ROLE OF TEAM DIVERSITY ON TEAM PERFORMANCE AND AMBIDEXTERITY

Case Study of product and service-based teams from semi-conductor industry

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Executive Summary

Diversity as a topic is increasingly becoming important aspect of organizations and society in general. Team diversity could bring different perspectives and thus diverse teams could reap the benefits such as better performance, innovation, and problem-solving abilities. Teams face challenge of deciding between alignment activities focused on organizational goals vs adaptability activities helping organizations adapt to changing external environments. Teams that balance both types of activities are known as ambidextrous teams. Through literature review, it was found that there is knowledge gap in understanding the link between team diversity, performance, and ambidexterity. This thesis tries exploring various diversity factors and its relation to team performance and ambidexterity. Further the thesis investigates if there are any differences in the link between team diversity, performance and ambidexterity based on firm types, that is product vs service-based firms.

To find the solution to the link, semi-structured case interviews was conducted. 6 team managers from product-based firms and 4 managers from service-based firms participated in the research. Data from these 10 semi-structured case interviews was analyzed using AtlasTi software and results of qualitative research is presented in the thesis. Various ways in which one can conceptualize diversity, advantages & disadvantages of diversity and its effect on team performance & ambidexterity is presented in this thesis based on the qualitative analysis of semi-structured case interviews.

The exploratory study indicates that semi-conductor team mangers conceptualize diversity from both social and information/decision making perspectives. Common surface level diversities such as function, experience, gender etc. were reported. At the same surface level diversities such as working style, task motivation, etc. were reported. The results indicate that teams various diversity factors can lead to divergent thinking and elaboration of task-relevant information thus improving team performance. Some of the reported benefits of diversity include increased knowledge base, better service to customers, better decision making, etc. Realization of diversity benefits is not straightforward; it comes with challenges. Some of these challenges due to diversity include complex team management, increased conflicts, increased time and effort. Thus, it is important for organizations to provide necessary support and

environment for reaping the benefits from diversity. Such organizational control is more in terms of structures of teams in case of product-based firms; structural decisions drive ambidexterity and division could take place based on diversity types such as functional diversity, experience diversity etc. However, decentralized structures and informalization of non-routine activities in firms can enable better exploration. And diversity types such as experience, function or skills act as deciding factors in determining extent of structural decentralization and informalization of non-routine activities. Decentralization of non-routine activities can thus enable ambidexterity. Contrary to product-based firm, all the service-based firms reported that employees need to have skills and abilities to capture customer needs and deliver them on time. Therefore, it is evident that all the employees in service-based firms could be involved in exploration. Thus, naturally the employees in service organizations are involved in both the types of activities. Diversities such as skill and working style can thus enable contextual ambidexterity in service-based firms by enabling employees to serve customers better.

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Contents

List of Tables

List of Figures

Chapter 1 Introduction

This chapter introduces the topic of study, background of semi-conductor industry and the role of diversity research and its importance. Research objective, main problem statement which needs to be solved is presented.

1.1 Topic of Study: Diversity, Team Performance and Ambidexterity. How are they linked?

Diversity topic as gained attention from companies worldwide in recent few years. Many of the companies are increasingly creating inclusion and diversity policies at hiring level. Conscious effort to increase female count at board and supervisory level is visible. Many of the past research topics investigate advantages of having diverse team members from a top-level management team perspective. There is little amount of research done in understanding role of diversity at a team level. Further many of the research has mainly focused on social category of diversity such as age, gender, ethnicity, etc. Many of the corporate policies of diversity also focuses on the same. But at the same time, one can view diversity from informational/functional angle.

