on the process, was the device could have been bought by a buyer's organization or directly. We have to ask if the product was repaired and resold, or was it first sold for a demonstration and then rented out, all this makes it harder to define what an original purchase price actually is, and how this price will be used to derive a value for the users. As we have just two sprints left, meaning six weeks of development time, we should accept that just for the simplest process, to show the first price, is possible. T. asked again around if this is enough, and A. and P. were given the permission to develop this story.

Now the next topic was brought up, a decision of how data should be displayed was decided on the week before, but now T. says:

“Working on user stories is not always democratic, agile means it is always concentrated on a few hands, and decision have to be taken by a few people but then we are bringing back the democracies by telling people what has been decided.”

There is silence on the part of the other people.

In another meeting another topic is blocked when reading another story in the same way:

“As part of release two where was a discussion about it. And then now we had a discussion again. And we then realized it was not possible to decide anymore, because the decision has already been taken as part of release two. So maybe some decision can't be taken anymore.”

Release two means here the previous part project that is thought of having different releases. This part of the process is now not of concern anymore. The momentum of experts and the project organization are a crucial element to drive the change. When finalized the moment this organization is missing, the corrective changes cannot be brought in as easily, and are therefore final to some extent, making the project un-democratic.

When in yet another daily meeting a story is blocked, then this time it is because of technical reasons, T. says:

“I am fine, to overrule the experts. but we cannot overrule our head of architecture, especially in interfaces, it is not so easy to rebuild them as other projects are not working agile.”

The problem is that the new system has to be able to communicate with the old system. That is why the concepts have to fit together. Other systems have other stake holders involved that

in this way can block decision, by having technical artifacts unable to cope with the new changes.

The Structure of Virtual Spaces

The codes and categories outlined below contribute to the development of an emerging theory regarding the concept of place in Computer-Mediated Communication (CMC). The categories show how in the virtual space meaning is as an activity ossified, written down in various state. The information that lead to the algorithms has to flow through various forms to, in a human-technological system, produce the results of the projects. Each of those places comes with a special meaning, an action or intention. The places carry additional connections towards the phases of the project. The phases can be seen as the Other (the big other), the symbolic order, which through its looming influences sets the rules of how the humans, or the algorithm has to act. In a critical view, one can observe, that tasks lists are characterized by the surveillance, which is the main intention. In positive terms, management wants to have transparency about what is going on. In critical terms, the transparency leads to surveillance, where the workers are checked for the execution of their tasks. In each category the materiality of the space is an important part of how exactly the work is being conceived, perceived, lived, to structure it in Lefebvre's terms. The conception as mentioned is dependent on the phases, but also on the category. Task lists are much more conceived as management tools, to organize the work. Software interfaces themselves are then more conceived in the way of developer tools, to actually do the work. This way, the resulting perception of the spaces is shaped. While task lists can be perceived as oppressive because of them being among other things tools of surveillance, the software interfaces can be perceived as oppressive because they pre-structure the work in their materiality. What we mean here, is that the developer experience is an important part of how the work is done, and how it is perceived. For example, SAP environments are much more flexible, and it is easier to be creative and implement algorithms, than for example the Salesforce environments, that are much more already structure to common patterns. But this perception can vary on the task to be done. A lot of times, such SAP system that can be used to be creative, are then equally used to support, sustain the creative of another worker. That means that the creativity of one worker, can be to the detriment of the support of another. Because the code is then more uncommon, can be more complex, etc. This is the same for message channels, in positive terms, they are tools for communicating very direct with other humans. But in negative terms this place can be perceived as something that overwhelms because of the frequency of

communication. In the third layer, of how spaces can be structure, the lived experience, exactly this emerges, that how spaces are conceived, and how spaces are perceived, result in the lived experience. If a task list, or the concrete place, the agile board, is conceived as a place of transparency, and it is perceived as a place of surveillance, the lived experience can be that worker are rejecting to put in all of the tasks, creating an aura of the unknown towards management. In this way they can then escape from the oppressiveness of the place, and choose the information they would like to share with the management. This is a form of a power strategy applied by the developers towards the management.

Now below is Table 11 that structures the emerging theory, the codes and the categories. We display the results of the study in the order of the (grounded) process of data analysis: the table lists the categories that could be derived from the coded field notes. The codes themselves are then listed together with a short description. Finally, the action/intention column should situate the category in a metaphor of the production of code. Code is managed, worked on, and discussed.

Table 11: Codes and categories

Category	Codes	Description	Action/Intention
Task Lists	Agile board, Task table	The code originates from either a task from an Agile board or from a planned task in a table	Manage
Software interfaces	SAP, Salesforce, SAP Cloud Integration	Code is written in this space. The user experience of the software platform changes the materiality of the production of code.	Work
Message channel	Public channel, Email, Group channels, Group chat, 1:1 chats, Meetings, Screensharing session	This category is for how the code is talked about, how communication is established.	Discuss

In the following sections, the codes are described in more detail.

Task Lists

The first category task lists show how code is managed. In most cases the subject matter expert is writing a short description of what needs to be done to a virtual card on a virtual board. This board has different columns all signifying the state of the code. A first column will have the status “open” from where a software developer can take the task and starts writing the code, moving the card to the status of “in progress”. Finally, the code has to be reviewed, i.e. discussed with peers about the quality of the implementation, and tested by the subject matter expert. The code is considered “done”, meaning ready to be deployed to the production system. The term deployment means that not just the code as a text is copied, but that the runtime of the code is started. This shows the materiality of the code in different states, as a textual artifact discussed with peers, and as a technical artifact run by the machine. This task lists create with their user interfaces different spaces where the code is the central object to be managed. The task boards’ central features are the flexibility of how different code can be created, there is no strict order. A daily meeting is held to pick up the tasks and clarify the requirements.

Another way to structure tasks defines a different space, the task table. This space is less flexible. The table is mostly predefined to be filled out, and again there are specific meetings to check the status and fill in new entries. The different user interfaces create different spaces by how the software developer and the subject matter expert is able to discuss, re-assign, re-order tasks.

If one now analyzes in the first step the situational dimension of code in task lists, then we can see how tasks are practiced in meetings, that are virtual, and a screen is always shared. Then in the case of the task board the focus is on distributing the task, and it is put in a specific time frame, that can be understood as cyclical, but also with a specific beginning and end of the sprint. With the task table this is different, as here we are thinking more about software development tasks in specific events. As those tables are used to practice control over software, to execute power, specific events are tracked. For example, if some error message is thrown, in the table the error message and the time of occurrence is tracked. Consecutively when the error is analyzed, the actor is noted down, and the date when the actor performed that action, as well as the result. It is also thought in a life cycle as the beginning is the error description, and the end the error resolution. In a second step we can have a look at the management of code through boards and lists in a genealogical way. When I started my observations, errors were managed differently mostly through a specialized

ticketing system. But even though time could be tracked differently the spatial dimensions of the software were different, and impractical that's why there was also a change in the practice. The ticketing system made it hard to specifically establish a space, i.e. an overview over all open actions to be performed. They had to be viewed in an isolated way. In the task board we have the spatial dimension of an overview, and the workload of all actors. In a way the evolution towards a specialized board enabled the empowerment of the worker of making transparent how much work is done, and what exactly, but also empowered management, to evenly distribute work, and have a transparent overview of all of the actions to be done. So, we have the development in the organization from a ticketing system towards interactive, virtual task boards. The next step was the move towards the task tables, because they enabled to focus on very specific critical tasks to be performed, and provided a tactical view of how to manage topics, not actors. That is why for critical communication workers created a special table to track those developments. This was started as part of an own initiative by workers, but is also sometimes demanded by management, to make it possible to report the critical incidents, and check the development of the code.

The configurational view of those practices shows the interdependence of actors. The main point of managing the code development through lists is to: (1) coordinate actions, but also (2) to check the state of the code. Tasks boards enable the cyclical work on the code, and task tables are observing, managing the codes shape, especially when the code in its materiality, and unknowable complexity has to be tamed/handled. That is why the title calls the code as unruly individual. The developers are never totally aware of all of the complex interactions that take place with the code. Especially in different lifecycles the number of interactions, and types of interactions increase. There the codes real face becomes more obvious. Before just between developers and smaller test cases the true picture could not be established. Error cases are a lot of times observed in a certain behavior of individuals at very different locations than where the experts or developers are working. Then individuals are starting to interact with the code they trigger certain error cases which could not be observed beforehand.

The final step in our analysis is the dialectical synthesis of all those different modes of understanding. The situational view shows that the way that the code is worked on is partly cyclical, and then in the crisis-mode more driven by events. The genealogy showed that the ticketing system was discarded away from clear workflows, more towards an ad-hoc pulling of tasks, and then more flexible by working with tables. In the configurational view we were

made aware that in later stages of the code lifecycle, different actors appear that are not directly integrated in the development, and that hidden complexities, grounded in the materiality itself of the code as an actor appear suddenly and have to be managed.

A dialectical synthesis of all those modes shows the internal contradiction of this way of working. Agility is achieved by letting the workers decide of what tasks should be worked on, and without regarding the code as an actor, sprints are seen as a cyclical mode of working, while projects with their timelines and different events have their own perception of time. So we have clashing concepts of time and space. In a later step we will analyze the software interfaces that provide yet another spatial environment, that is more inline of how the code actual works.

The fundamental contradiction is therefore threefold: (1) management of human individuals, (2) management of projects, (3) management of code. Each have different modes of working, but have to be synthesized, and managed in one way, through different interfaces that are not interacting with the code itself, in a different way. The software interfaces are the way the code is practically formed, and shows the spatial environment where this is done. The code here is obviously independent of human individuals, with its hidden complexities, independent of projects, with old or new synchronous developments but or constantly interfering.

Software Interfaces

The code itself is created through various different software interfaces. The quality and modernity of platform defines the space of work. Three different environments are used here (1) the Salesforce platform which is a cloud platform, (2) the SAP backend systems which is an older server system, (3) the SAP Cloud platform, which is another cloud platform.

Each different space has different types of software developers, which have to use the platform. Often it is needed to work together in a screensharing session, where in a hectic pace the different spaces are passed through. The code's life cycle is different for each system, as well as three different programming languages, and configurations.

Again, we first analyze the situation in which time, and in which space the development of the code happens, regarding the software interfaces. Human actors are working alone on their defined tasks, are together when needing help, or coordinating activities. Then they use the

software interface as the material manifestation of the code. From a genealogical perspective the cloud interfaces are a development of the SAP backend systems. This is spatially felt, because a special program VPN has to be activated, and external employees have to use a virtual machine to be able to access the software development toolset. In the newer cloud environment, the websites are not different from other websites on the public internet, they are indeed publicly accessible. That makes the work in SAP backend systems more tedious, and prone to error. Configurationally one has to view the different work on the code in its simultaneous environment. Many projects are running in the same time, changing the same code objects. Here there are code management systems in place that make it easier for actors to synchronize their activities. Code lives not in just one environment but runs in two development instances, where just developers have access of one system, then there are two more instances of servers where the code environments are connected to the other environments making it possible to test the code across code runtimes, integrated into other systems. Then finally there is a stage of the code running in production, meaning the actual code used for the business processes.

The dialectical contradiction that is resulting from the three different observations is, that code is not just existing in one environment and one form. The time of the code life cycle, first as something in development, then as something integrated, and finally in a stage of business usage. Projects run through different stages and all at different times. There is a synchronization process established by a separate release management team, that tries to govern through meetings and rules. But individual actors are interpreting those rules in different ways, especially in different contexts of time. Some developers push the code already into the integrated environment even though it is still producing errors. Some actors have different standards of quality, and push the code into actual management by carefully managing expectations, and the elimination of errors. The contradiction is between the perceived code base, and the different actors working in many different code environments.

To make it possible in this liminal space between tasks and code implementation to let a common understanding emerge, message channels are established for communication between the human actors.

Message Channels

Until now we mostly discussed the channels of *meetings* to share updates, and *screensharing sessions*, where developers meet around the code development environment, and work together on the code creation. Furthermore, there are the following options:

- **Public channels**, for general updates where a message is pushed to a general public
- **Emails**, which is less instant and asynchronous, mostly used for important messages that need to be logged in some way
- **Group channels**, this is a bigger group of invited members of a certain group, mostly for communication around a project or community of practice
- **Group chats**, for urgent tasks that involve multiple team members. This is a lot of times the form of communication established before a screen sharing session
- **1:1 chats** are for clarification of a task with a subject matter expert, or between developers

If we analyze again time and space in a first step situationally, we see that actors are interacting with different interfaces working with different understandings of time, more immediate ones, e.g. 1:1 chat, and communication with an established practice of responding not directly but with an acceptable time between the initial messages and its response. In the same time the situation depends on the interaction patterns, a 1:1 communication involves just two actors, group chats many more, but also clearly addressed, but public channels speak into a not that immediately defined group, where a direct response is not even necessary. While 1:1 interaction demands a timely response. In a genealogical way emails are at the beginning of the history of asynchronous communication for the observed communication. Even the preference for asynchronous communication emerged here as a result of the pandemic. Before much communication was happening in conference rooms, or at the work desk. The pandemic sparked the establishment of new tools. Configurationally the different tools allow for communication that is not a clear back and forth. Actors can decide in which channel to communicate. A communication can be started in one medium, and then be transferred to another one. The individuals are then deciding between recipients of the message, and by

choosing the channel either reducing or amplifying the audience. Different time zones are also an important factor affecting the synchronousness of the communication. So, for communication late at night for European times zones, South Asian actors prefer communication by email, this way it can be assured, that the recipient can process the information in the morning.

All those different modes of understanding are then again generating key contradictions. Actors have to perform tasks across different media in a linear form, but the communication with its channel complexity is deeply non-linear. Then again channels are not always expecting a feedback provoking unplanned events to intrude further into the ideal linear progression of tasks. Another contradiction is that tasks should be performed with a certain clearly defined set of persons. But many not immediately obvious actors are interfering in the task execution.

Interplay of Social Dynamics and Digital Artifacts in Global Organizational Management

The observed codes are related to the different stages of the code. The categories and their intention show the work done by the actors to the code. The social emerges as a system between individuals. Management as part of the social sciences are drawn to study the relations between individuals while neglecting the objects themselves with their inherent/essential properties. The praxis of managing in the studied global organization is done via different digital artifacts with each their inherent qualities. The artifacts are also spaces where individuals form around and relate to each other.

Manage

A task list acts as the space where activities are managed, but they are also a means of organizing the time of the workers. From the perspective of the code artifact, the task list is the organization of the interaction with the code. Some parts of the code base can be neglected, if not deemed critical, some parts can take the center stage time and time again, because of its cruciality for conducting business. Who decides about the priorities depends on the projects worked on. In the technical teams, it is decided through practical relevance, when the running code produces a large trace of error messages. In the ideal case, where Agile

practices are mentioned the functional users in their role as product owners are prioritizing tasks.

As an artifact, task lists are the foundational cradle of the code, setting the clear boundaries of what needs to be done. Even though we take the perspective of the code as an actor, in this stage it is clearly acted upon, as a passive object. But in the act of analyzing the issue, one can inscribe agency to the unruly behavior of the existing code. Many times, the original authors are not there anymore, and an existing code base, i.e. written code has to be inspected on its own. Other times code is taken over from big corporations, to be adjusted to the needs of the business. The original human actor writing the code steps into the background, they are not visible anymore. The behavior of the system, the code's incarnation as a running program, is in a lot of cases unpredictable. This contingent situation is accounted for by prototypes, small version of the real implementation, just to test the behavior. We can observe here that the code as an actor is present, and the space of his appearance is first in the existing runtime. The task list is then the space of the individuals to make note of the code's living behavior.

If we change the perspective back to the algorithms, then this affects the implementation, too. Sometimes it can be observed that hasty decisions are being made, just to be able to close the task. The code then tends to cover the minimum, or as it is often mentioned 'the happy path'. Edge cases are time-consuming to implement, and are often covered later, when the consequences are already felt.

Work

The next category, *software interfaces*, is another level of observing the code as an actor. The different development environments, the tools with which the developers work, make it possible to see the code like a living actor. If we take the SAP system as an example, a lot of times after the code is written, the developers make changes to the system observing (a) through logging the activity, i.e. making the code itself writing a protocol of each of its steps. Those steps are then inspected in a screensharing session, in its flow from the one system to another. Finally checking for the correct changes in the documents, e.g. the change of the price of a device is correctly send to another system, and the new price is also visible in the other system. These logs are visible in the SAP system itself, but then not live updated, the programmer has to refresh the screen to see the changes. But there is another space, a website where the logs are copied to and which automatically updates itself. Because of the livelier

visualization, most developers use this centralized system to observe the behavior. But there is a variant (b) that is even more direct in observing the code, the debugging mode of the program. The programmer sets a breakpoint, the moment the program stops at a certain line in the code. From this moment the programmer can decide if they want to slowly walk line by line through the code, or go deeper into the system, to explore layer after layer.

These interfaces are all different spaces to observe and manipulate the code, all with a different inherent speed. They are also intercultural spaces whenever different individuals are working on the code together. If we see the code as an actor, or an individual itself creating a relationship with the intercultural individuals then we can see clearly through our method the boundary spanning element of the code as an individual.

Can the code considered to be an intercultural individual? Different personalities with varying culture backgrounds are involved in the creation of the code. The code should therefore as a cultural artifact contain traces of the different cultures involved. One conclusion that could be taken away from the novel approach of analyzing intercultural management is, that code has to be managed equally in a culturally sensitive way, to be able to talk and interpret the code in the context of cultural differences, conflicts, and constructive management.

Discuss

The message channels are the space where the code is discussed or talked about, in the same way that the interfaces are. They are an enabling technology on top of the direct systems, making it possible to access the code in an indirect, untimely way. When managing software developers that are dispersed, this distance towards the code as an actor should be a variable to be taken into account. When observing the actors, this conclusion is lacking right now. For example when comparing an email with screenshots of the code, versus the life inspection via debugging one can clearly see the distance one takes towards the code as an actor.

5.2 Space—Discussion

To answer the sub-question of **what role organizational spaces play in the dynamics of culturally diverse IT projects**, we can interfere the consequences of dividing the space into concrete instances, task lists, software interfaces, and message channels. One can see algorithms as complex socio-technical systems arising through intercultural interactions in

the organization. The algorithms are not existing as an abstract concept, but are bound to space. An often-neglected idea when considering virtualized images, meaning objects of the organization that are not visible in their materiality, but are software in their most materialized form. And in the same way that algorithms lack the spatial factor in their interaction, power is disregarded in the new state of management arising. Technological culture brought in modes of production that are fundamentally equal in appearance, exemplified by project methodology defined as agile. But simultaneously with the recent events, the sanitary crisis, and the rise of virtual workplaces space is brought unto the center stage, because of its perceived lack. Workers need to be present in their former workspaces. This absence is especially felt by management, which feels at a loss from social clues, to understand the success of their control. This loss of space is felt equally by a loss of power. The work, formerly perceived primarily as something done in a particular space at a specific time, falls in the right place and is done more flexible.

The findings show different elements that define the role of space in the observed projects.

1. Third Spaces Emerge Through Experience and Narrative

In a first instance space emerges as a liminal object, shaped by the experience of the individuals, and an emerging narrative. Different narratives are competing with each other as what counts as “real”, power is derived from knowing, or being in authentic touch with reality.

2. Approaching Space as a Subject

From how space is shaped and understood, the findings show that it is useful to understand space as subject rather than an object. That means, individuals are heavily influenced by the emerging properties of space.

3. Power Strategies are Contrasting with the Other

The literature points to the concept of the Other to understand the motivation and desire of individuals, to form power strategies that are firmly located in space. Space’s role as an object/subject of desire extends the literature by empirical findings, and novel implications of space and algorithms as an expression of IT projects.

4. Computer-Mediated Communication and Virtual global spaces are projections of desire

One special form of spaces are virtual spaces. We extend the literature by grounding the existing theory with ethnographic data. Simultaneously, the introduced theory gives rise to a new understanding of Virtual Spaces, enriched by the connection to the Third Space, concepts of subjectivity, and as projections of desire.

5. Time as Located System of Activities

Time is a necessary component to understand the processes in a project. Therefore, the findings are extending on the literature of time as well.

6. Time as Located System of Activities in Space

Finally, as a last step time and space are shown to be functioning together, with the processes to be understood as a system of activities, that have a temporal as well as a spatial structure.

Third Spaces Emerge Through Experience and Narrative

The company's headquarters has a spacious reception, giving way to vertical space, and through a modern glass structure sunlight is able to enter the lobby of the building. When one looks around, one sees a small cafe bar, and further a model operation room stressing the role of the medical technology. Aside are large meeting rooms with glass doors, in multiple open layers. In the management sciences, this could be as a first space the company building itself, is there an atrium, is there enough light, the meeting rooms, their size, their properties, are the walls all grey or like in many startups colorful and with stylish decoration.

The headquarters new building can be seen as a non-space (Augé, 1992), in its new and anonymous construction. In general organizational spaces (De Vaujany & Vaast, 2014) imbricate over time their own meaning. In this case the new organizational space is closely linked to the old building, which is very close. In addition, the area of the building is an old industrial area, and connects to the concepts of the repair workshops, and storage facilities, which just before the recording of the data moved to the outskirts of Hamburg.