Firm's ambidexterity relates to ability of the firm to manage both exploitation and exploration within the organization as studied by Birkinshaw & Gibson Mitsloan (2004). According to March (1991, p. 71), exploitation activities refer to "production, efficiency, refinement, choice, execution & etc.", whereas exploration activities of the team-members refer to "search, discovery, innovation, risk taking & etc." (March, 1991). The firms need to choose between exploration and exploitation activities. Diversity could possibly aid in better exploration by bringing diverse ideas. At the same time, it can also aid in exploitation activities. For example, an experienced person can avert risk of wrong process in the team activities. There is little understanding of link between diversity, team performance and ambidexterity within the semi-conductor industry. This research tries to bridge the knowledge gap. The knowledge gap and problem statement is further elaborated in the section 1.3. The informational aspect of diversity such as task motivation, skills, etc. may not be readily visible, but they are job-related. Thus, diversity can lead to elaboration of task-relevant information. Diverse team members can bring different perspectives to task at hand. Diversity can lead to improved team performance by enhancing aspects such as creativity, decision making quality, innovation, etc. Thus,

understanding how diversity affects team performance is of paramount importance. Based on this background information and previous literature, the research tries to understand how diversity is conceptualized in semi-conductor diversity and its effect on the team performance and ambidexterity.

1.2 Need for diversity research in semi-conductor industry

Almost all modern theories of technology adoption incorporate the 'S-curve' of adoption where the parameters are plotted against time and apply different theories as to what causes this logical function. These theories may include economic based theories like Mansfield (1961), Roger's Theory on innovation diffusion (1962) and others (Mansfield, 1961). In particular, the beginning of the S-Curve is of interest due to that time being an area of intense competition between technologies and market participants looking to define the next dominant design. There is a close interdependence between technological diffusion (S-curve) and the rate of technological change as detailed by Farzin et al (1998). 'The importance of technological uncertainties become more evident once it is noted that the firm's decision about how soon to adopt innovations depends on how fast and by how much technology will advance over time' (Farzin et al., 1998). Most technology developments follow a 'Sideway S' shaped curve- they start flat, grow over time and the level off when there is a natural barrier is reached. In case of the semi-conductor industry however, this technology adoption curve is somewhat seminally different, and the technology adoption and development have been guided by Moore's law (Arden et al., n.d.).

Moore's law is an observation that the number of transistors in an integrated circuit doubles about every 2 years. This is an observation and projection of a historical trend and not a physical law, But this provides an empirical relationship that has been used in the semiconductor industry to guide long term planning and to set targets for research and development, thus becoming the engine of the electronics industry and regarded as a self-fulfilling prophecy and technological trajectory. Predictions made using the Moore's law become the basis for future production goals and this in turn becomes a measurement of the semiconductor industry progress.

In his Paper, Mollick (2006) attributes 4 main factors to the increase in the chip density as stated by Moore's law: Die size, Line dimension, technical cleverness, and technical innovation (Mollick, 2006). These 4 factors together explain most of the exponential improvements in the density of transistors in an IC as predicted by Moore's law. The first 2 factors are device scaling parameters, and the last 2 factors would be relevant to the current course of study in the thesis and are elaborated below. Particularly, "technical cleverness" describes the trends in chip design process than just the technical production of chips. Some examples of such "technical cleverness" would be ability of the design engineers to design chips that use increasingly more chip space through clever circuit design than just rely on advances in chip production techniques and manufacturing methodology. The final element that contributes to the increasing chip density is technical innovation which describes the advances in materials and methods of chip production. Numerous challenging technological innovations, each seemingly not very important, have collectively allowed Moore's law to continue. Thus, the semiconductor industry is largely dependent on such "technical cleverness" and "technical innovation" to realize Moore's law.

West et al (2002) in their paper discuss ways in which diverse national systems of innovation manifest within the firms of one industry (West, 2002). This paper also provides empirical evidence for the microeconomic existence of characteristic and distinctive national modes of organization for technological development:

> "The semiconductor industry provides a rich field in which to test theories about the relationships among institutions, modes of organization for knowledge creation, and technology development performance, especially in technologically turbulent environments. The industry is subject to sometimes extreme price and product feature competition, in which the capability to develop new technologies is critical (p.162)."