Therefore, Soja's (1996) concept of a Third Space enhances our analytical tool set to view space as something beyond physical reality and subjective experience. After we analyzed the First Space and the Second Space the Third Space emerges out of this context. The First Space is characterized by its virtual nature, where cameras are turned on or off, according to the power structures. The camera devices are one visual part of the space, as well as the

microphones, which are in each meeting not only picking up the voice of the speaker, but in the same time picking up the background noises.

In our research we could contrast the physicality of this space with materiality of the virtual space. The material space is for example the headquarter of an organization, the physical building space. The physical space has certain properties that in its materiality affect the individual. Headquarters might be more spacious, they might represent the materialized accumulation of resources. Then through this difference in the materiality of the headquarter contrasting subsidiaries, power relations can be constructed on this level. The people absent are able to govern, the people present won't.

And this juxtaposition from the material space, with the meeting rooms in the headquarter, and the concept of power, defines two spaces. A second space is the space of the subject, how we perceive the space. Depending on our cultural background our perceptions are different. In the literature of intercultural management this refers to the basic concept of *proxemics*, which Hall (1966, p. 1) defines as “the interrelated observations and theories of man's use of space as a specialized elaboration of culture.”

What we're doing here is differentiating between two forms of human experience: first, the object that we perceive, and second, the subject. When we identify office buildings in Spain or in Germany, then we can see them just as objects. But they have a subjective and spatialized meaning, too. They are the material that the regions are about, to cluster countries, places of responsibility to sell, to repair, etc.

But as when we see space as something active rather than passive, we have space emerging as a social system, independent from its objective and subjective spatial properties. Again, we found this emerging system in the data, while conceptualizing the work flow of a technician. We have the physical place the hospital, where a device has to be repaired, and we have the imagination that the worker has to find a department, because that is how conceptually the space is divided into through the information system. But in the Third Space, through the emerging system, this department does not reflect the reality on the ground. The worker reported that the department spans multiple buildings, and anyway he can't navigate the building because the hospital workers are leading him to for him unknown and unspecific locations.

As a second example from the data, the system theory concept of diversity and consensus introduced in the literature review as a fundamental problem statement emerging very early

on from the data, is spatially dependent. We defined it as a paradox on the organizational level between subsidiary and headquarter, as well as on group level between project teams that have to diverge first to take into account all the information available, but then have to come to a decision. On the organizational level, the HQ and the subs. are not abstract concepts but are real existing buildings with humans that define this as their workplace, building functional regions internally. For example, workers of the headquarter will have more face to face communication with each other than workers of the subs. And vice versa, the workers of the subs. will communicate more with each other, as well as have more local context, the HQ workers have maybe less local but more global knowledge.

To connect this observation of distinguishing between several categories of space can fundamentally connected to a core concept of intercultural management, that of the Third Space (for example compare its placement in Barmeyer (2012)).

From a genealogical point of view, the Third Space is a term that Lefebvre (2000) established when researching space in the context of the everyday, as our one example from the worker showed, who's real life experience of the space is distinct from the pure physical building on its own, but also from the imagined space conceptualized beforehand. He starts to distinguish between the aforementioned layers: "It none the less emerges that the everyday unfolds and is constituted in a space and time distinct from natural space and time, as well as mental space and time" (Lefebvre, 2014, sec. III, "Introduction"). That is, the Third Space is a space that is different from the natural as well as the mental space. The first space defined as the physical, natural space, and the second space, as the mental, imagined space. The third space is a dialectical space, that is open for subjective intervention (Lefebvre, 2014). While Lefebvre is using this concept more in the way of a phenomenology of lifeworlds, how the life is experienced, rather than conceptualized, Soja (1996) interprets and enhances Lefebvre's concept to construct the third space as a the synthesis of the first and second space. The third perspective is a synthesis of the natural and the mental perspectives that clearly distinguishes itself. Then the Third Space is a social space that emerges, not unlike language emerges in the social domain (MacWhinney, 1998). In the intercultural context of the studied field different subjective perspectives towards the space emerge to a cultural space that is different from situations in a homogenous cultural context.

We already described how we discovered the categories of space in our data by looking at the HQ subs. relationship, and the perception of diversity. The first space defining the physical

buildings of the HQ, and then the imagined space of the workers emerging from different physical proximity of the workers. The Third Space would then build up here, by for example taking these two perspectives, that are incongruent, and create a new intercultural space, where individuals from the HQ meet up with individuals from the subs. The both differing imagined spaces, as a result of the first spaces, would create a Third Space, that is negotiated. It is fundamentally *liminal*, because both perspectives have to withstand some tension, also with different power strategies in place of the actors. Taking into account the power strategies also shows how the Third Space is actively shaped by individuals.

The *liminality* is another concept connecting to the Third Space, and a lot of times defined as a crucial property (V. W. Turner, 1969). This is something quite visible when looking at diversity. For example, if the imagined diversity includes teams with different nationalities, and the natural diversity includes linguistic diversity, then the third perspective is the everyday experience of this *liminal* space. This third perspective is needed to understand the lived environment, and to explain the changes that occur in an intercultural situation. This stage of enactment of cultural diversity opens up the possibility to describe the interventions of the subject.

During this time COVID-19 suddenly disrupted work life. This intrusion rendered new managerial challenges visible, a hyper-accelerated drift towards virtual spaces. We might expect space then to become less important because of it is less visible. This study will show that to the contrary space becomes the focal point of managerial challenges in this new era. Virtual intercultural spaces are a vital place of conducting business during the pandemic, specifically interesting by their constitution as *liminal spaces* (Bhabha, 1994). In another way, when space becomes the object focused, in itself space can be thought of a subject interaction with the participants (as O'Doherty and Neyland's (2019) call to deconstruct the subject-object dichotomy). Imagine a meeting between different locations of a multinational corporation. Teams were already meeting up online when travel was not practicable, e.g. it was an informal talk between engineers in Europe and South Asia. But before pandemic restrictions at least some travel was possible between close by locations, and the office as a place in general. Now place got virtualized in a way that office workers have to live under the same restrictions as one would expect before only for far-away locations. As the physically space is absent, one could assume that space in general becomes obsolete, as the primary place to do work is not available anymore, the office. And even when one looks at the alternative location, the home office, this is not visible anymore except for our own place of

work. This is coupled with the general trend of the studied corporations of a strategic drive towards globalization, where workers can expect that even post-pandemic working style will include this absence in space.

This emerged from the data clearly when looking at the drive to standardize processes. Where the motivation of the standardization, in the mood of everything is fundamentally the same, overwrites the experience of the subs. with everything is actually different. If the individual then argues from a position of power, they actively change the space by manipulating the mental image of the space of the individual of the subs.

This stage of enactment of cultural diversity opens up the possibility to describe the interventions of the subject (Lefebvre, 2014). The everyday is mirrored in the Habermasian theory of the *lifeworld*, i.e. the horizon of the individual (Habermas, 2011a) which is constantly challenged by interaction, and therefore broadened. But also always restricted, never able to see the whole of society, or the other individuals inner life world, e.g. their thoughts representing the strategic motivations of their communication.

It is important to distinguish mental and natural diversity and consensus, because of the distinction between what the individual is aware of, and what is perceived as value-neutral “natural” fact. The “natural” perspective doesn’t exist as a mental image, but is performed by individuals of an organization. Part of this perspective is the restriction of the individual in the sense of its performed personality. The individual chooses exactly what to expose according to his or her role or status. For example, taboos can be part of the “natural” repressed, e.g. bio-political properties of the individual, that society restricts, leaving it to the individual to resolve paradoxical situations in the work environment. An important part of the observation was to question the narrative of the actors, and observe what is not said.

The narrative is important to analyze and deconstruct, especially for MNEs Vaara and Tienari (2011) see that identification is a central theme of the constructed narrative, playing a crucial role in establishing power, and constructing space. The authors see the discourse structured in three layers, that of the nation, the region, and the globalized view.

To make it clearer what this precisely means, the dialectical means that the two concepts misalign, two statements about the same space but in the different categories seem to not fit, this is exactly what our ethnographic data shows, there are certain understandings about a certain space, but the lifeworld of the people with localized knowledge, e.g. the field technician, is different, sometimes shocking even to themselves. To take another example, a

developer might imagine in defining a technical blueprint a single hospital as the space where the code is used. But then later on, they realize that it is a hospital chain that uses the algorithm, or a private practitioner. The Third Space is exactly what then comes into being, the movement towards a new conceptualization, but also the openness of this situation. Suddenly the programmer has to decide how to handle the conflict. Bigger hospital chains will have more demand of computation and will create larger data constructs, small practitioners will be overwhelmed by the data constructs designed for a complete hospital.

Approaching Space as a Subject

As a further reflexive step the study then explores the concept of space in the paradigm of neo-materialism. Space is seen as something objective, observed by a subject. New materialism problematizes the subject-object dichotomy itself (Tischleder, 2014). But far from being an unchanging fact of nature, always closed to the observer, it is possible to explore space as something dynamic, without inherent properties, and therefore without an inherent moral aspect (Castree, 2003; Hawkins, 2010).

Space can be seen as a mediator, actively transforming the message, intention of the actors (Jones et al., 2004). We can imagine the different actors (where we can include objects in their fluid materiality, too) forming a network, less in a way of a computer network passing digital information, that is guaranteed by its technical properties to arrive in the same way as it was sent, but more in a way of a whisper network. Where with each passing, the message is transformed. To make this clearer for objects, the materiality of a chat message is important in how the information is passed. People are choosing randomly words and enter them into a box to find a fitting GIF animation. The algorithm behind choosing such visual information is an important factor of what kind of messages are being sent. Maybe the actor had some different in mind, but a pop cultural reference was chosen, because this was the easiest available image. The other actor has now more space to interpret the message because the medium chosen does not directly map to what the sending actor intended, etc. Those networks of materiality show the network character of actors in space, where the space itself has an active materiality. The software platform as a space of work actively with their algorithms intervenes into the communication of the actors.

The pandemic can be seen as one important constraint, that is a critical non-human actor. In Neo-Materialism those actors are especially designated as hyperobject (Morton, 2013). As such an object it is grouped with other non-human actors, e.g. climate change. Hyperobjects

are differentiated from other non-human actors, like code or algorithms, in that they are always withdrawn from our sensual comprehension, but sticking to us and influencing us deep into our lifeworlds. Without ever being something that we in its totality can touch. The pandemic's virus is not visible for us, it's transmission can be explained scientifically, but we cannot observe this transmission. To keep with the paradigm of practice research, preventing the transmission of the virus was not a singular action, but very prominently a system of actions, e.g. if you're indoors, open the windows every hour, wear a mask, don't stand close, prevent contact. Those actions are independent of each other, and up to change. When less people were infected, the set of actions was changed. This hyperobject is then different than a normal object, e.g. code. Code can be observed, seen and changed. It is immediate to us, and doesn't surround all of our actions. Whenever we are in the nature we can escape for a while the environment of software, but it has the tendency to become a hyperobject, with smart phones that are surrounding us, and the incomprehensibility of software. Climate change as a hyperobject can't be escaped because it surrounds the complete globe.

Power Strategies are Contrasting with the Other

Referring back to Parson's concept of how to establish power in organizations (Parsons, 1956), this would be as in the first vignette a technical form of power. In line of my former description of how boundary spanning works in the ethnographic context, the subject matter experts are forming their whole internal organization where the technical team is an environment. My role was here to understand their desire, and communicate that desire to the technical team, that in turn transform this desire to be mine. This these two systems that have their own symbolic order, there is always a lack. Lacan (1966) uses here the expression of 'suture' which can be made useful in a management context, and in the context of space. 'Suture' means to cover up for the lack when bridging different systems. The two symbolic orders, or systems of how individuals understand the business context, are distinct, with different elements, on the one hand for the experts lived experience how for example sales are working, and on the other hand technical experience how cloud software is working. When trespassing both worlds this lack has to be 'sutured' in communicating the desire. In the Third Space that happens when both symbolic orders are confronted, through meeting with the business experts and the engineers, it is useful to problematize this fundamental lack instead of trying to either ignore or fix it. It is useful to understand this lack as a given constraint.

This statement about decision have to be undemocratic explains the process' nature, by referring to the project's methodology. Agile is a newer method that regulates how software should be developed, by centering on the less bureaucratic more human element of the process, and by focusing on the results. In this context it means the swiftness of decision making that has to be taken to be able to deliver any result in a timely manner. This meaning is created in a context where agile is the opposite of the known bureaucratic process, that is negatively connotated. Because of this negative connotation the democratic decision making is disbanded. As this is bordering on what can be said as what is good for the organization, it is mentioned, that the decision is then clearly communicated. Which is also the case, but one important point is that because of the concern of budget and time restriction the change of this result is then not possible. This is an element of agile development, to iteratively incorporate those changes. But as I have observed other changes, the moment the project ends, the process of how to change things also changes.

There is another aspect of power in technical projects. The power to stop decisions is dependent on one's rule. Here the technical necessities can establish themselves as the definitive rational, able to counterweight managerial power. In this way new technologies that are introduced are also elements of a change in power in a global organization, where the regional technology is then later chose on a global scale. Centers of excellence are defined, also on a technological basis. New projects have to then compete with their new understanding, but also dominating to become the globalized way of conducting business.

But referring back to that power doesn't have to be always negative/restricting. This play of power can also be interpreted as a way to reach new efficiencies, becoming a new form of technological/positive. Now it is possible to exert in unison strategies, where before it was produced in a less efficient way, decentralized. The globalized macro structures are here at work on a micro level.

In line with the critical realist paradigm of our research, we can progress from our data to understand the causal mechanisms behind the scenes. Bringing up a scene of the meeting between engineers, business persons, management discussing the service processes in the company. What was observed is, that there is a working towards shared knowledge. This can then be linked to the literature of Intercultural Communication, where the situation can be perceived as an interactive process of exchange (Barmeyer, 2012). Because of the inherent moments of surprise and misunderstanding, it is crucial to work towards a common

understanding. Here the confrontation of different cultures demands from the individual to confront the other, the alter ego of the communicative situation, and to create from that something new (Müller-Jacquier, 2000).

To further analyze the causal chain of events, the HQ has established a certain knowledge about the subs. This is acting as The Other even for the individuals of the subs., because a lot of times they are aware of the official processes. Even space itself can appear as *the other*. From the perspective of the individuals of the HQ this would be the imagined, but also normative space, e.g. how a hospital has to look like, how a field service technician will act, what standard process to follow. With the events unraveling and the confinement to different spaces, that are specific places, space specifically can appear as *the other*. The theory of Lacan (1966) provides an interesting approach of how to “read” this psychological phenomenon. This enhances the discussion of intercultural interaction by putting the imagined desire of the other culture on the spotlight, while in our study to further concentrate on the proxemic aspect, how space is structured as an artifact of culture.

To position Lacan himself into a paradigm, he is a poststructuralist thinker by providing structural foundations for his analyses but rejecting key properties of structuralism as the totalizing removal of the subject (Miller, 1998). The perspective of poststructuralism is important to problematize to theorize the structure subject/object, and structure/agency distinction (O’Doherty & Willmott, 2001). Equally fitting is Lacan’s focus on singular cases to focus on the specific situations at hand (Arnaud & Vanheule, 2013), to our ethnographic study. One part of Lacan’s theory will be his distinction between the little other and the big other. This analytical concept will help us to understand how space is enhanced by our view of others, and how others perceive us.

The *Little Other* is the object cause of desire, and also the reason of desire. Here we have to understand that Lacan makes a difference between the reason of something, meaning the logical understanding in a system of thought. And the cause of something, which refers to the real. In the same time the Little Other is never something concrete, but a perceived lack in reality that makes us desire something. The stage for this desire is the fantasy that the individual, but also groups, or society imagine. For example, an individual can have the fantasy of going to work, and achieves something meaningful for everybody, and the individual fantasizes about how the others are amazed by the individual’s accomplishments. This fantasy is the stage for the desire. To desire success at work is something that makes

sense in the logical system of society at large. But the desire for recognition at work will not be for the logical accomplishment of the work. It is for receiving a certain kind of recognition, it is the lack of recognition that is the cause of the desire. When we desire the presence at work, it is the lack of presence, the lacking experiences that make us desire the presence. This example relates to remote work, a new data point not mentioned before. It was observed that people desire to be present at work because of individuals that challenge our common perceptions, but also because of the work itself, because we judge ourselves through the object of work, that has a surprising output.

Thinking of the causal chain of events of Critical Realism, we can draw up the events: (1) cause: the perceive lack of presence, the absence from work, (2) effect: the desire to work at the workplace. Another term of Lacan is that of *jouissance*, the failure of ourselves to satisfy our desire. The fantasy of satisfying work in the workplace is sustained by society at large. In our imagination the others are then satisfied by that presence. But the reality of our situation is that we are not, something is missing in our reality, something that we cannot really express, this something is the Little Other. This concept of an Other is what cannot be expressed by the subject. It relates to the impossibility for us to fully absorb reality, there will always be a lack, that then sustains the desire.

To make it even more concrete, a developer wants to be recognized by his manager for his work, that's why they come to the office. Then he got positive feedback because of being at the office. Maybe then the individual feels validated, but not directly by the feedback itself, but something undefined, that the developer cannot really point to. Therefore, when in virtual meetings, and just sustaining the symbolic order, the normal work routine, without surprises, the desire comes to be at the workplace, together with the reinforcement at work, that causes the desire, by fulfilling this aspect.

With another empirical data, the Little Other is useful to understand the power of individuals of another cultural background, i.e. the worker from the subs. that intrudes our symbolic order, the standardized process, the imagined normed space, and makes us question if this understanding is correct. We can imagine the standard processes as a fantasy, therefore as the stage, the scenery of the desire. Then our individual understanding is scanning the real subs. processes for a lack where the real is not fitting to the symbolic order. That lack makes us desire standard processes. Culture itself is a lot of times unconscious, therefore we don't know what we lack of understanding in the Real. Different cultures are a lot of times then

presenting new things that moves our understanding. We then don't really know why we desire, because this lack is the object cause of the desire.

The *Big Other* is then the symbolic order, the standard processes mentioned, the imagined spaces. The *Big Other* is functioning on the level of the social, and for this study we will assume the Third Space as the other that intrudes the imagined space, i.e. how things should The Other be, versus space as an object that corrects our understanding of how things are.

Computer-Mediated Communication and Virtual global spaces

The first vignette "Virtual global spaces" has as a theme the power relation between the social structure of the company: internal and external employees. External employees are meant to actually execute the tasks, while internal employees are governed. The organizational divide, between internal and external employees are presented by senior management of the IT organization as an economic necessity, which is part of the managerial discourse, a discourse of rationality (Grice & Humphries, 1997). But the veiling of the socio-technological framework cannot make disappear a noticeable disconnect from the life world, the Third Space emerging at different levels of the organization.

Friedmann and Nissenbaum (1996) calls this pre-existing bias. In our case the bias is derived from both individual bias, by the people empowered in the creation and key decisions, and societal bias, in that efficiency is valued. Both forms are interdependent, the efficiency being the motivation of enforcing a strong centralization towards the headquarter, and furthermore globalization. Then individuals that are closer to the headquarter will create value and keep the overview over projects, the external workers have a different life world while fundamentally being able to perform the same tasks, with the lingering possibility to be enabled for a broader view.

The developer's view tries to account for the multitude of narrative structures. As in the paradigm of rational management (Grice & Humphries, 1997), the role is interpreted in the internal organizational structure as to act according to the value chain, with high value work done by internal employees, and lower value ones by external employees. The separation of experts by their knowledge reflects this value-chain (Corbett-Etchevers & Mounod, 2011).

As the Third Space is the space of the social, we have to take account of the desire of others as an analytical tool. As the organization is following a global strategy, it is helpful to imagine the worker's desire in these global changes on a macro level. Taking our defined

concept of the Other, we look at the organization and think what does the organization desire. This understanding of desire depends on the physical location of the individual.

The headquarters are located in Hamburg, implying an inequality of space, because even if there is an imagined, represented reality of a global governance, the physical space is an undeniable part of the life of labor. The central location of Hamburg does not equally represent the regions it will try to govern. If we now assume that with a global organizational change that the headquarters in Hamburg are strengthening their position, then part of the workforce, the peripheral, will perceive the power of the headquarters from a position of following the direction. Their desire will be the perception of what the headquarters possibly want.

But going global could also weaken the headquarter in Hamburg which is right now only in charge for Europe, the Middle-East and Africa. The headquarters desire is therefore to be the primary actor, then being able to govern the Americas, China and the Asia-Pacific regions.

This whole picture of being the winner or loser of an organizational change contrasts with the daily setting where the Other, the Third Space, and its desire is dependent on understanding and managing daily tasks with intercultural understanding as an utmost priority, to avoid conflict and satisfy the organization's demands.

The global organization exercises its power anonymous by putting high level project portfolios upfront, that then trickle down to concrete project teams. Power is then exercised by putting tasks into teams, limiting their creativity by being less strategic and more tactical in this space. When conceptualizing those moves towards a globalized and virtualized space-time unity, we have to see the aim not only in its ontological terms, but also to what it means psychologically, especially the added pressure and dissonance (de Vaujany & Riot, 2023).