All firms that hope to remain competitive in the semiconductor domain must undertake substantial R&D efforts and should draw on a broad range of internal and external sources of knowledge about the technology and devise this as a strategic priority. In their paper, they discuss the organizational dichotomy and attribute these as responses to the institutional and cultural differences. For example, the authors have noted that in Japan, managers in semiconductor firms can select organizational strategies that assume continuity of employment rather than adopt

approaches that require recruitment of already-skilled employees, whereas US organizations cannot assume continuity of employment and they can recruit already highly trained engineers and scientists. Guaranteed employment continuity allows Japanese firms to pursue an experience-based approach for knowledge creation and problem-solving and facilitates deeper organizational socialization enhancing communication and co-ordination. This reduces problems of inter-functional and interdisciplinary knowledge transfer. But these would also come with a caveat that the managers reported that it would be difficult to introduce new personnel from outside, when if they would be available. US firms dealt with an environment favoring professional socialization over organizational socialization. The key elements of such an organizational mode would be focus on experimentation, tight project teams, centralized resource allocation and task partitioning. The key summary from this paper is that organization for knowledge management in the 'semiconductor' industry is difficult to 'globalize'. The modes of organization for knowledge creation do not appear to be globally homogenous.

A challenge is thus posed for the semiconductor firms. Keeping up with Moore's law is becoming increasingly complicated and difficult with device scaling approaching atomic levels, and thus the organizations can no longer rely on internal sources of technology alone, they cannot continue to look only inward for new technology. All had to develop the capability to source technology rapidly and effectively from wherever it is deployed.

Further semi-conductor organizations must choose their activities between exploitation and exploration and the team must allocate their time based on these activity types which are completely different from one another. Many studies show that firms that can manage both exploitation and exploration well can gain competitive advantage over other firms.

To source knowledge from a geographically dispersed range of sources, with knowledge-creation institutions remaining locally differentiated, firms need to be simultaneously global and local. Thus, teams within semiconductor industry are expected to be more diverse. Having diverse team members could enable elaboration of task-relevant knowledge and possibly enhance team's performance (Van Knippenberg et al., 2004).

This research thus focuses on exploring how diversity is conceptualized within semi-conductor industry and how team diversity affects team's ambidexterity and performance. Based

on the responses from case-study participants, the research further attempts to find any possible differences in this link of team diversity and team's ambidexterity and performance based on the firm type.

1.3 Knowledge Gaps and Problem Statement

Diverse team members might help in increasing task-related knowledge (Van Knippenberg et al., 2004). However, there is very little understanding on how team diversity is conceptualized within semi-conductor industry and how it affects team performance. Further, the composition of diverse teams within service sector might be different compared to product-based firms and might result in elaboration of task-related knowledge in a different manner. This creates a problem for a practicing team manger to design an optimal diverse team to elaborate team's knowledge base and possibly enhance team performance such as innovation, agility, etc.

Although many studies in the past have been done trying to link team's diversity and team performance, there is minimum knowledge in understanding task related team diversity and team performance within the context of semiconductor-based product and service firms. Thus, the research tries conducting an exploratory study of multiple teams from both product and service-based firms. The thesis tries to explore task-related diversity factors and its relation to team performance and ambidexterity.

Much of the existing literature is extensively focused on organization level ambidexterity. There is little understanding on team-level ambidexterity. Study by Jansen et al. (2016), indicate that team-level ambidexterity is collective behavior of individual team-members who search for, experiment with & develop new knowledge (Exploration) and simultaneously refine and recombine existing knowledge to deliver higher efficiency to the assigned activity (exploitation) (Jansen et al., 2016). Teams that manage this both exploration and exploitation are referred to as ambidextrous teams. Functional diversity of the team can play a key role in driving team-level ambidexterity. Li et al. (2018), indicate that functional diversity plays a key role in team's ambidexterity (Li et al., 2018). According to their study, team members having different functional background could lead to cognitive differentiation which can drive exploration and exploitation activities. For example, group members working in the same functional domain for long period of time can be more exploitative in nature over explorative.

Finally, team-level ambidexterity and performance can be measured both objectively and subjectively. Objectively we can measure team's ability to deliver new product innovation at rapid rate, identify number of radical and incremental innovations done by the team over time, etc.,(Wang & Rafiq, 2014). Alternatively, we can adopt subjective team performance measurement. Study by Yang et al. (2010), indicate the possibility of measuring team's subjective performance by analyzing how team information is acquired, how information is analyzed, how decision and actions are made and how actions are implemented (Yang et al., 2010). Another study by Schnellbächer et al. (2019), highlight measuring team-level performance in relative manner. For example, Team-level performance could be measured by understanding whether team meet its objective quickly compared to other teams (Schnellbächer et al., 2019). This subjectivity of the team performances increases complexity of analyzing the link between diversity, team performance and ambidexterity. The link could be subjective in nature because different teams could have different task at hand, agendas, decision-making style and industry type. This thesis tries to address this knowledge gap by focusing on semi-conductor service and product-based industries. The research attempts to identify how diversity is conceptualized within semi-conductor product and service-based firms and how diversity affects team performance and ambidexterity.

1.4 Research Objectives

1.4.1 Practical Research Objectives

The practical research objective of this research is to enable participating team mangers from semi-conductor industry, understand how diversity can affect team ambidexterity and performance and how this link varies between product and service-based firms. Cross case analysis will give insights to participants regarding key commonalities, differences and challenges related to the topic of study. These insights can further be shared beyond the case study participants to other practicing team managers. Thus, the research outcome can enable companies practically design optimal diverse team that can elaborate task related knowledge and enhance performance by considering all the practical issues and challenges related to team diversity.

1.4.2 Theoretical Research Objectives

The theoretical research objective is to consolidate research on multiple team's diversity, team ambidexterity and performance. The aim is to collect different perspectives on the topic from multiple teams and to develop theoretical model showing the link between diversity, ambidexterity and performance and how it varies based on firm type. Thus, the research is mainly exploratory in nature and find outs diversity factors and its relation to team performance and ambidexterity within the context of product and service-based semi-conductor firms.

Chapter 2 Literature Review

2.1 Diversity

Many researchers have attempted to define diversity in various ways. There appears to be an assumption that diversity concept is understood by organizational researchers intuitively without the need for definition. Thus, White (1986) described that "Diversity and segregation are characteristics of a population most individuals can sense intuitively. Diversity is variety" (p. 198). Oxford Learner's Dictionary defines the term diversity as "a range of many people or things that are very different from each other; variety" (Van Knippenberg & Schippers, 2007)(Press, n.d.). White's (1986) description that "diversity is variety" is probably most understood by anyone. Terms for example "heterogeneity", "inequality", "organizational demography", "differences", "disparities", "distance" and "variation "are commonly used by researchers to describe concept of diversity. Researchers have faced challenges in determining what should come under diversity research because individuals can differ on many numbers of characteristics. Diversity as variety concept is thus very broad and precise definition is needed to understand diversity in organizational work groups context. This challenge of defining diversity has led to various new and precise definition of diversity. For example, Jackson et al. (2003) define diversity as "distribution of personal attributes among interdependent members of a work unit" (p. 802). This definition still has drawbacks. Firstly, it focuses only on interdependent members groups. And secondly, distribution can take many forms and is thus slightly vague. Alternatively, Harrison and Sin (2005) define diversity as "the collective amount of differences among members within a social unit" (p. 196). This definition is more useful for researchers, since it focuses on social unit rather than single type of group. However, the term "collective amount" could still be conceptualized in various ways. This led to recent development of diversity constructs as three types: 'separation', 'variety' and 'disparity' (Harrison & Klein, 2007). Separation happens when work group members hold opposing viewpoints on a team task. Variety refers to multiple approaches that team members can have for the given task. Finally, disparity refers to actual or perceived superiority of a particular team members with other team members. These three constructs help researchers address diversity in organizational context. Different attributes of diversity for each of these three types of diversity can be assigned. For example, Opinions and

Beliefs differ within team members and this can be regarded as separation type of diversity. Further expertise and functional background of team members can vary, and these attributes are classified as variety type of diversity. Finally decision making authority of each team members could be different and this attribute can be regarded as disparity type of diversity (Harrison & Klein, 2007). These attributes and types of diversity is further explained using diversity theories in the next section. Thus, it is evident that diversity cannot be used as single construct but an overarching idea consisting different definitions.