On the observable level this starts with global projects that are taken up to establish Hamburg as a global center of excellence, which was beforehand taken for granted on a regional scale. The internal team has to do more tasks of governing the heightened amount, but equally in their role of boundary spanning (Aldrich & Herker, 1977), especially in its technical role. Parsons (1956) gives a useful overview of three ways in which individuals can device power in an organization, managerial, strategic and technical. In this case the team establishes power relations technically by using special cloud technology that is distinctive to the global organization while competing with other software. To be able to exert power the technology has to establish itself as an "object-in-use" (Vaast & Levina, 2005). Those objects are able to

establish itself as common symbols in the global environment (Bartel-Radic & Munch, 2023). The symbolic order of the organization incorporates the object to make sense for every individual. In a Third Space between the external and the internal team this work to establish those objects is then the lived experience of more context switching and a heightened complexity to accommodate the different situations where the object is used now. But as it becomes clear in the team practice, even technical objects are employed in a context. The ever-changing context in a global environment makes it harder to understand. On the other hand, internal colleagues in their role as boundary spanners have to govern with in a more diverse environment, for example calls with Japan which are in a different time zone. In the same way the complexity of the communication has an added practice of communicating in turn with the external team that is then implementing the object-in-use. It is important to establish global leadership to bridge the boundaries of systems, using power effectively by concentrating on the project's efficiency instead of enforcing a dominant role in shaping the culture (Bartel-Radic & Munch, 2023).

In the organization sciences in general, in the literature of virtual communication in particular, space itself is often omitted (Sydow, 2002). Bachmann-Medick (2017) conceptualizes a spatial turn, as a sub-concept of a cultural turn, and explores its potentials. One of those is that "[i]n the humanities and social sciences, 'Zwischenräume' ['in-between spaces'] have long been considered as specifically challenging, innovative 'third spaces' created by cultural overlapping and mixing and as 'play spaces' for creating something new" (Bachmann-Medick, 2017, p. 43).

For this theoretical framing to be more complete, let me also define desire more clearly in the terms of Lacan (1966). We desire the other that is lacking. In terms of space the office space as a place with certain rules and rituals lacks things like intimacy. When all communication started to be put online, suddenly there was an invasion of intimacy: The screams of the worker's children, the noise of a colleague that didn't have time to have a lunch break. The Third Space makes us as a social space aware of this liminal state. It makes one also reflect on the state of offices in general with its lack of intimacy that can now be overwhelming. Walter (1995, 1997) found that intimacy is greater in computer-mediated communication exactly because of the lack of cues when comparing to face-to-face interaction. Over a longer time, one has to reveal more of oneself to be able to convey one's individual characteristics to compensate for group associations.

Chevrier (2012, p. 202) had critical observations of virtual teams relating to the psychological proximity, that are equally reflected in this study: In virtual teams it can be observed that geographical distance is still mirrored in the core-periphery relations of the team. There is a loyalty towards the physical center, and tenure in the team is not resolved. Technical project settings are getting into the foreground, e.g., the project's result, but this cannot fully emulate the psychological proximity of a co-located team. An anonymity remains.

On the other hand, the effects of anonymity should not be only seen on an individual level. The social effect itself should be taken into account. The social identity is another concept of identity which derives its core not from the individual but from how the individual positions itself in the social structure. By stressing this social identity, e.g. "I am a software developer", one loses their individual characteristics. Stereotypes will be then used to influence group behavior. This process of loss of the personal characteristics in favor of social ones is the de-individuation. There is a trade-off characterized by the Social Identity and de-individuation (SIDE) model (Spears & Lea, 1992) where through computer-mediated communication (CMC) the social identity of the individuals in the group is stressed, and individual action is characterized by normative processes.

But this goes against the strain of the classical theory of de-individuation, where the individual is lost in the group, loses themselves in the mass by being anonymous. Here, the anonymity in a group leads to my lack of possible response patterns. I can only be affirmative to the collective movement (Zimbardo, 1969). The attention is taken away from my own individual self-monitoring and self-regulation, towards the group (Diener et al., 1980). But Reicher (1984, 1987) stresses here, that while anonymity produces a loss of personal identity, it actually enhances social identity. Because when the individual is de-individuated, still the social identity remains. These effects of social identity are so strong that in an empirical grounded observation the strong group effects can overshadow the effect of anonymity.

Those are special observations about the identity of individuals during computer-mediated communication, with very specific attributes, such as the before mentioned anonymity and concealment, but also better surveillance (McQuail, 2010), by Zuboff (2020) seen as a new phase of capitalism. But a fundamental property is its mediation through technology. The mediated aspect suggests that it is therefore placed in a category of mediated communications (DeSanctis & Monge, 1999).

This interaction is in general not restricted to human-to-human interactions, but might be also mediated quite far through a chain of machines that just might be triggered by a human, e.g. a workflow system notifying a worker of an outstanding repair, or a finished repair. Those sub-system interactions might be part of one system, but are fundamentally different, human-human, human-computer, and computer-computer interaction (Gaines, 1988). This runs against the grain of a behavioralist world view of humans as machines. But humans make choices based on a shared cultural substructure, machines have a substructure of necessity (Habermas, 1984).

It makes sense to remark the highly developed technological character of this mediation. Communication is then also not just the classical letter in the form of an email, or more instantaneous through a message, but also through the little green status icon showing that the worker is online, communicating presence, virtually. This is in a paradoxical relationship of the absence of the workers in a hybrid workplace where the presence is signaled through the green circle, but bodily marked by absence as many workers prefer to work from home, also conceived by the official guidelines by Salus Vitrum Therapeutics, of prescribing two days of office work vs. three days of working from home, therefore inscribing the preference for working from home to the official policies.

To apply this to the problem at hand, when employees have to be managed across different time zones globally, the virtual space is not inherently for example more anonymous. The space is something that gets noticed most through different moves, e.g. whenever it is curved to fast-track a German employee soundscape in a spacious and silent office, to perceive the loud noises of a home in India. Here the enriching experience of global soundscapes lets us judge morally different than another case where an engineer expert is energetically presenting her work, but instead of receiving a visual feedback she is greeted with silence. Virtual spaces have their own properties, they lose certain aspects of “real” spaces (Lefebvre, 2000, 2014) in the sense of spaces without a virtual enhancements, visual feedback might be missing, audio communication is something one can now opt-in. But how this space expresses itself, intrudes our reality is far from a static picture, that we can have a singular moral judgement on.

Time as a System of Activities

From understanding our ethnographic data as fundamentally spatial, we also recognize their time dependency. Let us take the data point of an action, reading email in the morning at the start of a work's day. It is an action with the ideal intention of being up-to-date about the ongoing business. It is a relationship between the sign of the email embedded in a computer with a screen. The reality of the social situation contains a contradiction. Take the case of having too many emails in the morning, the worker is too busy to read them all, and just reads the ones that are enough to signal the superior to be up-to-date, even though those messages were filtered out that have no urgency or relevance for the superior. But then another superior on another level recognizes in a meeting that the worker is not aware of some important changes. This creates a double-bind situation, the worker has to read more messages, but is then unable to do the work of his direct superior. New actions take form, and the worker is starting to skip tasks relevant to his one master, to fulfill the additional tasks of the other. The unit of analysis would not be the action, reading emails themselves, but the process of reading emails, the time it takes for the individual, and the space where this is embedded in.

Our analysis starts with the activity, as something that is mediated between the inside and outside world of the individual, strongly connected with speech which is fundamental to thought and action (Vygotskij & Cole, 1981). The inside is represented by the sign, i.e. the cognitive processes happening inside of the mind of the worker, to process the email, and the worker themselves, sitting at the table in front of the computer screen.

Those activities are not seen atomically, but are understood as an activity system, and as a basic unity of analysis (Engeström, 2015). Activities are analyzed in their complete cycle, from initial assumptions to first contradictions, double bind moments, i.e. all movements of contradiction and resolution. So the lone activity itself is not at focus of practice study, but its embeddedness into a system (Langley & Tsoukas, 2017).

The activity system can be linked to the performative turn in the social sciences. This turn is concerned with thinking about social categories in a process, instead of in terms of social structure (Bachmann-Medick, 2006). The turn has some properties that also ethnography takes as a fundamental epistemological point. Away from an essentialism of individuals, towards their actions. Social objects of knowledge are not abstract entities with general rules, but concrete context-dependent or -aware. Even if we imagine social reality as emerging

solely from communication between actors, those actors are starting the communication at a certain point in time, and situated in a certain space.

This is especially useful when thinking about power relations in a company. Actors are not bound to a certain social structure, especially when thinking about activities of exerting power strategies, those are dynamic and leveraged through a multitude of different attributes, rather than solely through social structure, and specifically in a company through the hierarchy. Instead attributes like technical seniority can be used as a lever to influence decision. Taking the example from the data, where higher up management confirms a decision, just to be rolled back later because a technical architect has to confirm, and he is refusing to do so. Because the business-oriented management is at loss at the technical intrinsicalities, they have to trust the judgment of this senior engineer.

Our approach to performativity and praxis is a dialectical approach, a combination of three general approaches, based on (Langley & Tsoukas, 2017), of how to study practice in organization:

1. Situational, analyzing certain special places (as spaces with a special meaning) in-depth
2. Genealogical, tracking how
3. Configurational, explore practice in its place and time, with a focus on interdependence and simultaneity

But the dialectical approach would synthesize the aforementioned modes of exploring performativity, and show their inherent contradictions. To go back to the email example. A situational analysis goes into detail of the worker in his conditions, working remotely, has a laptop, gets daily many important updates. Genealogical, first the performance is based on checking only emails relevant to the direct superior, then extending the content read to that of another superior, then adjusting work. Configurational, by describing how certain tasks are communicated asynchronously, for example the worker is located in a multinational company, with different time zones because of different locations. That is why there are so many messages, because a lot of context is missing that has to be added to the messages. Each new meeting has to then be extended by the context that was learned through the messages.

Time as Located System of Activities

To deeply understand spaces and how they are conceived, we categorized activities. But those activities are not just conceived spatially, they are also bound by time. As our basic unit for the cases is the project, they are quite tautological bound by time. To understand the time and space relationship, the cosmology of Alexander (1920) can be a useful starting point. He takes the human body as a starting point of his reflection, “Time is the mind of Space and Space the body of Time.” (Alexander, 1920, p. 38). Every activity of actors is enacted at a certain stage the space and in a certain time. The both aspects of reality are intertwined, giving body and form to the abstract inner picture of the action.

Time has to be understood in this context on two levels, first as something subjectively constructed by the actors, but equally as something connected to the material world (de Vaujany et al., 2014). Subjective means, that for example in projects time runs out, deadlines are perceived as markers of an end of a project. In the same way that cultures around the world are setting festivals for certain events, to perceive the passing of the year, or birthdays are celebrated. These markers subjectively divide time, and makes time intelligible. But on the other hand, we are relating to objects to understand time. In a global organization, time zones are constructed to make the day understandable, transferable for each region, we know when office hours start. This is made easily accessible through calendar software, that immediately schedules accordingly. Planning software divides time into sprint, and a dashboard makes the tasks in a sprint visible. The actor associates each task with the help of certain objects, in this case a virtual object, a simulated card on a screen.

Time is imagined differently, depending on the activity, and on the person executing the task (Ancona et al., 2001). Time and timeliness are ultimately tools in our ontological stance, of coordination of the actors and objects of each other, not unlike a choreography for the manager (de Vaujany, 2019). Ancona *et al.* (2001) make a useful distinction between (1) a cyclical understanding of time, (2) as an event, and (3) as a lifecycle. Those differences in the notion of time are useful to analyze the different activities relating to time.

1) *Cyclical time* is clearly exemplified of how time is understood in sprints. Tasks are split into parts that can be finished in a certain timeframe, the sprint. A sprint represents a cyclical representation of a project, just in the timeframe of two weeks, where a project would take approximately four months in the observed context. While a project, which is still

the common division of time to implement software, is more of a specific timeframe with a start and an end, the sprint is perceived as something regular reoccurring.

2) *Events* can be more seen in projects, where the start of a project is a clearly defined event, communicated and lead by the project manager. Equally the project's end is an event.

3) *A lifecycle* is the complete project, but also products. In the observed projects the products have a lifecycle which is also important for the projects. A product is sold, shipped, repaired, and in the end scrapped. The life of the product has to be strictly logged in the software, because it is a medical product and losing the device's track, would mean in case of a malfunction the cause could not be determined anymore, which has not just legal, but also ethical ramifications.

In a classical distinction, Hall (1990) describes the different cultural modes of how time is perceived in two ways according to the cultural background, polychronic, that many things are happening simultaneously, in cultures where being late to an appointment is excusable because of another life event happening, and monochronic, where this would be perceived as rude, because no other thing can intrude the timely execution of the one appointment. For example, this is clearly seen in the sprints, how many cards are processed simultaneously, and how big is the tolerance of postponing tasks, because other activities came in between. The intercultural context here is between India and Germany, concerns different actors, with not so clearly defined cultural backgrounds, because some Indian workers moved to Germany and identified in a positive way with working the German way. Then cards/tasks were closed because time was seen cyclical but monochronous, and not because the task could be considered finished.

But we should not forget the relationship between the three actors involved here, that organize the code, especially in a managerial context: the worker, the manager, and the artifact. Managers want to be sure that tasks are finished in time (Clegg & Dunkerley, 2015), and use the tasks lists to control and predict the outcome. The task list lets the manager observe, and in another reading surveille the implementation of the code. It should be therefore also, among other readings understood as surveillance (De Vaujany et al., 2021). As De Vaujany *et al.* (2021) stress, technology has the role of the mediator, and they give the example of business intelligence as transforming communication into a digitized artifact, which creates meaning for the organization in an automated way. The difference to be seen

here is from their example is between pure symbols to be interpreted, and meaning, in the sense that the artifact itself triggers managerial actions of control. The task lists observed in this study are not creating meaning in themselves, they are symbiotic to the observer, but they stress certain aspects, to be used for surveillance. For example, whenever a task is kept more than one sprint as an active task, then a little red marker appears. In other lists the comments grow in one column with timestamps next to it. We can observe here two dimensions of time, first the duration of tasks. With an agile view, all tasks are put into sprints. To keep this boxed timing is crucial and is observed by all participants. The second parameter is the timestamps for the other medium of keeping task lists. The practice of putting actions with a time and date into a column to track the executed behavior surveils the actor, but also the code, namely by writing the changes in another column. Each event is recorded, the longer the trail the more the likelihood that this task will be 'escalated', meaning put unto more managerial control.

Space—Key insights

There are deep paradoxes of space. Especially virtual spaces are influenced by the organizational context. The three observed spaces were: task lists, software interfaces, and message channels. Below are the key insights about those three main observed virtual spaces:

- (1) Task lists were confronted with how the organization was structured in general. The line and project organization had different goals and priorities to achieve them.
- (2) Software interfaces have to be used at different levels of the organization and for different development stages of the algorithm.
- (3) For message channels, there is a high level of complexity due to different audiences. There is no clear input and output to discuss the work and then proceed to do the work. Many different inputs have to be merged by the individuals or by the group through the other virtual spaces.

6. ALGORITHMS

Algorithms are the building blocks of the observed IT projects. But with their complexity, especially in a global environment, unexpected behavior emerges. The algorithms themselves are not created from a homogeneous void, but from a culturally diverse workforce. Referring back to the overarching question of how the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes, this section looks at algorithms specifically. As such, this chapter answers the third research sub-question: **How do algorithms developed in culturally diverse IT projects affect organizational outcomes?**

The following finding section will show the different development stages of the algorithm. Constructing a life story, and connecting the technical artifact with its different individual that give birth to them. Then in a move of reversal the technological object is more seen as a subject, also an agent acting upon workers.

The discussion section connects to the literature, showing how the ethnographic data, and emerging theory fits into the field of Critical Management studies, as well as the post-reflexive stance in ethnography. It contradicts the literature in that the interplay between workers and algorithms is very intimate, where later in the life cycle workers are anticipating the behavior of the algorithm.

The technological side of how the context of an algorithm is restricting its functioning and how the algorithm is coming into existence changes the organization. While it is clear that the implementation of algorithms is started from a core premise of management studies, to find ways organizations can be more efficient. The assumption would be substituting a part of the business process with an algorithm. This part of the process would be the moving part and maybe the interface between the step beforehand and after. However, as the data shows, the implementation of the algorithm changes much more. In a multinational complex organization, the algorithm's need for formalized knowledge becomes a platform for those who can implement their process variant. These power plays can never be localized in the business process only. They will also affect the power play included, the other parts of the business operations. It is shown because the algorithm is not just a substitute for a process but is put into place as a tool to establish, in favorable terms transparency, and critical terms, surveillance. This surveillance then affects not just the process itself but also the broader

perception of workers of how they will react to this added transparency, e.g., information-hiding strategies.

Objects are often seen as neutral, having no culture. However, they must be put in the cultural context they are created, then acting as subjects while performing the task, the algorithm exhibits cultural characteristics. When individuals of different cultures interact to create something new that acts independently, we have the diverse synergies of different cultures, understanding their different ways of working and their information being picked up. This constitutes a prime advantage of diversity. What often arose in the data was that diversity was also hard to synthesize together, in some way bred with the algorithm a paradoxical personality, acting different from all the diverse subgroups expected. This bridges nicely with the concept of complexity in the literature that systems exhibit emergent behavior. Even though each part is understood, the final behavior arising from the diverse sub-parts/modules is unexpected and appears chaotic, i.e., hard to make sense of.

To make it clearer, let's provide an example, a worker is receiving a device for repair. Each machine has to pass through different stations until it is ready to be shipped back. The algorithm of this study has been created to determine how long it will take until the customer gets back the device. Many different parameters must be considered to decide on this date. The model this algorithm will be based on reflects the people's perceived reality in designing the algorithm. An algorithm is something that is produced through a process not unlike writing an ethnographic study. The writers must immerse themselves into the global company's operations to create something new that accounts for all the eventualities.

Experts are brought in from multiple places worldwide with different ways of handling complex procedures. However, the expert's input changes the algorithm and the surrounding organization integrated into specific power structures, restricting the creation. Because those experts cannot be treated as neutral storage of the organization's knowledge but as individuals embedded in the company's power structure. The individuals have to express themselves to bring the information across. The individual standing in the organization then is an essential factor, but also the individual's motivation of why those specialties should be accounted for in the algorithm. Then on the other side of the communicational dyad, the receiver, the project has certain constraints, the developers want to keep the IT complexity down, etc.

6.1 Algorithms—Research Findings

In this section the findings are presented in the form of the analytical result, using Grounded Theory to answer the question **how do algorithms developed in culturally diverse IT projects affect organizational outcomes**, the data were first coded openly, and later unified.

Data was sourced from all the projects under consideration. However, Momentum stands out as a unique case. Unlike other projects, Momentum primarily involved the implementation of a sophisticated algorithm. The insights obtained were primarily due to the employment of ethnography as the data collection method. Grounded Theory was then utilized to analyze this data, leading to the derivation of the analytical codes that form the crux of the findings. To do so, initial codes were set for each line of the collected ethnographic field notes. Then the codes were merged together through the emerging research themes, with a focus on the lens of the Critical paradigm.

A first finding apart is the importance of nationality. This element is a marker of how intercultural processes are crucial for the algorithm's characteristics. The next big tripart block of findings are the algorithm's developmental stages. The expression is consciously chosen to mimic the development of a human being. Often the algorithm is imagined only in its stage of running already in a system. However, different stages are essential to understanding how an algorithmic system works. Just as with a human being, the algorithm's early stages, the early decisions the actors make, deeply influence later characteristics.

1. The first finding is the importance of the nationality for the organization, via the development of the algorithm.

Interplay of Technology and Social Structures: The algorithm transpires not merely as a technological entity but as a non-human intercultural actor, because of its creation and maintenance by different nationalities, embedding itself within the organizational matrix. In this context, the demarcation between technologically embedded algorithms and the social contexts from which they arise blurs, showing the intersections of algorithmic development and human systems interaction within SalusVitrum Therapeutics.

2. **Importance of the development phase design:** The design phase is crucial because they influence all later stages, just as with the development of a human child. In the

design phase, the critical decision about the meaning is taken, what the algorithm is for, why it needs to be implemented, and how it should look in its basic appearance.

3. **The build phase:** The assumptions from the design phase are brought to life. This phase is marked by constant testing of assumptions, understanding the complexities behind the initial design, and realizing the real-world implications of the functionalities. It's during this phase that emergent properties become visible, sometimes leading to changes in direction based on newfound understandings.
4. **The management phase:** might be primarily reflected in the literature critically because this is how the public perceives something like the algorithms of insurers or social media networks. Nevertheless, this study is marked with the word manage, in that the once-built algorithm must be managed just like an individual. The algorithm becomes an actor in the business system. This also implies much more agency from the employees because they are active parts of this system with the institution of a change process for this algorithm. This is unlike an algorithm superimposed by another organization.

The following sections are now detailing out the findings (see Figure 11 for a visualization).

Nationality

For SalusVitrum Therapeutics, nationalities were found as a code, and therefore recurring theme. In the beginning the different nationalities were coded—Chinese, French, German, and Indian—not only to signify diverse technical minds but also as a basic structure of cross-cultural interaction, letting power structure emerge within the organization.

Now, let us describe what nationality means in detail. The nationality is a potent marker of those involved in creating the algorithm and its environment as a visible indicator of cultural diversity. There were Chinese, French, German, and Indian workers, internal and external to SalusVitrum Therapeutics. Nevertheless, a nationality can never be enough to capture an individual's full range of complexity. For example, the developer of Chinese origin is also Swiss, therefore, a bi-national individual. Nevertheless, nationalities represent different power balances in the organization. France and Germany stand out because of their importance and market size in the EMEA region. German has a unique role as the host country of the headquarters. In general, not nations but regions are the valid construct in the

company discourse. When Britain is officially mentioned, UI, a short form for UK and Ireland, is named. India plays another unique role in that this is where most of the engineers the supplier for IT come from. India is not a market in the region, so mostly mentioned in private conversations or matters of coordinating the workforce, for example, for national holidays in Tamil Nadu, a region in India where most of the team is coming from. However, Delhi is mentioned, too. So it is not exclusively one region. Another aspect of this code is that not every employee of Indian origin is from that company. Some are engineers that worked in other German companies before and switched to SalusVitrum Therapeutics. Another phenomenon worth mentioning is that some external employees from the Indian supplier switched from an external to an internal role, switching jobs from the supplier to the company after building successful relationships and providing value. These explanations should show how each code has a multitude of meanings. The codes are mainly meant for structuring the discourse around the data.

The work towards the algorithm is shared through different roles. Domain experts and senior technical engineers are supposed to do all of the higher-valued business analysis and draw up the design. This forms along the lines of the coded nationalities. As one manager described, external workers from India were more involved, lowering the value creation chain, namely the build phase, where the code was implemented. The assumption is that the Indian engineers should encode the refined requirements. Therefore, roles are preconceived to do certain things. The domain experts should design the system. Then the engineers should find a technical solution to the problem. Moreover, finally, the outsourced developers should do the job of coding the algorithm. However, this conception of the roles is not observed in the data. Every theory of how the work is done to create algorithms has to include accurate life observation. To adjust to the demands to fulfill the job properly, the only option for external workers is to deviate from the prescribed roles. External developers deeply understand the problem domain; much of this knowledge is encoded into the algorithm. At the same time, business analysts equally encode the algorithm by doing something that the experts do not call programming, the developers, but is. They are modeling the algorithm via a provided complex configuration in the studied algorithm. Instead of just drawing up plans or governing solutions, the internal lead developers and architects do hands-on work, even on fine-grained tasks, especially concerning expert knowledge.

The difference in power is visible, for example, through the requirement engineering and prioritization of what should be built. In the field, it was observed that every engineer had a

strong opinion of the algorithm's usefulness in doing the work it originally intended. One can already question why the original intention was not drawn up by the complete group needed to implement this. The basic assumption is that the IT part of the group does not understand the business needs, which is negated in the observation. However, on the other hand, while implementing the stated goal, this is changed according to reprioritized goals, which became to be very different from what was initially stated. Another aspect of the power of the different roles that is undemocratic in the group is that the budget always constrains the project. Sometimes this is then reflected in the work. Whenever an algorithm has to be more complex to do its job than the budget allows, its functionality must be restricted. It is not up to the engineer to decide whether this makes sense. In the field, this was observed many times that engineers warned about a faulty rushed implementation, and only later on those warnings were fulfilled in malfunctioning.

The coding confirms our assumption that an algorithm is not just pure design and procedure but its embeddedness in a technological and social context. It does not exist on its own but in a network of different social and technological systems that are means of production for a workforce. The division of the algorithm does happen (1) through different technical systems assigned to different working groups with different power structures, (2) but also to different roles, (3) which are finally divided by different nationalities or cultural backgrounds. This grounds our theoretical understanding that algorithms are non-human *intercultural* actors because, on several system levels, the individuals creating and maintaining the algorithm are of different cultures, expressed by the recorded codes of different nationalities. The concrete nationality or monocultural determination does not construct the truth in those codes. However, it indicates a deeper intercultural and critical understanding of algorithms as systems permeate an organization.

Regarding Critical Algorithm studies, every attempt to exclude the code from the algorithmic system excludes equally the actors at the “lower” end of the value chain. If one restricts the creation of the algorithms to an elite of engineers, then other aspects are being missed. The code during later development cycles does, in its materiality, affect the algorithm much more than senior management perceived because of the value chain narrative justifying the separation of work.

While a human system determines the algorithm's creation, the emergent properties are as important. Those properties arise at every level during the several coded phases with the

different cultural backgrounds of the workers. This is comparable to stimulating a system at different layers and experiencing feedback loops. A core insight in system theory is that systems are never to be influenced directly. A system takes in some input and produces an output, but the inner workings remain opaque. The same happens with algorithmic systems. Different coded nationalities are more concerned with stimulating the system in specific ways to encode the algorithm into an existing algorithmic structure. This point is vital to understand the different feedback loops observed to establish at different levels. While the algorithmic unconscious might be less accessible for a business manager from France or Germany, the Indian engineer is much more careful in implementing certain functions because of intricate knowledge, the established relationship with the algorithm, and its observed unpredictability. Code is prone to have unintended consequences, and here is the distinction between the algorithm as planned by elite engineers and business experts and the persons in the call centers using the applications or the support engineers experiencing the differences or shortfalls.

Design

The code ‘design’ was given to designing the algorithm as a first stage. The codes were built around the project Momentum, where I worked as a lead developer. My work started with giving the principal business analyst a rough concept of how the algorithm should work in the future. I was then tasked with translating this into a concept that could be implemented. After I wrote down my first design of the algorithm, I invited a subcontracted developer to explain my concept. She was relatively new on the job at the client, my employer. I have described to her what I was planning for her to do. This includes stretches of how the data should be stored, how it would be read, how analyzed, etc.

My specifications were already very limited in scope. The whole implementation was restrained by the goal of bringing a faster momentum to the process. To be specific, the whole concept of the algorithm was at risk because the process the business process would not align. The algorithm would wait for certain events to happen in a particular order. Because the employees were aware of the events the algorithms would track, they would postpone those activities or leave them out altogether. This behavior would undermine the now newly formulated goal of only providing transparency. In the beginning, the reason why the algorithm under study should have been implemented was that the repair process could be

sped up. Later, because of the project's time constraints, the essential function of management was prioritized to provide transparency and surveil the process better.

In my field notes, I have noted exemplary for the code 'design': "We met in a small room and went through a word file, which is a concept, that I wrote earlier." Here I am referring to explaining the concept to another developer who will support the creation. This communication happened from one developer on a level among peers. Even though I was in the lead role, this implies some power imbalance. So early on in the design phase, the relationships in building the algorithm were based on truthful communication and trust. The algorithm will go through several design iterations, where the actors are becoming less motivated to speak among peers and use communication strategically to negotiate certain limitations. That means technical emerging harmful properties of the algorithm were solved organizationally. This resolution was not without conflict and was more in the mode of mistrust.

This excerpt shows the clashing of two roles that are fundamental to the creation of algorithms. Each has different stakes in its creation:

"Later, after the testing, the central business analyst discovers the lack of a crucial functionality. The section manager stresses that the formal way has to be honored. Therefore, all phases of a new change request, i.e., an effort, must be estimated and placed inside a backlog. Because everything not implemented to the specification is nothing to be fixed directly."

Often the business analyst is taken from the stock of prospective users of the algorithm. In both projects, Virtuoso, the business analyst, came up with the initial specifications. Also, the key stakeholder in forming a consensus was a prospective system user. The consulting company also provided external business analysts, primarily tested to finish the project on time and in good quality. For the project Momentum, the critical business analyst had the stake of being part of the sub-organization that will be used or affected by the algorithm daily.

On the other hand, senior managers will mostly try to see returns on the development investment. A specific budget is allocated to IT developments, and here the goal is to make workers more effective or efficient. In the whole design process, they are only involved on special occasions, whenever the scope of the project changes or some important implications have to be signed off, e.g., some significant risk to be taken.

The immediate section manager is concerned about the project work and how it will affect day-to-day business. Workers cannot attend to their daily tasks or obligations towards other projects if the project becomes too intense. This risk is mitigated by detailed plans that are often to be changed because of the emergent properties of the algorithm. Even in the design phase, the complexity of an algorithm is quite unclear and dependent on the complexity of many small parts and their newly established relations.

Suppose now the level of complexity suddenly and unexpectedly rises. In that case, the section manager will mostly worry about the worker's ability to cover that project and, in the worst case, neglect the other obligations, especially in this described matrix organization where every obligation is towards two things simultaneously, the project and the line organization. This organizational conflict then translates to a conflict already given in the design phase, where for the first time, it becomes apparent to the worker how complex the algorithm will be. The resources have to be allocated accordingly.

What is interesting for Critical Algorithm studies is that this interplay/conflict affects the algorithm itself. If the section manager defunds the technological side, issues will likely pop up later for the user. The algorithm quality might suffer if resources are removed from the project manager not to staff their project.

The funding of the technological side of the algorithm makes sure that there is a certain quality. One often observed aspect of software quality in the public is that of a sound security concept. Especially for data theft often, basic security mechanisms are missing. Users must secure their data, but this aspect is often neglected as it is not visible. The narrative by business analysts, among other things, focuses on the function that provides value to the customer. The inherent contradiction is that some functionality is not apparent and not directly visible, so corners are often cut where it is about the long-term effects.

Furthermore, in this excerpt of my ethnographic notes, I am referring to the process that has to be followed when the design of the algorithm should be changed. This institution of change management positively affects the algorithm in later stages. Because of the often creative and innovative work, fast iterations are needed for design phases. Attending to the bureaucratic process for change is marked by Strategic reasoning, e.g., to deflect using up resources.

Strategic reasoning sets herein because organizational boundaries are crossed. The actions of each individual have consequences that are not bound by the algorithm itself but by

organizational politics. A worse design is considered, not because it is closer to the *actual* implementation, but constraints set by the organization and structures of power. *Proper* refers to the theory of communicative action, where consensus is formed towards an ideal goal, unlike *strategic reasoning*, where the logic of the project with its time, cost, and budget constraints comes into play.

So, in the first discussion of this code, we saw what it means to generalize the defunding of sufficient engineering resources. But the opposite of an observed scenario, too. How the algorithm should work is not something apparent immediately. The loop of creating an understanding by further and further inquiry is interrupted by organizational constraints of how much is invested into discovering the truth of an idea, or very precisely, in this case, the correct date of when a repair is finished. The concept of strategic action expresses here the good enough date. What is enough is defined as whatever answer can be given in the amount of time available or the amount of exploitation of knowledge possible. The latter widening is interesting to speculate about in the context of complexity. In contrast, many experts would increase the chances of having the right solution available. However, a wider divergence will hinder finding a consensus. The experts would produce different facts or suggestions, but to finally design the correct solution, each expert has to agree and categorize the input.

Build

The code 'build' describes another step in the life cycle of an algorithm. The algorithm not only forms a newly implemented core of some new digital business function, but it also forms new relations to existing technical and human systems. Especially even the enunciation of going into build mode was, for the internal engineers, a big step because, from that time on, external resources had to be drawn into the projects much more. As mentioned, the algorithm is a system embedded into several systems. Whenever the algorithm starts to be implemented, a certain finality is drawn up for the design phase, and now different release mechanisms have to be taken care of. Equally, other projects have to be informed, and whenever the same technical objects are touched upon, the other projects have to coordinate how the algorithm will be built together with those teams.

In the project Momentum, this is visible by an early instance of this coding: "I then proposed a minimal version, that we then extend later, just to test the underlying concept. Later on, we would extend." I meant here that not the full complexity of the system is modeled, but just a minimal core that helps the original designers further understand the algorithm. This shows a

break in the concept that most traditional engineers follow to make a clear cut between the project's build and design phases. Nevertheless, this code is essential to show how projects, even though Momentum was not structured and promoted as an agile project, had to be handled as such because it was so hard to formulate an exhausting list of features and how to implement them. That is why in this phase, I have only communicated my perceived core of the project to my external colleague to implement in the first step while exploring a complete feature set in parallel.

Another essential part of this thinking was that one could already see and experience the algorithm with a minimal feature set implemented. Thus, the human mind drives the creation and emerges from the interaction with the algorithm in its material reality. In the project Virtuous.3, this was even officially communicated as the abbreviation MVP (Minimum Viable Product) for the complete implementation because it was essential to communicate the incompleteness of the product. This allowed users to accept limitations while exploring the system and then build their new algorithm on top of those observations.

Back to the project Momentum, there were, as in the design phase, multiple discussions of how to implement the algorithm that could potentially lead to renegotiations. I noted: "I was questioning her if I am wrong in my perception that it is hard to do, but the developer said it is doable." This was an incident where I was unsure how the developer handled my request internally. Even though she was a new worker, I trusted her because of the peer-to-peer mode of communication.

As a stereotypically but common situation, sometimes less communication is used strategically to save one's time. However, this behavior might change the algorithm by not going through the design in detail, implementing code to one's interpretation of the problem, and practically inventing a different algorithm.

In general, both communication modes could have been employed here when engaging with the Habermasian concept of strategic vs. communicative action. She could have said that it is doable to avoid further discussion. However, it also could have been a statement among peers to affirm a correct design. Only later it was possible to confirm the correct interpretation when the code was done quickly and timely without further explanation, i.e., it was communicative action, not used strategically. It is important to stress that engineers do not make this distinction in this way, but it can be in the field observed to arise naturally. It is

pretty unlike when observing communication with business users, which is exclusively communicated strategically.

One instance of this code is building up the opposing pair in the theoretical sampling when several meetings and workshops were held to prepare for a decision for senior management. It is important here that a frank formulation of the problem was avoided in the preparation, and everything was reduced to the decision-making process. This originates from senior management having limited time and must have a distilled view of what is at hand and just enough to make a decision. This, for sure, shows the different power structures. I observed this in several instances, especially in project Virtuoso.2 and 3, because senior management had to approve every significant deviation from the initial project scoping in a monthly board meeting. The project in the smaller scope, Momentum, had not got any of those meetings, but also here more as an outside threat, the escalation towards senior management was brought up. There was a more significant moment of conflict and escalation when a project dependency was discovered. A new cost structure was about to be implemented. The whole algorithm depended in its design on the already implemented structures, as the already existing algorithmic system was extended. This strategic communication was characterized by determining who to communicate the escalation to. Interestingly in this excerpt, not a central manager, the head of controlling was singled out, but equally local controllers:

“Analyst: I will have to ask the project colleagues to see what can be done and how to connect the countries. It is more about the new cost center structure. I fear that the workshops will stand still. I would propose to call around. Chantal and Sofia can help us to identify the local controllers to get names. We should also get the new head of controlling to find out how to escalate to the finance organization.”

Therefore, the power to escalate is bound to communication strategies, notably with whom it is to be communicated. While one individual can trigger communication, an organizational consensus is built. Ultimately, only little had to be changed, mainly by the business analyst. The topic was not communicated widely, and the only consequence was that the algorithm was not working correctly at the beginning. As I wrote this text in 2023, four years after this event, I observed and found out through asking about the algorithm that it established itself as a crucial part of the repair process. Only until then many changes were made to accommodate the situation finally. Also, in many cases, the algorithm was being turned off because the

workers could not keep a mental model with the algorithm. As an official explanation, the algorithm behaved too unexpectedly. However, as I heard from one business analyst, the workers often want to evade precise tracking and suppress the algorithm by carefully not triggering the events.

The strategic reasoning is not restricted to the build phase, as I wrote in my notes: “Today, we had a problem that a coworker discovered a missing piece in the implementation. That project part was already late. As a result of some mismanagement, he made me put the project manager into CC.” A project's implementation phase is when further adjustments are done or left undone. Each of those pathways in the build phase affects the algorithm's materiality. The adverse action of partly leaving the algorithm undone is done strategically. It was often observed that corners were cut when users could not verify the result. The project managers strategically pushed this and justified it by the impossible time constraints. Whenever I talked about this with my manager, I had to balance both demands from the line organization to provide a product with minimal support activities afterward because if something is left undone, later on, it will be discovered by the users. Then the line organization is to pay for the savings of the project.

Different organizations are here clashing with different interests. However, some of the conflicts can also be culturally determined. Because of the project constraints, led by strategic reasons, less time and space for an open discourse is given. The lack of understanding between the modes of production, a software developer, and a project or section manager is a consequence of an intercultural process. Neither of those roles is neutral when they initiate the creative process. They play a role in the innovation process. Both are deeply embedded in organizational culture through conflicts and synthesis that touch upon the concept of creativity. They can get to the consensual gist of an algorithm by its diversity in views and search for meaning, if not instrumentalized and limited by the goals of a project.

Manage

This code ‘manage’ handles the actions of organizing the work. This spectrum of actions can be shown with two contrary poles, managing through communicative action and, on the other side, managing through strategic action.

I coded this line with the code manage for communicative action: “Then a developer gave me good advice. She connected me to another developer that will be able to implement the missing part.” In the discourse of time constraints, to be able to build the algorithm, another

developer manages the work. This happens on the level of peers. The algorithm itself is affected by its possibility to have a particular property coded into. The algorithm would not contain that feature in a parallel world where this would not have happened. The algorithm's structure depends on the worker's ability to organize themselves.

However, it also depends on the organization's ability to change itself. As one coded passage shows: "One of the biggest concerns, the controlling [management accounting] for the subsidiaries, has changed this. The algorithm can just run when certain events are triggered. Now it is under discussion if not the daily lived process changed, and therefore the algorithm cannot pick up the events." If the organization had been unable to enforce certain events, the algorithm could not have picked up the signals to function.

Let us consider both quotes as being on the opposite spectrum of the managed code. On the one hand, we have a positive self-organizing system of developers that ensures the algorithm is implemented as designed. If parts are missing, other developers jump in to fix the code. In contrast, on the other hand, we have the user as the algorithm's object that tries to resist its correct implementation. The managed code is characterized by two different things: the implementers and builders managing themselves. It is also an adjunct system to let the algorithm grow, even beyond project scopes, through the institution of IT support. On the other hand, the object of the algorithm to be surveilled, which manage their situation with the algorithm, to resist those changes actively. An important part is the commonality of power. Neither of those actors has a direct interest in the algorithm. The developers are doing this as part of an institutionalized practice. They are just doing their job. If they perform the job well, the motivation does not lie in the implications of the algorithm, the reason why it exists. In the same way, are the surveilled workers not interested in the algorithm being there? They are more interested in avoiding the gaze of the algorithm. Two disinterested parties, therefore, manage the algorithmic system. However, one interested party, the business analysts and managers, tries to make the algorithm work, despite the resistance and obstacles. They are not acting in bad faith. Their rationalization is not to surveil but to create transparency in the process.

6.2 Algorithms—Discussion

Contributing to the question, **how do algorithms developed in culturally diverse IT projects affect organizational outcomes**, the findings suggest a focus on a case of actual

implementation and, in a longitudinal study, also its maintenance. This research study was chosen to frame the social phenomenon (Yin, 2014). That means we use this frame to look in-depth at code as an actor, spotlighting the technical artifact, making it the center of the study, and looking at the surrounding social phenomena. This also answers Beer's (2017) call to see how the algorithms play out in organizations—a more profound look with knowledge under the hood. We are combining the two separate registers of coders and social scientists.

In this study, the algorithm aims to speed up the business process. Later, as the algorithm's complexity becomes clear, the original plan is restricted to provide transparency. The research problem of an unforeseen complexity not bound to a single algorithmic entity (Seaver, 2013) also exists for 'insiders.' Because even if one takes the theoretical concept to paper and can write the perfect non-technical specification, the resulting algorithm would have its own emerging properties that are complex, and as with any complex system, would be surprising for the individuals who can only understand the algorithm partially. However, another contextual element is that the ideal specification is not given in the field. The implementation of the algorithm is always, at the same time, the transformation of organizational knowledge that might be somewhat tacit. The algorithm is then the first time when this knowledge is written down. In its materiality, the algorithm also requires a high degree of formalization. Then two elements are dragging purely from an informational perspective on the algorithm, the management of organizational knowledge and the formalization of said ability.

The implementation of the algorithm, and its impact on the organization, are fundamental parts of the organization centrally employing algorithms. The algorithm is actively brought into existence by company workers, changing its form during the design, but even at a slower pace during the maintenance, where more minor requests for change are accumulating. The organization itself does equally change during the two project phases. The work answers the call to understand how people work on algorithms (cf. Beer, 2017). The work with algorithms is not ending when the algorithm is implemented. The algorithm has a physical presence, too. So, in the field, we could observe how algorithms were only used in some regions first and then spread slowly throughout SalusVitrum Therapeutics. And then, in the same way, the algorithm is not fixed. With more interaction, there is often a need to change, where then different individuals, also belonging to various organizations, adjust the algorithm, but in this way also influence the technical artifact with their understanding shaped by different cultural backgrounds.