2.1.1 Diversity Research Theories in Organizational Literature Context

Diversity research theories can be broadly classified into two different perspectives. First perspective focuses on social categorization. The second perspective rather focuses on information/decision making a. Both the perspectives of diversity are to be considered in parallel because they can give rise to different outcomes of the team under consideration (Dawson, 2011).

2.1.1.1 Social Categorization Perspective

Similarity-Attraction Paradigm

According to Similarity-attraction paradigm, the individuals who find similarity in their attributes such as background, race, etc. with others in team may find it easier to interact and thus could help in better team performance through better communication as result of either direct or perceived similarity among the individuals (Byrne, 1971). This effect however might be weakened once the individuals find out deep-level information about surface level similar ones in the team. For example, a mechanical engineer could equally be attracted to both other mechanical engineers and non-mechanical engineers too. This could be due the fact that non-mechanical engineer could share similar values and attitudes. Thus, the theory is dependent of many traits related to individual and these traits could be either readily observable surface-level such as race or could be deep-level such as personal values. Thus, this theory highlights the complexity of combining deep-level and surface-level diversity.

Social Identity Theory

According to social identity theory people may assume different identities based on the social composition of the group. This identity stems from different values, beliefs, attitudes, etc.

This can lead to perceived oneness of the group members as a result of self-esteem and self-definition of social groups (Ashforth & Mael, 1989). Thus, the theory suggests possible formation of sub-groups with different social identities such as race, sex, etc. and these sub-groups could act as a motivational factor for the group members. The individuals in the team could 'self-categorize' themselves into ingroup or out group member based on perceived social identity. Thus, social identity theory, ingroup members could be more trusted than out-group members. Further, the extent of effect of self-categorization could be varied based distribution of the attribute under consideration. For example, self-categorization of men under a team full of men is less and slightly more in a mixed team and could be highest when men are minority in a team dominated by women. As a result the theory suggest that members would feel more safe and attracted to a group whose social attributes are homogenous in nature (Van Knippenberg & Schippers, 2007).

Second aspect of social identity theory is 'social comparison'. Social comparison occurs when members of the group make comparisons based on self-perceived categories of the group and its related values and individuals values. Group members can make comparison with outside groups and define norms based on it depending on particular situation (Ellemers et al., 2004). These social categorizations can shape attitudes of the group members and can create biases when working with outgroup members.

2.1.1.2 Information/decision making perspective

According to information/decision making perspective, diversity in the team could have direct impact on the team's performance. The team that is diverse could have larger source of information, knowledge, skills and abilities (Tziner & Eden, 1985). Thus, the benefits of having increases source of knowledge and improved decision making of the diverse team could result in net gains and overcome decrease in trust and coordination among dissimilar members of the social unit (Phillips et al., 2004). As a result, many of the diversity research in the information/decision making perspective has considered functional background, educational and informational aspects of diversity. Although, some research also includes demographic diversity that suggest demographic diverse teams could have wider source of information and knowledge. Further the functional diversity itself can be categorized into dominant functional diversity and

intrapersonal functional diversity (Bunderson & Sutcliffe, 2002). Dominant functional diversity of the team members refers to extent of time individuals have spent their career in a particular domain. Intrapersonal functional diversity refers to extent to which individuals in the team have broad functional specialty. Intrapersonal functional diversity could lead to increased information and knowledge within the team and thus leading to better decision making due to broad expertise. Thus, this type of functional diversity can be viewed under information/decision making perspective. While dominant functional diversity could be viewed under both social categorization and information/decision making perspective.

2.1.2 Types of Diversity

Various researchers can attempted have attempted to classify diversity into various types based on the theories shared in earlier section. Also, the approach of analysis varies among the research, for example firm-level & team level. Various outcomes of diversity have been reported such as better team functioning, organization attraction, broader information and better decision making, etc. There are mixed results of specific type of diversity and the outcomes of the research. This suggests that diversity is not a fully defined construct and can be conceptualized in many ways. This section highlights certain types of diversity and their conceptualization.

2.1.2.1 Surface vs Deep-Level Diversity

Diversity can be classified into surface or deep levels based on the observability on the attributes. For example, organizational tenure, team tenure, sex, age etc. could be readily observable at surface level (Jackson et al., 1995). On the contrary, attributes such as values, attitudes and beliefs of individuals is not readily observable. These types of not readily observable attributes of diversity are known as deep-level diversity. Deep-level diversity is particularly important in the context of diversity research because unlike surface-level diversity such as sex, race, etc. it does not evoke biases, prejudices and stereotypes on the outcomes of the diversity (Milliken & Martins, 1996). Some of the typically used attributes on deep-level include: attitudes, beliefs and values (Harrison et al., 1998), network ties (Beckman & Haunschild, 2002), individual performance & personality, etc. Further deep-level diversity has stronger relation with team cohesion and interpersonal attraction than surface level diversity (Harrison et al., 1998). The key difference between deep-level and surface level diversity is further explained via clues over time.

Deep-level diversity is discovered over time through verbal or non-verbal cues over time, whereas surface-level diversity is readily available and apparent (Harrison et al., 2002).

2.1.2.2 Task-Related vs Relations-Oriented Diversity

Attributes of diversity can further be classified into task-related or relations-oriented (social categorization). Task related diversity are attributes that are highly relevant to the task of the team. Examples of task related diversity include: 'organizational tenure', 'team tenure', 'educational level', and 'memberships in task relevant external networks' (Sessa & Jackson, 2012).

On the contrary to task related diversity one view the diversity in relations aspect. Relations diversity tries bringing out differences relatively, for example in terms of age. Whether one is young or old? Relations oriented diversity can be viewed mainly using social categorization perspective while the task-related can be viewed using information/decision-making perspective and sometimes using social categorization perspective. Some of the examples of relations-oriented diversity include: 'sex', 'culture (race, ethnicity, nationality)' and 'age'.

The underlying attributes of diversity changes based on whether it is task-related or relations-oriented. Some of the attributes of task-related diversity include knowledge, skills, abilities and experience(Sessa & Jackson, 2012). For relations-oriented diversity, attributes such as social status, attitudes, values, behavioral style, social ties are important. These underlying attributes can result in different outcomes and performance of the group.

2.1.2.3 Workgroup Models

Another way to identity different types of diversity in the team members is to understand trait differences between individual members and work group. McGrath et al. (1995) proposed five different clusters highlighting attributes of trait differences of the work group (McGrath et al., 1995):

- Cluster 1: Demographic related attributes that are relevant and has social meaning to both organization and society: Age, race, gender, education, sexual orientation, religion etc.
- Cluster 2: Task related knowledge, skills, and abilities
- Cluster 3: Values, beliefs, and attitudes

- Cluster 4: Personality, behavioral and cognitive styles
- Cluster 5: Status of an individual within the work group's organization. For example: organizational tenure, organizational rank, organizational specialty, etc.

Some of these clusters are surface level and are readily observable. Within cluster 1, with some exception on attributes such as education, sexual orientation, and religion, the attributes contain more of surface level differences. These surface-level differences may prompt the individuals to categorize themselves and others and may lead to similarity or dissimilarity perceptions based on these attributes. These perceptions may result in attraction or bias. The other clusters (2 to 5) are traits that are nothing but deep-level attributes. Some of these deep-level attributes can be identified immediately, for example organizational rank. But other attributes are revealed over the time.

Using these clusters McGrath et al. (1995) developed three models representing diversity traits and its effects on performance and group interaction. Further the authors suggested an integrative multi-cultural approach model combining all the three models for studying diversity and its effect on group performance and interaction. These models further explain how deep-level diversity and surface-level diversity are connected. These separations are not always possible and examination of diversity and its effect on performance at an independent level is not possible. The model suggests that deep-level traits emerge from initial filter of surface-level traits. This eliminates the social prejudice, biases, or discrimination of surface-level traits on group performance and interaction.

Trait Approach Model A

This model suggests that demographic attributes of an individual A and other clusters (2,3 &4) directly affect member A's behavior and thus it is related to work group's performance and interaction. This model is based on individual member perspective.