Technology provides the basis for different actor connections (Hafermalz & Riemer, 2020). This can be, on the one hand, understood as mentioned before inside of the process, i.e., the algorithm substitutes a process part, then individuals that were ‘cut out’ are now not providing the bridge between the process steps, individuals that beforehand were separated by humans are now interacting potentially with each other through technology. Imagine a dispatcher that typically bridges between the call agent that takes the work order and the technician that takes the tools and the spare parts and goes into the field to repair a device. The dispatcher's job would be to take orders from the call agent and decide who goes out in the field first to repair what. Suppose we would substitute the dispatcher with an algorithm that automatically does the dispatching. Then, the connection is established directly between the call agent and the dispatcher. In an ideal case, both will be in contact with the algorithm. If something goes wrong or is not planned by the algorithm, the technician will contact the algorithm directly. As the data shows, the algorithm's creation and maintenance must also be considered. Different individuals must tell how their work works when the algorithm is created. Those individuals might not have been in contact with each other beforehand. The algorithm is then the part that creates a hub-and-spoke relationship, a lived experience that condenses the complexity of the organization. That means, when it was possible beforehand to live processes differently according to cultural norms, now a new algorithm also creates new knowledge of the other.

Whenever an algorithm acts in the field, this action occurs in a virtual space devoid of the physicality that was there beforehand. The loss of space is then substituted by a broader ‘package’ of spatial environments, creating a more diverse work environment (Halford, 2005), making it possible to provide greater interactional justice by making it possible to choose a medium that can represent an authentic ‘voice’ of the individual, e.g., email (Kurland & Egan, 1999). What is meant by this statement is that there is an inherent oppressiveness of the business process itself, not just by direct instruction, but also because of an imagined other of the global organization that might restrict further than is actual. In creating the algorithm, the individuals now have the chance to explicitly emancipate themselves from this oppressiveness and express how the work should be done in the algorithm. The algorithm itself can also act as a platform of exchange between different actors, and the expression of the algorithm, be it via code or design documents in a knowledge management system, provides the chance for individuals to express themselves through the work of information gathering, technical specifications, and code

implementations. Moreover, as the codes show, the theory of this emerging points to the algorithm's enhancements that start a new formalized process with a support team that can change the algorithm. Before, it might not have been possible to change another employee's behavior, let alone from all employees in multiple regions. Now, this channel is opened through the technical implementation and the institutions that come with it. Now this change is the opening of a bug report. In SalusVitrum Therapeutics, these institutions are more developed than, for example, an imagined business process excellence team that would enhance standard processes. Those working methods are taking over because the algorithm is in IT management. It also comes with additional diversity, with an Indian support team actively trying to understand the business processes, even for small changes. Because of the system effects of algorithms, this thinking is needed. Here an example would be the simple addition of a field. To implement this, the developer must understand that the process already exists. How is this field duplicating data, how often will it be changed, not to overload the system, etc.? With this understanding of outsiders of complex processes, the information theory of diversity comes into play, and the different views enrich the perspective on those processes.

Critical management has to question structures of inequality in management, as they also project to post-colonial structures in a broader political context, as businesses are part of a democratic society (Alvesson & Willmott, 1992). Moreover, to add, not only on a national level. When now critically questioning the conceived roles, one can see the undemocratic element in them. On the first observation level, it is possible to see that roles elude to a certain kind of specialization. However, with the loosening of the roles in the lived experience of the workers, it is questionable if this role concept reflects the power structures of how to acquire labor from India and how to make it still possible to govern that process.

Because if we center our view solely on the human actors, the perspective might be tainted by a standard narrative established. As Grounded Theory's central conception of freeing itself from pre-conceived theory and trying to establish something that is grounded in the data, i.e., that is really reflected and crucially must lead to the theoretical framing, the concentration on a non-human actor, is used as establishing a distance from the subject. Incredibly as a researcher in the field, one's observations are always grounded in the established practices of the field. The technical artifact now cross-cuts the individual social systems precisely because it establishes new connections.

The social emerges in new ways than around the algorithm. Ethnography is then used to describe the theory through the emerging practices of the individual. This contrasts with previous descriptions of algorithms as being fundamentally “just,” a neutral technical tool in its conception, only reflecting the original intention of the business persons requesting the formal specification. In this ethnographic study, we see how cross-cutting the implementation is and how every different part of the organization that plays into the creation of the algorithm changes the algorithm. At the same time, through those complex changes, something new is emerging that is complex, with new, unexpected emerging properties. An organization then has to be complex to control the algorithm.

This case study will examine the software development section of a global medical technology company. Because of the nature of this work, we have chosen to follow the flow of the code as the fundamental raw material to be managed in a virtual space. As described beforehand, with space, the code is far from being a static engineering artifact. It is constantly changing with the different requirements of the environment, but also in its physical conditions. Code is run on different machines in different software centers, copied, stopped, replaced, etc.

Not only is the algorithm created as a concept, and then implemented through developers. It also has to be released, which means it is copied onto a machine that acts as the system connected to the business processes. Not only is the algorithm's expression as code copied but it must also be activated. This is a technical process, but there are organizational problems arising through this process. For example, the dependencies on other projects are tested just by activating the code. A lack of communication will be visible when algorithms are implemented in parallel projects. Then certain things were assumed to stay the same, but the algorithm failed because the underlying assumptions changed. Therefore, even this technical process plays into the physicality and spatiality of the algorithm. At the same time, it also shows temporal factors, especially important for a globalized firm. One example is that code is always deployed (a term for putting the algorithm physically into place) at off-hours when workers are not working. However, this is not uniform for all regions. The Emirates are always brought up, therefore present in the image of the regions, where Saturday has to be considered a working day.

The code in praxis is resisting the reductionism of computer science as an adjacent discipline. Code is here often reduced to its expression of computability, in the same way, that business

studies reduce the richness of software engineering to the study of its performativity, how it is managed to maximize the outcome (more features) or minimize the resource usage (in less time). Compare the argument of reductionism Benton (1991) or Stengers (2011): As Benton (1991) does with the biological sciences, and their discourse never being reduced to physical facts, but always embedded in society where each fact has an effect on society. Or Stengers' (2011) fear of an unreflected potency of various natural sciences and computer science. In the same way computer science has to be seen in its aspects towards society, for what the developments are being made.

This means that algorithms are rich in being cultural artifacts, vessels of meaning. The complexity of the organization will be reflected there, not for technical or universalistic management reasons, but because humans from diverse backgrounds are designing the algorithm. Computational complexity only regards the computational steps needed and their change when triggered with different amounts of data. However, an algorithm is often not one artifact but many different aspects of the code engineered into place through a complex organizational history. The algorithm under study is not just a formalized concept of how to do the computation. It has rich objects, e.g., the graphical interface to the algorithm, the configuration parts, and the database reflection.

For each element, organizational practices are cut through different functions. For example, the configurational part is done by business users. The technical workers could also do this, but this data entry is often strategically put off to the specifying business colleagues because when an error occurs because of a wrong configuration, which often involves the tedious entry of data, the blame can be pushed off. The algorithm is then the system that emerges through its implementation. A change, even in its graphical interface, i.e., the part of the code responsible for making changes by workers possible, changes the algorithm itself, as the input is a crucial part of the algorithm.

The study's data was collected ethnographically. This method's advantages are often used to illustrate the theory. This does not do justice to the “reflexive engagement” (Mahadevan & Moore, 2023) of the researcher necessary to do ethnography. That means to on the one hand be engaged with the subjects, and experience this engagement, and on the other hand to then transmit this experience to the reader. Here one can see the same move as in contemporary theatre, where the relationship between stage and room is resolved (De Vaujany & Riot,

2023) and the reader has to juxtapose the intersubjective experience of the lived experience while engaging with the (academic) writer.

In this study, this would mean taking theories of space, Lefebvre (2000, 2014), or Bhabha's liminal spaces grounded in a linguistic model (1994), and using the ethnographic data to mold reality into a particular space theory. The differentiation between conceived space, of how the algorithm is organized by the specifiers, the imagined space, how the algorithm is then by the different actors imagined to work. The lived space of how the algorithm is then working and influencing work in the daily experiences of its users and co-workers if one sees the algorithmic as a co-working subject.

The particular dimension is not restricted to the algorithm itself but is also true for the surrounding context, its implementation, and its environment when put to work. This influences how the environment is perceived, which means that in a global organization, mainly how business processes are conceived. Only to disappoint through its rich expression in different cultural contexts. Workers from different regions then put forward this imagination to describe reality. And then, finally, the daily lived process can differ from the imagined one, especially when taking into account that the individuals formalizing the process are possible, for the first time, put into the position of formalizing a complex process, which differs from the perception of colleagues from other regions, or even just other locations in the regions. In the projects under study often, representatives are put into place to describe the existing processes. However, those can never speak in the totality of the rich possibilities of the work.

The novel approach of this study is the post-reflexive posture and turning the theory-data relationship/hierarchy around. The observed praxis, the observed empirical phenomena, becomes the center of scientific inquiry. Whenever theory is used, it is employed to enhance the praxis. In line with Grounded Theory, the data comes first in an analytical step, building the theory from there. The reflective step of constructing hypotheses is reflected upon always containing certain narratives about the data. That is why the focus on specific technological praxis is used to produce counter-narratives, and the expression of "post" is a posture to move away from the intention to expose or uncover narratives but move one step forward by trying to follow artifacts that are resisting being put into a narrative structure.

Culture is central to understanding the algorithm's context and examining what the algorithm is. From this point of view, the algorithm is a cultural artifact but, simultaneously, an actor in

an intercultural system. When stressing the metaphor, it can be viewed as having an intercultural upbringing because many different individuals from different cultural contexts are involved in its creation.

When Seaver (2017) argues that algorithms are more part of the culture than something exterior to the culture, this reflects a particular paradigmatic approach. Objects cannot be seen without their cultural embeddedness in this interpretive stance. They are always interpreted through culture. On the other hand, another paradigmatic approach, critical theory, allows us to see algorithms as part of a material culture that is not interpreted through culture but quite the opposite way the surrounding culture has to be interpreted through their algorithms.

The parties involved in its birth are the business analysts that analyze the existing situation and then draw up the algorithm's properties to fulfill its mission. Then the developers are involved, not just as assembling already defined parts, but are actively shaping the cultural artifact. The engineers have to make crucial decisions that will shape the characteristics. For example, the created algorithmic agent of our empirical data runs in the background every few minutes, looks for events to act on, and then sets the correct requested end date. The developers were responsible for designing those actions and structuring the events. The lead developer created a design, and the other engineer implemented the algorithm from that understanding. While the analyst gave important input in the first place and shaped the algorithm in its creation, the engineer's technological work is crucial in the materiality of the algorithm.

In general, this initial peer-to-peer communication can be characterized by communicative action (Habermas, 1984, 1987), where truth at least is the goal while undergoing constant refinement or a struggle. Later on, we could code other design instances that oppose communicative action with strategic reasoning.

When we see the data in that light, we notice that there are defined roles in creating the algorithm, with specifically defined practices. The analysts are the initiators of the creation, the engineers design and create the algorithm, and then the analysts and various business persons test the result. Also, after the developments are deemed to be finished, the algorithm changes its shape through the institutions of software support. The users from different regions, not just those used to introduce the algorithm, will start influencing the design and

further development. This multitude of voices will create then an intercultural artifact with agency.

It is intercultural because different developed parts are not to be separated. On the contrary, the algorithm fuses different viewpoints of the business. Then the resulting code represents a developed consensual view. This view is not free of conflict. Especially in the long term, code was adjusted or put aside because certain actors employed power strategies to make the algorithm obsolete or enhance it to change its function. The positive side of intercultural synthesis can be seen. The algorithm can function as a medium of shared understanding through the work of a diverse workforce, i.e., cutting through different roles and regions. For example, in the field, we could see how one call center agent was very interested in the implementation project and worked his way up to manage further implementations. On the other hand, in one project, where a new region is brought to adopt a group of algorithms, the fear was voiced that a big part of the workforce would not be needed anymore.

Seaver (2017) locates the algorithm as part of the culture and explores it with an ethnographic stance as something that is done rather than defined as an abstract concept, allowing multiple competing notions, just as they are produced in the observed fieldwork. This location of the notion of the algorithm in the observed praxis of the fieldwork shows that the term algorithm can take many meanings. Seaver (2013, p. 9) established: “It is not the algorithm, narrowly defined, that has sociocultural effects, but algorithmic systems — intricate, dynamic arrangements of people and code.” The algorithm is what we saw as not just the code implemented but its totality as a system working together with human actors.

In the literature, algorithms are already explored critically. For example, Pasquale (2015, p. 8) generally says that “authority is increasingly expressed algorithmically.” In a footnote, he refers to the insurer’s power expressed through algorithms, credit scoring, and discrimination of employers through algorithms. Algorithms are also at the cultural forefront. Striplas (2015) talks about ‘algorithmic culture’ when expressing the symptom of our times that significant parts of the cultural industry are to be seen together with algorithms. Pasquale (2015) groups algorithms into several black boxes in our society, where the individual cannot access knowledge. Thrift (2005, p. 224) evokes the notion of the ‘technological unconscious’ to refer to an inaccessible part of the mind while stressing how this is externalized and sustained, not unlike a fantasy. The world's imagination changes through technology, while understanding it is impossible. Parisi (2013) puts the algorithm as something ubiquitous in

the background. Everydayness is not something observed in the field for businesses. In the future, when algorithms obtain more autonomous behavior, understanding the algorithm is crucial. While the algorithm becomes embedded into the life world, the reality of the worker, the technology remains visible and at the forefront. In some way, what remains mysterious to the worker is the emergent properties of the algorithm through its embeddedness in a complex system. Technology is here interlinked with culture and with no claim on an inherent opposition between culture and technology. Nevertheless, we should account for “the emergent properties of technical systems in use and point to the importance of historical and contextual specificity in understanding sociotechnical arrangements” (Seaver, 2015, p. 13).

The workers have an imagination of how the algorithm works. This was observed to be an essential property. If the algorithm is too complex, then it will not be implemented. Alternatively, to express this in system theoretic terms, with each emergent property, it enters a negative feedback loop, making this system region collapse, with cascading failures of misunderstandings and rising entropy leading to difficulties in understanding.

Understanding the algorithm as a system is essential to know how all actors exert power. As mentioned, human actors work together in different ways to establish a cultural artifact. The artifact can be a medium for building a consensus while trying to understand the other side. When implementing an algorithm, it is part of an organizational change. The algorithm as a technology is not neutral because of its unifying property. There is a desire in the organization to drive the standardization of processes through algorithmic systems. The technology excludes certain behaviors because of their technological rigidity and to avoid overt complexity for the group creating and using the algorithm. This is for the engineers because the technical complexity rises with including each individuality. The people designing the algorithm have to collect all of this information and formalize it, as well as those who use the algorithmic system, because there is an imagination, a mental image of how the algorithm should work. When this picture is too complicated, it will be impossible to trust and use the algorithm.

The theory of communicative action shows here the two general distinctions of which power strategies are used relating to algorithms. Therefore, an organization needs trust and understanding to restrict specific behavior and accept change. At the same time, it is possible to communicate strategically to achieve specific goals by implementing the algorithm. For

example, if one region tries to be autonomous and rejects adjustment towards standard processes, algorithmic systems are used to implement the processes. Then the algorithm is presented as a neutral technical artifact that needs this change, not the organization itself. Through this method, the blame for the need to change is externalized. Algorithmic systems represent positive values, in some sense truisms, that are universally accepted throughout the organization under study. It represents “state of the art” systems that make the company perform great in a competitive environment.

Our definition of algorithm includes contextual information. It is not just the core code and its actors but also the organizational context evoked in the algorithmic system. Unlike defining culture as code in context, algorithms cannot just be regarded as implanted into the organization, but their meaning is always dependent on the organizational context. For example, algorithms that collect and display analytical data can be contextualized as enabling surveillance (hostile) and transparency (positive).

Localizing the communicative system around the algorithm is essential to enhance this picture of putting algorithms into a context. The built-up of communication around the algorithmic core structure. Was it built upon different actors strategically maneuvering technology to forward their goals, or is the algorithm an expression of truthful and consensual understanding?

It is essential to understand the algorithm not just as a passive tool. The emergent properties, even though unwanted, present themselves and can be appropriately associated with the algorithm. When this happens, the algorithm creates liminal spaces with a particular weirdness. For example, in the field, what happened is that the algorithm did exactly what it was told to, but in such a mass behavior, and also “wrong” in a way that humans would not have these strict rules, and would look, because also the human processes the work orders on a one by one basis, at the surrounding context, and take this also into account. When this happened, it was hard for the workers, analysts, and developers to understand what was happening. Ultimately, it was decided that everything was working correctly, but the humans were not applying the process properly. This happened in many instances. Another example led to a complete overhaul of a process because the algorithm was perceived as not working correctly. However, in the end, certain groups were not working according to the defined business processes.

As such, the algorithm starts to take on power by itself. To explain this for non-human actors, Foucault's (2020) explanation of power helps, in that power is not something situated in persons themselves but are more dynamic actions that can change and swift from actors. That is why when algorithms are produced and modified, the study tries to explain the existence of power structures and how the cultural concept of algorithms relates to those.

An algorithm sometimes presents itself as neutral, even though humans construct them and therefore carry on their value judgments, their original intent. When an employee leaves out steps because they are deemed unimportant, this values judgment of deeming something as unimportant is now put into action in places where it was valued, also driving a homogeneity. It is not just the individuals working on the algorithm driving inherent value judgment. The technological requirements themselves can be the origin of inherent value, e.g., the complexity of the system is driving the complexity so high that that technology cannot handle the workload, so the complexity is reduced to make it possible to run the algorithm so that it can react in real-time.

Algorithms—Key insights

The algorithm is restricted through the *strategic reasoning* of the project, where discourse is focused on goals independent of the algorithm's correct functioning. The algorithm is embedded in an organization that wants to change. However, for the algorithm to work, the organization had to change, too. To be precise, the project's goals of pushing a correct date when the customer can pick up the repaired device fade into the background, where senior management more closely watches the project's nominal goals. The stages of life of a typical algorithm are, from its inception, "design," to its embodiment, "build," and finally, through "manage," its transfer to a different level of the company's digital infrastructure.

Each of the codes provides data that describe synergies and restrictions. The interaction can see intercultural synergies in a global context of internal and external developers, mainly from India, that provide help and work more in the mode of communicative action. In the same way, the discourse of design has equal elements of *functional reasoning* and *communicative action*. The former through things that cannot make it into the final version of the algorithm, the latter through an ongoing discourse independent from the project informed mainly by the life world of the participants.

CONCLUSION OF FINDINGS AND DISCUSSION

This conclusion discusses two key findings of the combination of power and space, Paradoxical Power Structures Located in Space and The algorithm situated in time and space. This juxtaposition will conclude the findings and discussion section, before the General Conclusion in chapter 7.

Paradoxical Power Structures Located in Space

There is a sharp difference in power between internal and external employees that is felt in spatial term, too. In the same way a dichotomy between technical/managerial power can be seen. Technical meaning the employees with the knowledge and power to actually change the systems, and the managerial power with being able to initiate such a change. Here also in this power relationship the one-dimensional lens it not helpful. On the one hand does technological power make managers dependent on those employees, even though this is not explicit in the hierarchical structure of the company. On the other hand, this hierarchical relationship does have repercussions in the structure of the projects, and also in the possibility of the technical power to be applied. That means that there is a certain cultural praxis that enables an implementation of a technical system. For example, a change is in most cases only to be put to the production systems, when the code was tested and then confirmed that it is put into the live system.

The first of those concepts is spatial. The data have shown that managerial reality is grounded in a Third Space that is dependent on the social context using the vignette of two different kinds of meetings for internal and external employees. Each of those meetings has a different configuration, with Langley and Tsoukas (2017) precise meaning of being differentiated and dependent upon spatial and temporal terms. The two partial groups have different spatio-temporal configurations. The meetings happen in separate virtual meeting rooms, with different intentions, one more strategic in nature, the other one more operational. The spaces reflect here the power relations. They are an expression of the power relationship between internal and external employees, and the narrative of a hierarchical order of value creation, where internal employees are creating more value, dependent equally on power strategies employed by the different categories of employees. We have to keep in mind that this narrative was voiced by a middle manager in a private conversation. It is certainly a narrative that is plausible when thinking about the cost structure. This development itself has a history,

where the suppliers, i.e. independent consultants from different companies were under the umbrella of cost savings removed, and substituted by one streamlined company.

In this way the First Space is not only characterized by the specific virtual space, which in some way is universal, but is also distinguished by the intrusion of different first spaces, which are the physical reality where the speaker is located. This in a way gives clues to the social context at large of the individual that in another way would not be visible/audible. Another factor is the universality of the virtual space, which the collected data also calls into question, because the virtual space is marked by the laptop's performance, by the WIFI connection, etc.

Then the Second Space is the imagined space. This is then the interpretation of the voices, the surrounding noises, but also the emergence of place itself. Each meeting has a certain social function, which fits the pattern of conceived/perceived/lived spaces. The meeting is conceived as for example a daily stand up meeting, where the status is reported. It might be perceived as something oppressive, because the manager wants to tightly control the work. Then finally the Third Space, the lived reality might be different, in that the worker is reporting only selected work items. Also, in the field notes there are instances where the meeting was not at all used for the status updates, but as a place where important coordination could take place.

The second concept used, is Lacan's (1966) concept of the Other. By enhancing the spatial with a psycho-sociological concept, the Third Space takes shape as a construct that functions just as language, and emerges through a social situation, in that others perceive themselves and their function through this and in this space. In this space power relations in the sense of Foucault (2020) take the stage, either as a positive concept, or negative.

Through this analysis the configuration of the space is shown to have negative effects on the value of equality. But it is useful to work with a post-critical concept (Holbraad & Pedersen, 2017) and calling the value judgement itself into question (Adams et al., 2015). As such equality is not 'humanistic' in itself. As Johnsen and Gudmand-Hoyer (2010) argue, Lacan's theory of anti-humanism can be practically applied to management studies by questioning humanizing moral stances. Equality is something that we see the Other wants from us, meaning the desire for equality is a desire that we feel pushed upon by society and not perceived as subjects.

And one step further, power itself cannot just be seen as something that acts in a solely negative way, in that it restricts a holistic view for all participants. It is as well as positive, positive, because it creates new technocratic ways of organization. I would interpret a hierarchical order to be of less value for society than a flat organizational structure. Organizations should thrive in a free consensus finding mechanism, without behind hindered by their background (Habermas, 2011b). This in itself is not without criticism. An individual always acts within a context. Hierarchies are intended to reduce complexity, and the positive power of globalization might not be possible without the specialization of a company on its core value proposition, creating the need for external specialists.

Those categories make it clear that the management work is initiated and controlled through task lists. Software interfaces make it possible to do the work. Different message channels enable discussion about the code.

The interaction of code and the individual was analyzed with categories of time and space in the modes of: (1) situational, (2) genealogical, (3) configurational, (4) dialectical.

The key contradictions for each category are:

Task Lists: Mismatch between individual workers, projects, and the code. With a different understanding of time (the individual cyclical, the project in a life cycle, the code in the form of events) and modes of working.

Software Interfaces: Code is understood as one unity to be worked on, but is actually split between different systems, and worked on synchronously in its material (same code base per project phase) but asynchronously when regarding the workers (maintenance workers vs. project workers, different understanding of project phases for different projects)

Message Channel: Communication is acted upon the successful execution of a task, but the different communication channels have their own spatial properties relating to a different audience of actors, working at different times and on different projects.

The algorithm situated in time and space

Algorithms are then observed in these virtual spaces. The enumerated spaces can be related to its closeness to the core of the algorithmic system. Software interfaces, as the closest. Then message channels, with a potential screensharing, and the task lists. Complexity arises by the

active properties of those spaces, and the lack of their coordination. There is an observed density of the spaces, each in accordance to the development stage of the algorithm.

It is important to stress that the stages reflect more of the perceived labels of that life cycle, as it is one of the significant points of this article that in all layers, part of the algorithm is adjusted, not only in the design phase.

On the other hand, the life-cycle of the algorithm is embedded in different cultural groups, represented most obviously by different nationalities. An in-depth analysis of their belief systems is needed to understand better the intercultural negotiations surrounding the algorithm. While it is possible to narrow the ethical-national boundaries further, e.g., Tamil instead of Indian, this approach neglects the critical role of culture. An Indian developer in Germany will always act interculturally, absorbing German culture after working in this region or earlier through remote work.

Understanding that the cultural and intercultural are not just restricted to ethnical-national boundaries is crucial. Each team has its background and narratives through which the algorithm is formed and understood. The organization assigns different roles, with its expected behavior is paradoxical. However, the inner failings of the synthesis of those views are not readily apparent because of, among other things, the boundaries and patterns of how each side understands the work they are creating. The engineering side is trying to understand the solution as soon as possible—the business analyst side tries to understand the problem and solution deeper. Section managers are trying to cope with different demands. Project managers fight for the team to be able to sufficiently on the project.

Each role relates to the algorithm with its sphere of influence. The roles are relevant throughout the life cycle, but the primary focus shifts with the support engineer and business users becoming more involved towards the end.

7. GENERAL CONCLUSION

At the end of this text, we restate the research question: How do the dynamics of culturally diverse IT projects influence algorithmic and organizational outcomes? We have structured our answer in three ways, considering the elements of power, space, and algorithms to answer the three sub-questions:

1. How do power dynamics emerge and evolve in culturally diverse IT projects?
2. What role do organizational spaces play in the dynamics of culturally diverse IT projects?
3. How do algorithms developed in culturally diverse IT projects affect organizational outcomes?

So far, we have answered the sub-questions by (1) describing how power strategies are specifically employed to allow or restrict diverse voices, (2) showing that spaces are dynamic in their materiality in a vocal point of intercultural interaction, and (3) that algorithms develop a complex life of their own through cultural diversity, which in turn affects the organization. We then answered the general question by synthesizing all three parts, stating that algorithms are shaped by power strategies of allowing and restricting diversity that occur in particular spaces at a particular time, and in turn affect organizational outcomes.

7.1 Theoretical contribution

The theoretical contribution is characterized by how the findings confirm, contradict, or extend the literature. First and foremost, this dissertation confirms that adopting the lens of critical ethnography reveals profound tendencies and exposes underlying power structures, especially poignant in the context of organizational dynamics. A notable aspect that emerges from this perspective is the liminality of spaces that hold transitional and transformative qualities within the cultural and organizational domains. While diversity undoubtedly brings a rich array of perspectives and can catalyze innovative processes within these spaces, it introduces a layered complexity in orchestrating these diverse voices to achieve desired organizational outcomes. Thus, it is imperative to navigate the nuanced interplay between

diversifying entities and unifying goals while recognizing the invaluable yet complicated contribution of diversity.

On the other hand, there are places where the literature is contradicted. The intertwined relationship between workers and algorithms tends to defy simplistic interpretations. While algorithms, especially in a work setting, often remain complicated and elusive - akin to a black box in their complexity - workers often strive to establish some kind of intimate understanding with them, which presents a fascinating contradiction to explore. Moreover, the traditional positivist approach stumbles when tasked with generating generalized laws about the relationship between culture and power. This is due in part to its typically linear and reductionist perspectives, which seem incapable of fully addressing the dynamic, ever-changing complexity embedded in an individual's life-world. The recognition of the inseparability and co-formation of space and time further complicates these complexities, necessitating a critical approach that can traverse these multifaceted landscapes.

Finally, we extend the literature as space and time begin to emerge not as passive elements subject to formation and organization within a work environment, but as active materials that dynamically respond to their use and thereby shape ongoing processes. Similarly, algorithms move from being mere tools to being perceived as subjects-active participants within the organizational structure that are dynamically shaped by multiple interactions and developments. Thus, viewing algorithms through a lens that recognizes their subjectivity enhances our understanding of their role, illustrating them not merely as static objects, but as entities that simultaneously shape and are shaped by the vibrant, multidimensional diversity within the organization. This perspective introduces a new dimension to understanding the adaptive and influential capacity of algorithms in organizational settings.

Another contribution of this research is the dynamic evaluation of the spaces with their distance to the algorithm. The management of the employees can be described in different layers. The closest to the algorithm, as expressed in computer code, would be via a meeting with screen sharing and debugging, the farthest away by managing the code through task lists. While observing the individuals, it became clear that this knowledge of the code as an actor is indeed visible, not only for technical employees, but also for business users. Statements like "here the agent [the program, the running code] thinks that ..." or "the system behaves this way because ..." underline the point.

In the realm of the critical paradigm in qualitative research, this study shows how power is exercised from a particular technological perspective, that of software development in a multinational corporation. This part of the dissertation uses codes to describe how exactly power is regulated in IT project work, responding to the critical paradigm and showing how different power structures and strategies emerge under the veil of more empowering and creative project work. The research theme shows how MNCs struggle to account for multiple levels of complexity, both technological and organizational. There is a managerial need to regulate project work to achieve organizational goals. At the same time, however, a technological dimension is handled by a different type of employee, e.g., the software architect, who then exercises power by having specific knowledge and is empowered to make decisions about technological complexity.

This study also deepens the discussion of how space contributes to the complexity of projects. Space is not just a neutral factor, but an actively constructed entity. Especially when considering virtual spaces, this study shows how space does not disappear by transforming the work into the virtual dimension, but becomes even more visible by the intrusion of the wider social context through the work suddenly taking place in private spaces.

As a further contribution, the space was then further analyzed. Two cases have in common that they constitute Third Spaces in a very precise way: different material realities, e.g. different countries, meet different subjective realities, e.g. internal/external or technical/managerial roles. The Other is in play, with different desires to be read, e.g. globalization as a new opportunity vs. more complexity, or globalization as a narrowing of expression. Furthermore, the power relations are also visible in different micro contexts, developer task assignment vs. technical decision meetings, embedded in a macro context of the company's globalization strategy.

The in-depth analysis of two vignettes has shown these two spatio-psychological concepts at work. While the Third Space as a lived environment shows how meaning is constructed in projects, on the one hand through conceived places that are closely managed, but then through the lived spaces this management is at a loss, or in a more positive formulation, individuals adapt and work together to solve problems beyond conception and beyond individual perception. This means that this study contributes by providing data and interpretations that will later allow for a rich description of the emerging theory.

This research theme shows how power works, especially in information technology organizations. It shows how complexity arises through a particular object, the algorithm. Only by concentrating on the actions of the algorithm can we make the resulting power structure visible. This research theme uses the different codes to establish the different stages of an intercultural algorithm that is not created out of thin air, but is constructed by individuals in different ways through communicative or strategic actions. These different types of actions give rise to different properties and emergent behaviors.

The emerging codes provided a description of how power is created in IT management. This is then bridged to the theoretical concepts of Critical Theory, creating an extension of this theoretical framework. A concrete theory of space emerged that showed how spaces emerge. In particular, it provided concrete descriptions of what kind of spaces exist and how they can be read. In addition, the literature of algorithmic theory often assumes a certain darkness around the creation of algorithms. This text shows that, in some cases, what an algorithm does and how an algorithmic system is constructed must be something actively constructed by individuals, driven by groups, and supported by the entire organization. Finally, the merging of these contributions shows us that power does not exist as an abstract force, but is applied to spaces. These spaces give rise to algorithmic systems in IT organizations, which then reveal complex behaviors and must be taken as active subjects, changing the organization through the properties that emerge.

The study used a new method for IT management, critical ethnography. With its post-reflexive stance, it contributes to the refinement of this method. For intercultural management, positivism is still the dominant paradigm. Positivism is associated with a certain methodological package, i.e. quantitative empirical research. In this sense, this thesis contributes to the critical paradigm in one sense, but also to qualitative social research in a broader sense. The use of grounded theory for data analysis in combination with ethnography for data collection can be seen as a contribution, as the study had to adapt the methodology to make it fit in the technology management environment. In particular, the extraction of meaning for intercultural management can be seen as a contribution. The auto-ethnographic content as well as the ability to be actively involved in the construction of algorithmic systems is a novel contribution. In this way, theoretical constructs can be translated into the language of the social sciences and organization studies.

The impact of this thesis is mainly limited to questioning assumptions about algorithms by making them less mundane objects. At the same time, in a paradoxical twist, it empowers algorithms as intercultural subjects with the power to act upon other subjects. Therefore, the implications can be seen here in the field of intercultural management, broadening its perspective.

The novelty lies in (a) the access to data, (b) the ability to translate the data into social science concepts, (c) the linkage to distinct theoretical concepts. Ethnographic research for organizational studies in IT organizations is novel, especially the enrichment of theory as an active participant.

7.2 Methodological contribution

The presented study offers a contribution to the field of digital humanities, embracing a dedicated focus on the utilization of open algorithms and the practical application of open data. Deliberating stepping away from the conventional use of Computer-Assisted Qualitative Data Analysis Software (CAQDAS), our research took a distinct path, whereby data was coded directly in XML—a textual markup language.

To encapsulate the methodology succinctly: data was not only coded but also analyzed directly within the text, or alternatively, through the application of custom-developed mini programs, exemplifications of which are provided in the appendix. The strategic selection of XML was driven by its robust capability to organize, structure, and manage data with detailed precision, thereby facilitating an efficient analytic process, whether through direct textual interaction or via our tailor-made programs.

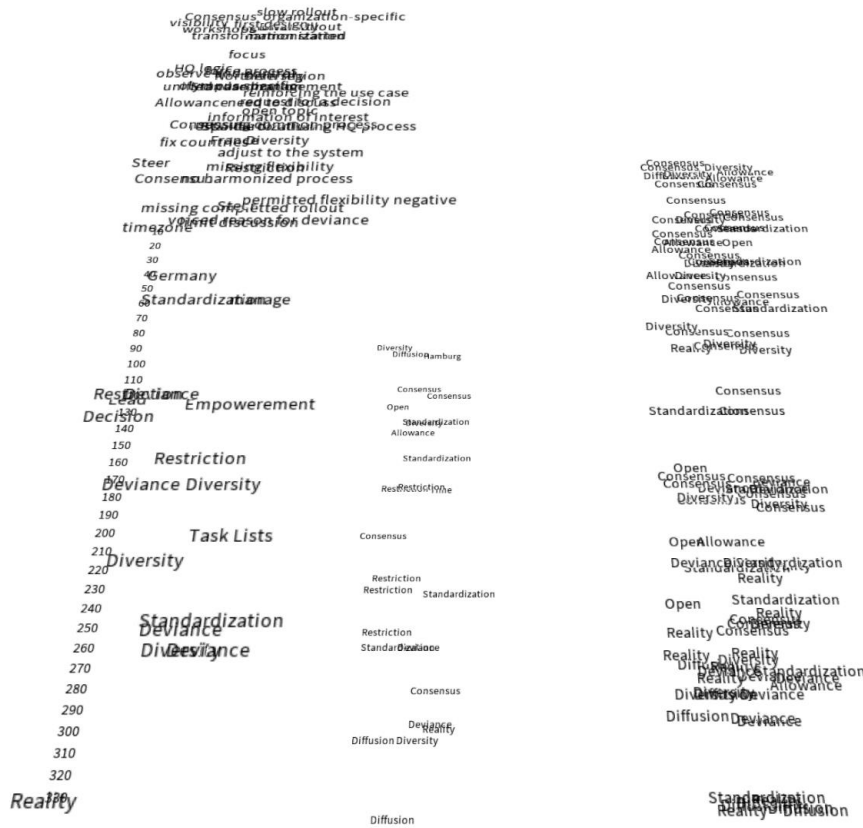
In the visualizations below, where codes are embedded within the transcripts, one can observe a clear depiction of the inherent spatiality of the transcript itself. It becomes evident that these codes do not exist in isolation; rather, they coexist alongside other codes, creating a complex, interwoven structure of data that is ripe for nuanced analysis.

It's crucial to acknowledge that each choice of code, and every abstraction made, inherently implies the omission of another potential choice. This decision-making process is underpinned by a considered strategy to ensure that the coded data is not only representative of the text but also meaningfully contributes to the subsequent analysis.

Therefore, our approach symbolizes a considered and deliberate methodology, amalgamating open algorithms and open data in practice, thereby substantiating this study as a valuable addition to the growing field of digital humanities. Our utilization of XML and custom mini programs, as well as our careful navigation through the coding and abstraction process, illuminates a pathway toward intricate, detailed, and substantiated data analysis within this domain.

For the power section: Figure 9 shows the codes and their neighboring codes visualized for the complete transcript, i.e., the recorded sessions. Even though not all codes are readable, it gives an impression on the reader on the distribution of the codes throughout the recorded data. It also shows where there is the density. It also presents the approach of Grounded Theory as a practice, as we can see how in the beginning there is a density of codes, and later on the codes are more sparse, because the theoretical concepts are more saturated. We can see three columns in the image. The middle column are the final codes used for synthesizing the analysis. On the left and on the right-hand side, there are the codes that are direct neighbors to before and after. This shows to approaches, the temporal development of the codes, forming to a more general abstracted fact, and also a spatial development, of being just codes nearby, for the multitude of meanings of each code line.

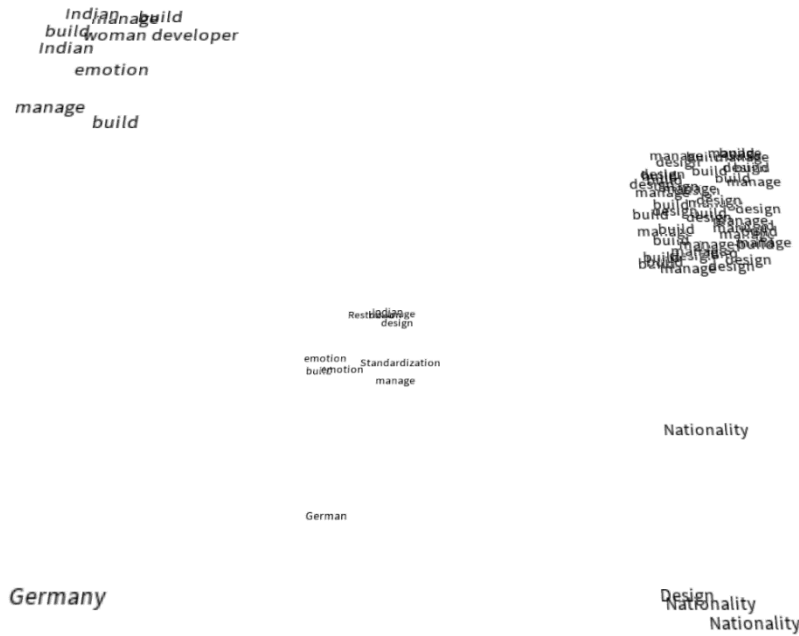
Figure 9: Power code visualization



The visualization for the space section: Here, we used the directly the textual information. The image (see Figure 10) show the density of the coded text. Illustrating deep interpretative approach taken here. Then as an assembling of qualitative codes, showing how from the spaces, virtual places are emerging.

Figure 10: Visualization of the space transcripts

Figure 11: Visualization of the algorithms transcript



It would be trivial to go one step further and make those visuals to be explored interactively for researchers interested in the temporal and spatial features of the data. The complexity of the recorded data is so to be explored interactively, making it possible for further interpretations, enriching our understanding of meaning. This is the power of open data and open algorithms, with more emerging features of interpretation, and rich meaning-making.

7.3 Managerial contribution

The managerial contributions can be seen as aimed at two different categories of people: project and line managers on the one hand, and software engineers and workers on the other. For the former, the study provides answers to managerial questions: how to manage diversity and, in particular, how to be sensitive to how the multiplicity of voices is suppressed in the name of objective goals. The focus on the algorithm is often not given in the sense that the algorithm is managed in its proper spatial dimensions. The focus of management needs to be on environments that allow the algorithm to speak for itself, rather than through added layers of abstraction. In addition, project managers must take the time to reap the benefits of diversity and be sensitive to the limits of power. Line managers need to be aware of the increased need for temporal and spatial configurations in the workplace.

But the managerial contribution also applies to the people being managed. From the technical side of implementing algorithms, software engineers can better manage their organization by seeing through attempts to solve the emergent properties of the complex system by addressing the symptoms rather than the true materiality and agency of the problem. Similarly, it is important for workers to manage their own agency and expectations of algorithms.

An obstacle to greater diversity is not only the imagined, but also the real, objective environmental constraints imposed by the surrounding economic system. The task of enabling greater diversity in the workplace is also a societal task. Corporations, as a particular form of organization, are poorly suited in their functional role in society to make room for diversity. In addition, the complexity of algorithms is an additional, as yet unseen, constraint that actually further limits the possibility of diversity by putting more stress on organizations.

As algorithms become more pervasive, there is a real risk that the active component of the emerging system will not only stress the individual, but also endanger the possibility of unintended consequences of the algorithm's actions. This can be subtle, through increased control of employees, or not so subtle, through autonomous behavior that is not even understood and managed as such.

Therefore, the main contribution for management is to ask critical questions, to communicate hierarchical structures, and to be aware of power strategies used by individuals or subgroups, namely technological power. It is to establish a meta-level of discussion of algorithms, rather than understanding them solely as a technological artifact. Although the critical paradigm of management theory is often characterized as unfavorable, the more positive side of the school of critical theory, that of Habermas, can be used productively to make the distinction between communication based on power strategies, where individuals are used as means to an end, and communicative actions that individuals perform to practice a discourse of truth and trust. Managers should be aware of this distinction in order to resist the cynical tension of seeing power strategies applied without recognizing the positive impact of truthful individuals who are able to transcend hierarchical orders and informational advantages to communicate and thus act with truth and integrity.

This study contributes primarily by creating awareness to be sensitive to the issue in the context of a globalization strategy. In managing intercultural communication, meta-communication should be established and space should be provided to be mindful of the different third spaces, desired and power relations. The spatial concepts provided by the interpretation of the empirical data as well as the connection to the literature show how management should be aware of the repurposing of place and how this can affect the work negatively as well as positively.

As in a qualitative research study, a manager should be aware of how he or she puts in place structuring concepts of recurring meetings and how the lived experience, the data points in management, then change in purpose as well as in perception. Imagine that global strategies are formulated at a top level and then trickle down to the individual level. What top management defines is then passed on to middle management, and finally to team leaders, who try to translate the abstract strategies into concrete actions. Different spaces are involved in the communication of these strategies, because a strategy is not just an abstract concept, but has to be communicated in space. An important contribution is to imagine not only the communication through e.g. virtual meeting rooms, but also with the perspective of imagined spaces, how these concepts are imagined to take place, how they are then conceived. Finally, one can see different power strategies arising from the different concrete roles in a project. These power relations influence the active bending of concepts to fit individual agendas or to fit a perceived moral obligation to communicate truthfully.

A management tactic to mitigate spatial complexity is the implementation through proof of concepts or prototypes, taming the unruliness of code, which is different from human employees who can be asked and explain themselves. The layers of contact make it possible to explain the observed preference of engineers to produce code to understand other code, or the startup culture built on producing artifacts as quickly as possible, as a means of direct conversation with code as an actor.