Expectations Approach Model B

This model is based on expectations theory. This model suggests that cluster 1 attributes of member A influence member B's expectations that member A has cluster 2,3 & 4 in a certain way. As a result, the behavior of both member A and B and as a result group interaction and performance changes. This model explains how members have expectations on other members

of the work and thus forming perceptions of similarity or dissimilarity. These perceptions of group members affect how they work as a group.

Differential Power Approach

This model explains that members of the group perceive themselves similar, different, higher status and power relative to another member of the team. The differential power associated with attributes such as gender or race can be analyzed using social categorization perspective and thus could lead to different outcomes and group interaction.

Multi-Cultural Approach

Multi-cultural approach incorporates all the three models explained before and integrates them. In this model, group members with demographic attributes differences might have differing personal experiences and thus leading to different deep-level attributes such as cluster 2,3 & 4. The differing cultural identity within a group leads to different expectations on each other's deep level attributes. This also lead to different powers within the group and thus leading to different group performance and interaction. For example, certain dominant members may have higher power compared to non-dominant members of the group and thus leading to group interaction and performance in a certain manner.

2.2 Diversity and Ambidexterity

2.2.1 Ambidexterity

Ambidexterity in general sense refers to ability of humans to use both left and right hands equally. In the context of organizations, the term 'ambidexterity' refers to managing two different types of activities. Organizations must choose their activities between two different types of activities called 'exploitation and exploration' and teams have a choice on allocating suitable efforts and time based on these activity types which are completely different from one another. According to March (1991, p. 71), exploitation activities refer to "production, efficiency, refinement, choice, execution & etc.", whereas exploration activities of the team-members refer to "search, discovery, innovation, risk taking & etc.". Firms that can manage both exploitation and exploration well can gain competitive advantage over other firms (March, 1991). This is a fundamental challenge that companies face and they to choose the right strategies for managing these two types of activities. Firm's ambidexterity relates to ability of the firm to manage both

exploitation and exploration within the organization as studied by Birkinshaw & Gibson Mitsloan (2004). Their study highlights ambidexterity is further grouped into structural, and context based.

2.2.2 Structural Ambidexterity

Structural ambidexterity relates division of the organizational ambidexterity based on team structure and focused activities are done in separate teams. The first author to coin the term 'ambidexterity' was Duncan (1976). He used it to explain how firms can possibly balance conflicting organizational objectives of being aligned versus adaptable based on organizational structures. Alignment or exploitation activities are nothing but pattern of organizational activities that serve companies attain competitive advantage by having an increased fit between strategy, structure, and environment. For example, semiconductor organizations focused on mass producing chips has its structure aligned in a way that it creates an environment wherein the workers can focus on increasing efficiency. These alignment activities could be routine activities and organizations have to choose this production, efficiency, refinement, etc. activities carefully to ensure they have competitive edge and strategy, structure of the organization enables the activities to be focused. At the same time, organizations have to adaptable to changing external environments. Thus, adaptability or exploration activities of an organization refers to reconfiguration of business units to quickly meet changing external environment demands and thus making organizations more responsive to innovation opportunities (Duncan, 1976). Thus Duncan (1976) suggested organizations create dual structures to find a balance between alignment and adaptability. His suggestion was to allocate certain business unit to ensure alignment to organizational goals such as improving efficiency, while other business units would focus on helping organization adapt to changing external competitive environment.

2.2.3 Contextual Ambidexterity

After a very long period time after Duncan's (1976) research, concept of 'contextual ambidexterity' was introduced into ambidexterity literature by Birkinshaw and Gibson (2004). They defined contextual ambidexterity as:

"Behavioral capacity to simultaneously demonstrate alignment and adaptability in individuals across an entire business unit" (p.47) (Birkinshaw et al., 2004)*.