On the other hand, the contradictions should not be seen as something static and unchangeable. While there is a mismatch between the three constraints of individuals, projects, and algorithms, new ways of interacting between the different spaces need to be found. But a technological solution is not what the study suggests, at least not exclusively. Management should be aware of the complexity and materiality of these spaces. Often a space, like a task list, is not conceptualized as a place established by management and actively constructed, shaped, and molded by workers. Some time ago these lists were taken as documents, but with collaborative editing and meetings where the task list takes up the screen, the list is transformed into a space.

In the same way, software interfaces are often seen as something neutral, their visual metaphors as unimportant. But as this research theme shows, with the transformation and loss of space in the physical world, this lack is compensated by alternative virtual spaces. Screen sharing is used to share knowledge, transforming the fundamentally solitary activity of writing code into a social activity involving many actors. Management, instead of seeing these spaces as necessary grudges, should re-create them as normalized and integrated spaces.

First, managers should be aware of the agency of algorithms. They are not just tools to improve or simplify business processes, but they also develop emergent behaviors with profound consequences for the organization. The different stages allow management to influence and positively change the organization. Second, managers should be aware of the algorithm as a dynamic subject of the organization. Like the established change process, the algorithm will evolve in different institutions. Third, the algorithm can be seen as an agent of change and provides an informational advantage when constructed and used as a platform for this change by intercultural individuals. The drive for standardization through the introduction of algorithms makes it possible to use this situation for more communication between teams that may typically work in isolation.

7.4 Limitations

The limitations of the study are related to its strengths. It is an ethnographic study with fieldwork data. The paradigm of critical management studies does not try to establish general rules that are valid in all social contexts. It is therefore questionable to what extent it applies to different sectors and company sizes.

The results have been abbreviated and thickly described, but this way of working has certain shortcomings, a complete topology of the topics is impossible to give. While this way of presenting the work allows for a better understanding of the topic at hand, an analytical approach can then more thoroughly show different facets of the issue.

One limitation of this study is that it doesn't take into account office space as such. Hybrid environments with flexible work arrangements add another layer of complexity. While the three categories don't lose their importance, because the primary space in the field is no longer the office, with virtual work environments becoming the default mode of place offered and structured in work environments. However, the office still provides crucial liminal spaces that are especially valued by research subjects for initial acquaintance, for "knowing the face", and for deeper discussion, for "real talk".

Another limitation is the lack of clarity or explicit articulation by the subjects regarding why they sometimes prefer physical office spaces over virtual ones. Despite virtual spaces providing all the official communication means (such as video and audio), there is a tangible yet unexplained preference for physical presence in an office environment among some subjects. These expressions are crucial for understanding the lack in these virtual spaces, and they fit well with the theoretical concept of the little other. The desire for office space is unconscious because virtual spaces provide all the official means. None of the subjects really expressed why exactly they sometimes prefer the office space. Because even though video and audio provide all the means of communication that should be important for work, the lack is still felt and drives the desire. It is the unimportant things, like shaking hands, seeing the whole body, being able to move around, that characterize physical spaces. As the researcher himself noticed in the field, some people changed their attitude completely. Where before only an image was visible and a voice was audible, now a program manager had a much more imposing manner because of his visible size.

The observations are case specific. Here, an intercultural team implemented an algorithm, which might not always be the case. One can imagine interesting constellations where a

culturally homogeneous team implements an algorithm for a heterogeneous field. The theory we have developed would suggest that the algorithm would not fit the field well because of the informational disadvantage. However, it is a limitation of the study to not be able to verify this claim.

7.5 Perspectives

In a further step, a theoretical sampling of these parameters would be helpful to see how this affects power in a project. Company size can affect power by driving different specializations and accumulations. For example, while larger companies can afford to hire a specialized software architect to manage technological complexity, smaller companies cannot. There, individual software developers would handle that complexity. The same goes for managing projects and individuals. When the company is smaller, the complexity of the business may not be as high, so undemocratic decisions would not be necessary because consensus could be reached more quickly. Also, projects may not have the same pressure as in more prominent companies with many stakeholders. The industry is also an important factor. Projects for IT systems are handled differently than, for example, purely medical projects. While technological power is a growing concept across industries and sectors, it is not always present or with the same intensity. For example, a medical project may be based on an IT product. However, the patient may be more central to the power structures and different roles with different knowledge may be involved, e.g. doctors.

The results can be enhanced by Critical Discourse Analysis (CDA), which methodologically goes beyond the fieldnotes and analyzes them according to the theoretical framework that this study has explored in detail. Although grounded theory should stand on its own, and the goal of this study is to describe the work and its environments that took place, an extension through CDA could be helpful, precisely because one of the findings is that space can be conceptualized as a social/symbolic order, and like text, the analysis of details can saturate the theory even more by allowing a deeper and finer view of how the language of space is used.

In the circular motion of how Grounded Theory evolves, and because the field is not a static picture, different projects will provide more insights into the evolving relationship between

the different cultures observed. Another important point is organizational learning. It has already been observed how virtual spaces are perceived. This perception changed during the fieldwork. For example, written communication was used more and more. This had a positive effect on the next projects and the general quality of the work increased. There are many aspects of virtual spaces that can be explored, especially as technology advances and virtual worlds become more real. How this is embedded or accounted for remains a question to be explored. With new theories critically explaining how to move forward. In these virtualized worlds, algorithmic actors may be much more visible. With autonomous AI also being pushed forward, these algorithmic actors could change form from something "ghostly" happening in the background and not visible, to something humanoid and more intuitively understandable.

We believe that more ethnographic data should be collected in the future to verify various research claims. In particular, claims about ethics can be expanded. More research can be done on the different algorithms and their impact on organizations. Algorithms present a new challenge with exciting possibilities for automation, but also for expanding our understanding of work. At the same time, they can be challenging by their power of emergent properties, each reflecting our changing society, with a surplus of personality to be managed.

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APPENDIX

1. Code Listing for parsing the codes from the transcript file

```
(require 'xml)
(require 'subr-x)

(defun is-code (node)
  (when (listp node)
    (string= (car node) "code")))

(defun get-lines (node)
  (xml-node-children node))

(defun get-code-category (node)
  (xml-get-attribute node "category"))

(defun construct-category (node)
  (mapconcat 'identity
    (list "*" "
          (cdr (assoc 'category (car (cdr node))))
          "**" "
          (car (xml-node-children node))) ""))

(defun visit-code (node)
  (if (null (cdr (assoc 'category (car (cdr node)))))
    (mapconcat 'identity
      (list "*" "
            (car (xml-node-children node))) ""))
    (construct-category node)))

(defun extract-code (node)
  (mapcar 'visit-code
```



```
(seq-filter 'is-code
           (xml-node-children node))))
```

```
(defun is-line (node)
  (when (listp node)
    (string= (car node) "line")))
```

```
(defun extract-codes (node)
  (mapcar 'extract-code (seq-filter 'is-line (xml-node-children node))))
```

```
(defun const-lines (node)
  (mapcar 'extract-codes (get-lines node)))
```

```
(defun parse-codes (codes)
  (if (listp codes)
      (car codes)
      codes))
```

```
(defun parse-lines (lines)
  (string-join (mapcar 'parse-codes lines) "\n"))
```

```
(defun parse-sessions (session)
  (string-join (mapcar 'parse-lines session) "\n"))
```

```
(defun atomize (ls)
  (string-join (mapcar 'parse-sessions ls) "\n"))
```

```
(defun indent-codes ()
  (goto-char (point-min))
  (while (search-forward "***" nil t)
    (replace-match "\n***")))
```

```
(defun remove-duplicate-cats ()
  (let (ls '())
    (while (search-forward "*" " nil t)
      (goto-char (match-beginning 0))
      ((set-mark-command)
       (when (member
              (goto-char (point-min))))))))))
```

```
(defun show-codes ()
  (interactive)
  (let
    ((xml-region (libxml-parse-xml-region (point-min) (point-max)))
     (codes-buffer "*codes*"))
    (unless (get-buffer codes-buffer)
      (generate-new-buffer codes-buffer))
    (set-buffer codes-buffer)
    (with-current-buffer codes-buffer
      (org-mode))
    (erase-buffer)
    (insert
     (replace-regexp-in-string
      "\n" ""
      (atomize
       (const-lines xml-region))))))
  (sort-lines nil (point-min) (point-max))
  (uniq-lines (point-min) (point-max))
  (indent-codes))
```

2. Example 1: Recorded Field Notes Virtuoso.2

<transcript from="2019-08-14" to="2019-09-11">

<session data="2019-08-14">

- A new introduction round, T. does the introduction.
- N. is new asks for more information
- J. does introduction again

<line>

N. introduces himself. He wants to enable the uptime delivery from a European perspective,

so that the countries are able to achieve their promised uptime,

<code>uptime</code>

<code>European perspective</code>

</line>

- He has a background in aviation consultancy background.

K.

- VIRTUOSO.2, intro,
- T.: transformation part, customer experience, support, future org, tools SF, technological and transformational org element
- Release no 1, 1st trial, basic complaint handling

<line>N.: Focus on Iberia and Italy (lead J.), because they have nothing in place yet

<code>country development</code>

<code>slow rollout</code>

</line>

<line>The first things to be achieved are speed and the establishment of transparency, not a better service.

<code>restricting creativity by reducing scope</code>

<code>transparency first</code>

</line>

- Rel 2 establishing proper ticketing, pre and post sales

- Product, price, basic cust engagement centre
- Phone calls, answering cust questions

<line>

For the second release ticketing will be handled. There will be an added transparency, with a 360 degree view on the customer with an optimized workflow.

Release 2 will be the start of a new solution, with a better quality than the current solution.

<code>more creativity will be in the next increment</code>

</line>

- No. 3 replacement <redacted> quotation tool
- No. 4

<line>

The first phase is just a strategy phase, just enough to hop on the train.

<code>strategy phase</code>

<code>phase restricts creativity</code>

</line>

<line>Delivery org as MSBU a collection of key people will have access to salesforce.

<code>key users</code>

<code>access</code>

<code>organization-specific</code>

</line>

- T.: introduces, customer, customer care agent, customer care manager (up to the msbu org management)
- B. takes over after T. asks should he read the slides out loud, B. describes uptime data customer, self service, dashboards,
- Next best action, SF functionality S. explains the functionality AI
- T. what's the customer's entitlement, with help of <redacted consulting company>, managing the process with sap,

we have seen loaner request,

The customer interaction itself is handled in Salesforce.

Seamlessly guides you into the CRM system

- Element glue between SF and CRM
- Now good time to show SF, so our colleagues have a proper understanding
- No. 5 replace AMS, field service
- N. timeframe of releases

<line>Release no. 2 February March, The reason for the first countries, they already work with SF.

<code>rollout</code>

<code>country development</code>

</line>

- S. starts demo
- B. takes over tells, go back, shows home screen
- K. there is a review customer, clerk, manager
- B. just a first version, internal view
- T. is really nice,

replace things that is super efficient right now,

customer calls several times, create a task, uptime manager, three calls from customer, there is something wrong with the device, or he treated it the wrong way

- No special tools, wunderlist, no email, just notify, and be done
 - B. all of the functionality is new
 - T. will work on phone, ...
 - Will do anything, laughter
 - S.:
 - B. close window, my bad eyes
 - S. I am in a call, basically she is from Spain,
- there is lot of fields there, you can search for an asset
- Shows etq questions

<line>You will get updates, who has done what, want to submit it and send it across,

for Spain this contact, would be send to a Spanish team.

`visibility`

</line>

- B. queues, we can choose timelines, things are less likely to disappear
- S. will bother you
- T. add contract relations, customer with 98%

<line>

S. submit, based on country, will assign it to the right queue and case.

`country-based queue`

</line>

- It should work, takes time
- T. break for a second, at some point go to crm, handover two systems
- With creation of an MSBU order
- N. prerequisite
- I assume multiple other companies tried
- B. fallback
- S. depends on what we decide
- T. still in evaluation
- However it will be done, will end up in sap crm
- How up down time is created
- Crm does not yet know, maybe for the customer too late
- Showing an update that is better than in reality
- Various possible approaches cust
- Field service my device broke down
- Define proper process solution and provide it to the regions
- K. provide it immediately
- S. how much data we are moving
- B. talked with C., delay faster than a day
- When loaner is allocated, dispatched,
- T. we will push for a real time solution
- K. this is one issue, uptime at night
- I propose d2d

<line>T. explains how two elements of service orders, uptime and loaner requests, will be

having their first design in September.

<code>uptime</code>

<code>loaner</code>

<code>first design</code>

</line>

<line>It will be decided with the first group of regions in the beginning of September, and the rest end of September.

<code>regional rollout</code>

</line>

<line>Then as a first result, a first concept will be in place in the beginning of September.

<code>concept</code>

<code>result</code>

</line>

<line>The first two workshops will be in Hamburg.

<code>workshops</code>

<code>Hamburg</code>

</line>

<line>For this MSBU will always be represented by Anke.

<code>MSBU representative</code>

</line>

- K. explains uptime
- B. slides?
- N. I draw
- K., you correct me if bullshit
- Draws 365*24 100

<line>Each country has varying weekends and business hours.

<code>country dependent</code>

</line>

<line>With the new <redacted> portfolio, all service contracts throughout EMEA will be harmonized.

<code>harmonization</code>

</line>

- Draws uptime promise portfolio,
you can cluster it,
up time prime, select, balance, lowest one no up time.

<line>There are different kind of levels for up time contract, a guaranteed up time, and non-guaranteed one. For this different countries should map their old contracts. This has for now been done 50% max. But in the future target picture, this should be completely mapped to the <redacted> contracts.

<code>mapping</code>

<code>country dependent</code>

<code>transformation started</code>

</line>

- preventive maintenance included, risk, expensive trade off.
- Restricted use, preventive inspection
- K. maybe I can complement something

<line>When one creates an order that doesn't mean it is done.</line>

<line>Let's say Italy, if the device works again with a workaround, the device is up, but still you need a technician.

<code>country example</code>

</line>

<line>T. so it is like a contractual restriction

<code>contractual restriction</code>

</line>

<line>

K. for field service it is different, ..., restricted, you can decide, there are exclusions.

</line>

<line>

For example due to wrong chemicals, need an order, but it is in our definition it is an exception.

</line>

<line>T. we need to be careful.</line>

<line>B. just to be clear, it is not working, but we consider it as up.</line>

<line>N. fair question, don't want to go into detail

<code>moderator restriction</code>

</line>

- B. what if the classification by the technician is wrong
- K. of course wrong usage, ex. PreMaintenance
- N. 10 days loaner device needs sometimes, that's why on-site
- Loander repex
- N. no one actively managing
- T. what do you mean?
- N. target not concern, status life,
- K. uptime percentage, yesterday past, also calculation for the time since the contract started,
for the contract item, for the offer itself.

<line>B. customer looks at up time? What do they focus on most?

<code>focus</code>

</line>

<line>N. UK perceived to be the most advanced uptime countries,

<code>country development</code>

<code>most advanced</code>

<code>UK</code>

</line>

presented up time figures, but what does it mean

- T. bonus malus,
- B. risk reward, penalty

<line>T. what's the relevant time period, what defines the penalty

<code>negative causal relation</code>

</line>

- N. contract period
- T. the overall?
- N. depends on the up time, did we achieve it
- T. contract performance, yearly chunks
- N. gut feeling, contract period, e.g. mobile provider
- T. how long the contract
- N. depends on the country, rollout or up time process
- break

<line>T. do they always call?<code>understand causal relation</code></line>

<line>In France they do it differently.<code>country related difference</code></line>

<line>They just send the device and then clerk calls.</line>

<line>Or they approach the field tech directly.</line>

<line>That's why the numbers are shit<code>model reality</code></line>

<line>In theory customer calls, picks and packs it, we receive it at local regional work shop.

<code>HQ logic</code></line>

- K. in that case starts there when the order is created, technically possible to enter a first contact date

<line>T. two different time stamps, the ones implemented, and the ones we would like to have.</line>

J. one step back, the timestamp start with registration of the order.

<line>N. what we do now force France, theoretically shipment we calculate that.

<code>France</code>

<code>force process</code>

</line>

<line>N. for many countries, too. Just send in the device.

<code>country related difference</code>

</line>

K. currently dashboards in excel, the goal

N. ideally we start service if needed

<line>Th.P. initiative unify measurement, country not comparable.

<code>unification</code>

<code>make comparable</code>

<code>observe and control</code>

</line>

N. No we should. We took over the topic. Infocus also has releases.

<line>Old team created the excels.

<code>excel as deviation</code>

</line>

<line>First in france, then northern countries.

<code>First</code>

<code>France</code>

<code>Northern region</code>

</line>

<line>If France doesn't have the timestamp, then we need to calculate it.

<code>France</code>

</line>

Calculation is same, parameters are different.

T. thank you, the customer is notifying us in this phase,

during the case creation. The customer approaches us through different channels.

<line>We need to further discuss what a customer agent needs to do.

<code>defer</code></line>

But the uptime is potentially decreased.

Internal SLAs

</session>

3. Example 2 : Recorded Field Notes Virtuoso.2

<session data="2019-08-15">

Meeting Virtuoso.2 Working Session "Repair and Loans" - Customer notifications, 08/15/2019

The meeting starts off with three persons in the room, J. (J), F. (T) and R. (R).

I am seating myself opposite of them. J sits opposite and to the right,

and T (T because everybody shortens his name to T.). T

has curly blond hairs and a white shirt, where two buttons are open, he is a young man, maybe around 35.

J is a woman around the same age with straight blond open hair.

She wears a costume top.

J starts off with remarking that it is nice to have me in the team,

because it is rare to have someone who knows both CRM Service and Sales,

IBASE from both the ERP and CRM perspective.

This should be a remark to me that my role is in the development lead team for both ERP and CRM.

So I fire back by telling that I am mostly just the machine oil that holds together the machine, stressing my technical role in the project.

J remarks that we have already seen much progress to what happened before, when the mapping was too generic.

<line>T wants to skip the Virtuoso.2 introduction,
remarks the project's laptop etiquette,
of closing the laptop and generally being receptive, esp. private phones.

<code>restriction of how to work</code>

</line>

<line>T The whole topic concerning the IBASE and how to transfer that to SF is specific to SalusVitrum.

<code>SalusVitrum specific</code>

</line>

What is need it to link the account to the ibase and the contact in order to create cases.

M. (M) enters the meeting.

T now reintroduces Virtuoso.2, with its 3 target groups.

The used channels how the customer contracts the clerk, via phone, email, or the web.

It is important to have a clear workflow management design.

<line>And that complaint workflow will be adapted for all of the customer inquiries,
a unified case management flow, as well as task management.

<code>unified case management</code>

<code>standardization</code>

</line>

<line>And a key element here is the IBASE,

to answer the question who is the customer and what is my IBASE?

<code>structure discussion with key elements</code>

</line>

J corrects, not the IBASE is important,

but the correct device which is starting point of customer inquiries.

J Will the SAP CRM IBASE be substituted by something like the SF IBASE.

T No, data will just be consumed.

<line>T Let's first consider the sales order that comes from ERP, just the happy path.

<code>happy path</code>

</line>

M First the equipment is shipped out of the warehouse,
and just at the moment it is shipped it is assigned to an IBASE.

J The customer represents the unallocated location,
the application field triggers the mapping to an IBASE location.

Here just a 1:1 mapping is possible, but before that the situation was worse,
equipment didn't go to the customer when the mapping was not possible, it went to the
country.

The object type is of importance in the process.

The allocation is just working for customer equipment, not demo, loaner rental.

<line>T A clear use case is, that the user wants to see the contracts.

<code>reinforcing the use case</code>

</line>

J The IBASE has the contract, as well as the warranties.

<line>

T reformulates, a clear requirement: the customer wants to see the contracts for the device.

I as a customer service agent want to see warranties.

<code>reinforcing the use case</code>

</line>

M Everything that has a serial number is an equipment, everything that is in batch
management hasn't.

J Shows location <redacted> as an example.

<line>

T The clear use case is, we need the contracts and warranties to be displayed.

That needs to be written down.

<code>reinforcing the use case</code>

</line>

J We only regard field service contracts, rental contracts are very special.

<line>

T Together with the assets we also want to see service contracts and warranties.

<code>reinforcing the use case</code>

</line>

I. (I) has entered the meeting room some time ago.

I Departments do not match with the IBASE.

We created automatically the location, but they don't match with the ones in <redacted>.

<line>T First we should define the requirements, as a second step the obstacles.

<code>structure the discussion</code>

</line>

We need to know the location at the customer site.

I You mean the location and the department?

T They should be one and the same.

J The object should always be the same. <redacted> and SAP CRM have different structure, because they have different data needs. So what kind of structure do we need in SF?

I For me the question remains, do I require departments and locations?

M From the business perspective it doesn't matter what it is called.

J Department and location could be the same.

M The location and the department can be mapped together, they are just from different systems.

I For me the business perspective is important.

M Regarding that, they are exactly the same.

I Tobias and me, we have received accounts and departments.

But private doctor's offices don't have a department.

M This should be just an <redacted> requirement.

<line>I No, this is decision, a private practitioner has no department.

<code>request for a decision</code>

</line>

<line>

T We have here a need to discuss: A doctor's office is in itself one, and a single location.

`need to discuss`

`</line>`

M Most likely a location needs a department from system.

I Will there be multiple levels of departments?

T No, the area is fixed. But the room could be the 2nd level. There could be even a third level.

T. (TH) had entered a while ago.

`<line>`TH We get lost here. We wanted to discuss the process.

`back on track`

`process`

`</line>`

T We are at this point.

M I was in this discussion about the room before and we came to the conclusion, one can assign the room as an attribute to the object.

T We need five data points connected to the asset (1) account, (2) objects, (3) IBASE location/department, (4) contract, warranty, (5) room.

I am the customer service agent,
the customer calls and says that the device broke down.
We need to tell the field technician which room to go to.

M We had already the same requirement.

And after analysis we came to the result for EMEA that we know there to go.

`<line>`Until now the room information was misused.

`experience`

`</line>`

`<line>`The real field service technician thinks, that it is a nice information, but really not needed,

because in most cases he is escorted around. So it is not really needed.

`reality check`

</line>

<line>T Let's leave this as an open task.<code>open topic</code></line>

M The building could be interesting.

The requirement came in, that the building information is urgently needed.

<line>But when we asked ODE for specifics,

<code>Germany</code>

<code>collect requirement</code>

</line>

<line>we ended up with three customers where it is really needed,
the rest is just on one campus.

<code>reality check</code>

</line>

<line>T Okay, we still need to decide for the room and the building.

But the account and contract are a must have.

<code>define scope</code>

</line>

<line>T We have to define what kind of information is of interest.

<code>steer meeting</code>

<code>information of interest</code>

</line>

T paints flip chart with assets and open orders.

M There is the cleansing of the object itself.

We focused on the whole process,

all the information necessary for the smooth process of the allocation,

because the whole life-cycle was corrupted.

We are still doing that,
but it should be done in a month or two for all of EMEA. And we also have a 2nd task.
T So let me note, until end of October.
M Then related to the customer stream,
we handled the matching of the department and the location.
This was done with limited time constraints.
The initial analysis is done.
It would take manually 200 man days,
to map all of the locations and departments.

```
<line>The mapping has been done just for the Northern region, and it took them 6 months.  
  <code>Northern region</code>  
  <code>regional rollout</code>  
  <code>Northern region</code>  
</line>
```

```
<line>Their data is half of the size of Spain, Germany or France.  
  <code>Spain</code><code>Germany</code><code>France</code>  
  <code>data size</code>  
</line>
```

T But this is part of the data cleansing. The measurements relate to the object only.

M So there is this mapping table.
Ideally we start with the lead,
while having a certain customer hierarchy,
a contact, an opportunity, an offer to the customer,
and map that to a contact and a department.

Then process stops for the presales.

We jump into the SAP ERP, and allocated the object to certain location in the CRM.

Physically it is the same place like in the offer.

J The department chosen by the sales agent is lost.

The service team sets up a different location. There is no 1: 1 mapping.

M sums up <redacted>. Step 1 was the cleansing of the object in SAP CRM.

Step 2: the cleansing of the department and location.

I would trust the object in the department more, that comes from <redacted>.

It is just a gut feeling, but I would chose that information.

I No, we had the case where there were several departments with exactly the same name, the same information. But a different ID for several contacts assigned.

But the department information is exactly the same.

<line>J It depends on how the countries use the departments.

<code>country-specific usage</code>

</line>

<line>We missed to set up a common process.

<code>missing common process</code>

</line>

<line>Business tried to respond by acting in a way to handle the daily business.

<code>response to missing HQ process</code>

</line>

<line>M We don't have the resources for the correct department location mapping.</line>

<line>There is no time for the perfect solution,</line>

<line>now we have to choose between the one or the other system,</line>

<line>and migrate that into sales force.</line>

<line>Just to imagine one scenario, we take the <redacted> departments, and migrate them to SF.</line>

At a later stage the clerks cleanses one by one the SAP CRM IBASE when errors are encountered.

T Have we actually defined that the data cleansing of that step two is part of the Virtuoso.2 project?

I At least it has been assigned to me as part of the data migration.

Assets from SAP CRM are linked directly to the company, not department. That is DQM.

M That is part of DQM customer stream.

<line>T We have countries that are ten times bigger than the north.

<code>country comparison</code>

<code>Northern region</code></line>

<line>So we have to live with the shit.<code>live with the differences</code></line>

<line>Now when we directly address this problem to ODE and France,

we have a decent chance that something will happen.

<code>Germany</code>

<code>France</code>

</line>

Two things came to my mind, we have to talk about it at the program level,

I need to ask for a mandate, and then I have the right to speak about it.

Or it could be part of DQM. But for sure we don't want to miss to talk about it.

<line>I Also keep in mind that you have to merge back the fixes

back for the already migrated countries

if we fix it for the countries that are not yet migrated.

<code>migration</code>

<code>merge back</code>

<code>fix countries</code>

</line>

<line>T Sure, but they may just follow a different sequence.

</line>

<line>Let's forget Spain and Italy we cannot save them, let's focus on the happy path.

<code>happy path</code>

<code>Italy</code>

`Spain`
`acceptance of failure`
</line>

<line>Let's see what works for ODE,
and then use that at a later point for Italy and Spain.

`Italy`
`Spain`
`Germany`
`acceptance of failure`
</line>

<line>M If we handle it in a crisis mode, we have to apply the matching later on.

`crisis mode`
</line>

First we should take the data form <redacted>.

I am really lost, what is the current state.

<line>We have companies in the MDG, companies, departments as well,
so let's map locations to the departments so it maps to the MDG,
that's how you insure the governance.

`governance`
`adjust to the system`
</line>

<line>Only TMs from sales are allowed to open new departments in <redacted>.

`restriction to a user group`
</line>

J Also in CRM there should be restrictions who is allowed to create locations.

<line>M Just from Salesforce it should be allowed to create locations,
everyone else has to do it in MDG.

<code>restriction to a system</code>
</line>

What I am struggling with is,
what we have to endure for the next 2, 4, 6, 30 months
we have to live with the data situation.
Achim has to be involved for the MDG project, for the MDG role out timeline.
But departments are somehow excluded as far as I know.
T We have to sync with the MDG role out.
M remarks that his new role in innovation management will prevent a long term
commitment to the project.
After we two talk about our new roles and that the engagement in other projects
prevent the enactment of our newfound roles.
M tells me that he visited a hackathon in Prague where the data was already given,
and that that was great. I tell that we should do an internal hackathon.
M wants to connect the development, maybe as part of a lab to the innovation management.
</session>

4. Example 3: Recorded Field Notes Momentum

<session data="2019-09-11">

Regarding the old Momentum project P. called me and we have issues, that the wrong date is
calculated.

But this is because the end codes are not set.

<line>

P. told me that it is because they don't want to set the end codes,
because then it would trigger a service confirmation.

<code>country-specific deviance</code>

<code>accounting</code>

</line>

They don't want that.

They book everything in the end to the cost center incoming inspection.

So I ask why do they want to book everything to one cost center and the answer is,
<line>because they don't care.

<code>voiced reason for deviance</code>

</line>

I asked, why don't we force them,
and P. tells if he would be responsible for MRS, then he would.

<line>But right now they don't care and they are jeopardizing the whole Momentum project.

<code>country-specific deviance hurts projects</code>

</line>

</session>

5. Example 4: Recorded Field Notes Momentum

<session date="11.01.2019">

The three levels, the real, the imaginary and the liminal, can be seen also in the technical artifacts. The imaginary component is the mental model of the code, how the code is supposed to work. The real is how it is working in the running environment, how it is interpreted by the machine, by objects. Code is not just a static object. It is also "running", that means that it has a "life" of its own. This life-like properties are important, because it structures the lived experience. The support workers have to work on the living artifacts. That means, that they have to adjust to the system that is used throughout the customer area that spans over several timezones.

<line>Support workers are external workers, brought into from an Indian company, because of the value creation.

<code>build</code>

<code>Indian</code>

<code>manage</code>

</line>

<line>The argumentation is, that
where most of the value is created, internal workers should be
placed.

<code>build</code>
<code>manage</code>
</line>

<line>Therefore we can describe, the separation internal and
external workers, and in the same time the structure in the
development process projects and support.

<code>manage</code>
<code>build</code>
</line>

</session>

<session date="02.04.2019">

<line>Made a short introduction for another external man developer, so that
he can go on.

<code>man developer</code>
<code>Chinese</code>
</line>

<line>We met in a small room and went through a word file,
which is a concept, that I wrote earlier.

<code>design</code>
</line>

<line>The different status are a
problem of complexity also for him.

<code>complexity</code>

</line>

<line>The business should be able to
change and add to the complexity.

<code>complexity</code>

</line>

In the same time this makes him
thinking, that it is not possible to end as early as next week, even
though this was the plan.

<line>I then proposed a minimal version, that we
then extend later, to just test the underlying concept. Later on we
would extend.

<code>build</code>

<code>design</code>

</line>

After the meeting I had another meeting about two
smaller projects, that had incidents. For the first topic I added to
the agenda after talking to the principle process consultant who is
also invited. So we added this item, but unfortunately we mixed up the
person, so just one agenda item was relevant. This incident was for a
performance adjustment, a first experiment, that failed. We discussed
the relevant item, where the incident was, that it was not enough for
the business to see a certain result, but also to search for some data
in detail. I restated the problem, and then added to the word
file. After this meeting I wrote the general structure directly in the
code, after having even myself a better understanding, because of the
earlier meeting with the other developer. Then I sent by instant
messaging the results. But tomorrow we will look into it.

<line>I also

contacted for the same project an external Indian woman developer. She will leave earlier, so I messaged her by instant messaging after talking to the coordinating external man developer. He told me to just ping her. She communicated the hour until then she has time and I put in an appointment.

<code>Indian</code>

<code>woman developer</code>

<code>build</code>

</line>

</session>

<session date="03.04.2019">

Gave an introduction to one part of a project, so that it is possible to manage.

<line>Everything was understood and said to be done.

<code>design</code>

</line>

<line>Questionable if I am wrong in my personal perception that it is hard to do, but woman Indian developer said, it is doable.

<code>build</code>

</line> And everything is understood. The short messages contained a lot of smileys. This is something I noted as a cultural element of Indian culture, that I also already experienced with different Indian coworkers. There is a preference for instant messages that is not given for German colleagues, especially when establishing earlier contact. The connection for the virtual meeting was not that good.

</session>

<session date="08.04.2019">

I discovered that the Indian woman developer where I was in the beginning unsure if she would be able to implement everything in time, implemented already the solution, ready to be tested. So what I had to

do, was to create an example case in the development system. I was feeling very positive about this development.

<line>The coding style is old-school, the programming language ABAP has different styles developed over its long career.

<code>build</code>

</line>

This one is an old one, not yet using class-based programming.

</session>

<session date="09.04.2019">

Had a problem that a man German coworker discovered a missing implementation. That project part was late.

<line>A result of some mismanagement that let to start put the project manager into CC.

<code>build</code>

</line>After

the other team, that has to carry out a task for the project. The main manager was not able to track the status.

<line>Then an Indian woman coworker gave me the good advice and connected me to another developer that will be able to implement the missing part.

<code>Indian</code>

<code>manage</code>

</line>

<line>A man Czech business was the one who originally requested the implementation.

<code>design</code>

</line>He also coordinated between the coworker that first discussed the missing implementation, and will work on top of that.

<code>build</code>

</session>

6. Initial Interview Guide

Interview (PhD project Roman Glass)

Description Each interview will take place for 30 to 45 min. The questions asked are stated below. As these interviews are part of the initial phase of the research project not all questions have to be asked, but are selected to accord to the flow of the conversation. One topic is not immediately left, but if the interviewee exhausts a category the next one will be selected.

TEAM

- Describe some special occurrences in your project with regards to your team?
- Do you experience things differently from your colleagues?
- Were there or are there differences in how you could find yourself to perform as a team?

TECHNOLOGY

- Describe in what way is IT taking care of the differences between the subsidiaries?
- How is the business perceiving that support?
- Do you feel like the business is part of your project in the same way your IT colleagues are?

PROJECT

- Do you think that projects are expressing a genuine interest in the problem domain?
- Could you describe your strengths in a project team, especially regarding the work with the business and the special processes?
- How does the stress of different project phases affect you?

LEADERSHIP

- Could you recount the properties of a good leader?
- Do you think others find the same properties in yourself?
- Is the cultural background important in this regard?
- Is there a difference between leadership in the headquarters than for the business side in the subsidiaries?

7. Code for generating a heat map from the coded field notes with Python

```
import matplotlib.pyplot as plt
import xml.etree.ElementTree as ET
import collections

# Parsing XML file
xml_path = "Documents/thesis-data.xml" # Replace with your XML file path
with open(xml_path, 'r', encoding='utf-8') as file:
    lines = file.readlines()

tags_per_line = [set() for _ in range(len(lines))]
for i, line in enumerate(lines):
    try:
        elem = ET.fromstring(line.strip())
        tags_per_line[i].update([e.tag for e in elem.iter()])
    except ET.ParseError:
        pass

all_tags = [tag for tags in tags_per_line for tag in tags]
counter = collections.Counter(all_tags)
unique_tags = [tag for tag, count in counter.most_common()]

# Parameter to adjust the compression factor on the y-axis
compression_factor = 10
compressed_lines = len(lines) // compression_factor + (1 if len(lines) % compression_factor
!= 0 else 0)

# Creating a 2D array initialized to zero, size = (compressed_lines x num_unique_tags)
heatmap_data = [[0] * len(unique_tags) for _ in range(compressed_lines)]

# Filling the heatmap data: iterating over each line's tags
```

```

for i, tags in enumerate(tags_per_line):
    for tag in tags:
        if tag in unique_tags:
            j = unique_tags.index(tag)
            heatmap_data[i // compression_factor][j] += 1

# Creating a heatmap using Matplotlib
fig, ax = plt.subplots(figsize=(10, max(5, compressed_lines // 5)))
cax = ax.matshow(heatmap_data, cmap='viridis', aspect='auto')

# Labeling the axes
ax.set_xticks(range(len(unique_tags)))
ax.set_xticklabels(unique_tags, rotation=90)
ax.set_yticks(range(compressed_lines))
ax.set_yticklabels([f"{i*compression_factor + 1}-{(i+1)*compression_factor}" for i in
range(compressed_lines)])

# Adding labels and showing the heatmap
plt.xlabel("XML Tags")
plt.ylabel("Line Number Range")
plt.title("XML Tags Heatmap")
plt.colorbar(cax)
plt.tight_layout()
plt.show()

```

8. Code for generating the heat map with Processing

```
XML xml;
void setup() {
  size(500, 1000);
  xml = loadXML("thesis-data.xml");
  XML[] sessions = xml.getChildren("session");
  float x = 40;
  float y = 40;
  noStroke();
  background(255);
  int g = 1;
  textSize(14);
  fill(0);
  text("Line No.", x-35, 30);
  text("Code Heat", width/2, 30);
  ArrayList<String> ls = new ArrayList();
  for (int i = 0; i < sessions.length; i++) {

    XML[] lines = sessions[i].getChildren("line");
    fill(0);
    for (int j = 0; j < lines.length; j++) {
      XML[] codes = lines[j].getChildren("code");

      if (codes.length == 0) {
        fill(0);
      } else {
        for (int k = 0; k < codes.length; k++) {
          String code = codes[k].getContent();

          if (!ls.contains(code)) {
            fill(255);
            float r = random(width-50);
            text(code, x+r, y);
            ls.add(code);
          }
        }
        fill(0, 50+(codes.length*20), 0);
      }
      rect(x, y, width-5, 2);
      if (g % 10 == 0) {
        fill(0);
        text(g, x-35, y);
      }
      y += 2;
      g++;
    }
  }
  save("heatmap.png");
}
```

9. Initial Coding List for Algorithms

- * Chinese
- * French
- * German
- * Indian
- * advice
- * boss
- * bugs
- * business analyst
- * business complexity
- * business
- ** value chain
- * changement of assumptions
- * code complexity
- * communicate
- * complain
- * configuration
- * controlling
- * country alignment
- * country
- ** India
- * country
- ** Indian
- * department responsibility
- * design
- * development team
- * doable
- * ease of understanding
- * emotions
- * errors
- * events
- * formal project approach

- * headquarter logic
- * hero
- * home
- * implementation
- * initial request
- * interaction
- * learn
- * man developer
- * management no change
- * missing part
- * multinational team
- * needed functionality
- * no complaint
- * operations team
- * out of scope
- * phone conference
- * priority
- * process
- * project dependency
- * project manager
- * prototype
- * release
- * remote work
- * roles
- * sick
- * simplify
- * software concept
- * stress
- * synergy
- * technology
- * testing
- * woman developer

- * workers status
- ** external workers
- * workers status
- ** internal workers

Reduced List

- * Chinese
- * French
- * German
- * Indian
- * build
- * complexity
- * design
- * emotion
- * learn
- * man developer
- * manage
- * woman developer

10. Initial Coding List Power

- * EMEA
- * European perspective
- * First
- * France
- * Germany
- * HQ logic
- * Hamburg
- * Italy
- * MSBU representative
- * Northern region
- * SVIT
- * SAP CRM
- * Spain

- * UK
- * acceptance of failure
- * access
- * accounting
- * adjust to the system
- * back on track
- * collect requirement
- * common emailing
- * concept
- * contractual restriction
- * country comparison
- * country dependent detail
- * country dependent differences
- * country development
- * country example
- * country independent
- * country involvement
- * country related difference
- * country specific solutions
- * country system availability
- * country-based queue
- * country-specific deviance
- * country-specific deviance hurts projects
- * country-specific differences
- * country-specific feature
- * country-specific usage
- * crisis mode
- * cut off
- * data size
- * defer
- * define scope
- * design

- * emailing
- * excel as deviation
- * experience
- * feature country-restricted
- * first design
- * fix countries
- * focus
- * force process
- * governance
- * happy path
- * harmonization
- * information of interest
- * key users
- * limit discussion
- * live with the differences
- * loaner
- * make comparable
- * mapping
- * merge back
- * migration
- * missing common process
- * missing completed rollout
- * missing flexibility
- * model reality
- * moderator cuts short
- * moderator restriction
- * moderator shortens meeting
- * moderator structures
- * more creativity will be in the next increment
- * most advanced
- * need to discuss
- * negative causal relation

- * no harmonized process
- * observe and control
- * SalusVitrum Therapeutics specific
- * open topic
- * organization-specific
- * permitted flexibility negative
- * phase restricts creativity
- * process
- * reality check
- * region project dissatisfaction
- * regional rollout
- * regions
- * regulate behavior
- * reinforcing the use case
- * repair
- * request for a decision
- * response to missing HQ process
- * restricting creativity by reducing scope
- * restriction of how to work
- * restriction to a system
- * restriction to a user group
- * result
- * rollout
- * sales
- * slow rollout
- * standardization
- * steer meeting
- * strategy phase
- * structure discussion with key elements
- * structure the discussion
- * transformation started
- * transparency first

- * understand causal relation
- * unification
- * unified case management
- * uptime
- * visibility
- * voiced reason for deviance
- * workshops

11. Refined Code List

- * EMEA
- * European perspective
- * First
- * France
- * Germany
- * HQ logic
- * Hamburg
- * Italy
- * MSBU representative
- * Northern region
- * Italy
- * SAP CRM
- * Spain
- * UK
- * acceptance of failure
- * access
- * accounting
- * adjust to the system
- * back on track
- * collect requirement
- * common emailing
- * concept
- * contractual restriction

- * country comparison
- * country dependent
- * country development
- * country example
- * country involvement
- * country related difference
- * country specific solutions
- * country system availability
- * country-based queue
- * country-specific deviance
- * country-specific deviance hurts projects
- * country-specific differences
- * country-specific feature
- * country-specific usage
- * crisis mode
- * cut off
- * data size
- * defer
- * define scope
- * emailing
- * excel as deviation
- * experience
- * feature country-restricted
- * first design
- * fix countries
- * focus
- * force process
- * governance
- * happy path
- * harmonization
- * information of interest
- * key users

- * limit discussion
- * live with the differences
- * loaner
- * make comparable
- * mapping
- * merge back
- * migration
- * missing common process
- * missing completed rollout
- * missing flexibility
- * model reality
- * moderator cuts short
- * moderator restriction
- * moderator shortens meeting
- * moderator structures
- * more creativity will be in the next increment
- * most advanced
- * need to discuss
- * negative causal relation
- * no harmonized process
- * observe and control
- * Salus Vitrum Therapeutics specific
- * open topic
- * organization-specific
- * permitted flexibility negative
- * phase restricts creativity
- * process
- * reality check
- * region dissatisfaction
- * regional rollout
- * regulate behavior
- * reinforcing the use case

- * repair
- * request for a decision
- * response to missing HQ process
- * restricting creativity by reducing scope
- * restriction of how to work
- * restriction to a system
- * restriction to a user group
- * result
- * rollout
- * sales
- * slow rollout
- * standardization
- * steer meeting
- * strategy phase
- * structure discussion with key elements
- * structure the discussion
- * transformation started
- * transparency first
- * understand causal relation
- * unification
- * unified case management
- * uptime
- * visibility
- * voiced reason for deviance
- * workshops