Contextual ambidexterity focuses on giving individual employees the freedom to choose between alignment-focused and adaptability focused activities. This is fundamentally different compared to structural ambidextrous organizations. Thus, the decision-making capabilities doesn't lie at top management, but front-line people make activities choice of aligning vs adapting. Rather than creating structures, setting organizational context that favors individuals choose between activities becomes more important. The nature of work and roles of individuals in contextual ambidextrous organizations are very flexible compared to structural organizations where roles are clearly defined. Employees in structural organizations are more of specialists in nature whereas in contextual ambidextrous organizations, employees are more of generalists in nature. Compared to structural organizations, contextual environments can enable improved communication and innovation because there are less organizational barriers among the employees.

2.2.4 Team Ambidexterity

Most of the existing literature deals with ambidexterity at an organizational level, business unit level, and top management level. However, one can even view ambidexterity at team level and very few research has been done in this area. This is one of the important knowledge gaps that this research is attempting to address. Team level ambidexterity can be defined as:

> *"a collective learning behavior of team members that search for, experiment with, and develop new knowledge, and concurrently refine and recombine existing knowledge "*
> *(p.939)*(Jansen et al., 2016)*.

Team ambidexterity tries to understand collective behaviors of team members motivation and decision-making approach towards exploitation vs exploration activities. Recent research shows that leaders dialectical thinking of leaders and collective team identification can act as antecedent of team-level ambidexterity (Han et al., 2021). In their research they show that teams having strong team identifications and leaders having high dialectical thinking will benefit the most from team ambidexterity.

Team-level ambidexterity and performance can be measured both objectively and subjectively. Objectively we can measure team's ability to deliver new product innovation at rapid rate,

identify number of radical and incremental innovations done by the team over time, etc., as indicated by Wang & Rafiq (2014). Alternatively, we can adopt subjective team performance measurement. Study by Yang et al. (2010). indicate possibility of measuring team's subjective performance by analyzing how team information is acquired, how information is analyzed, how decision and actions are made and how actions are implemented. Another study by Schnellbächer et al. (2019), highlight measuring team-level performance in a relative manner. For example, Team-level performance could be measured by understanding whether team meet its objective quickly compared to other teams.

2.3 Diversity, Ambidexterity and Team Performance

Racial or ethnic diversity perceived by the individuals in an organization can lead to weaker psychological commitment and lower desire to stay in an organization (Tsui et al., 1992). Another research shows that heterogeneous ethnic groups may not necessarily produce more ideas or more original ideas but may produce better quality ideas (McLeod et al., 1996). Likewise, many research has been done showcasing contradictory results on whether ethnic diversity helps the organizations. Because the studies have mainly shown negative results of ethnic diversity on performance, recent studies have tried challenging previous studies by testing with moderating variables. One such study shows that heterogeneous groups produce better quality ideas when conflict in task acts a mediator (Harrison et al., 2002). Further studies have shown that ethnic/racial diversity is positively related with emotional conflict (Brief et al., 2005). Over the time, team member's emotional conflict can diminish, and they would focus on resolving task conflict over emotions, thus increasing social integration within the racially diverse groups (Harrison et al., 1998). Likewise, there are many more research done on ethnic diversity that shows contradictory results. Earlier research points out negative results based on social identity theory; however recent studies have tried to showcase possible positive benefits by considering information/task related perspective of diversity.

As explained in the earlier section of the report highlighting diversity theories, one can analyze link of diversity and performance based on these theories. Social identity theory and self-categorization theories suggest that people can differentiate themselves as in-group vs out-group and they tend to have more trust and willingness to work with in-group members vs out-group

members (Mohammed & Angell, 2004; Van Knippenberg & Schippers, 2007). The third perspective tries to take into information and decision-making perspective. Both social identity theory and similarity perspectives showcase negative benefits of heterogenous groups on outcomes and they are invoked to showcase negative benefits of team diversity on outcomes. Information and decision-making theorists on the contrary make opposite arguments and they try to illustrate positive benefits of team diversity on outcomes. These positive benefits of team diversity are because of wider range of access to task-relevant knowledge, abilities, skills, information, perspectives or opinions (Van Knippenberg & Schippers, 2007).

Further Van Knippenberg et al. (2004) argue that diversity researchers have typically examined social categorization and information/decision-making process in isolation. This is why past research's point out varying results of diversity on outcomes, which can be either positive, null or negative (Van Knippenberg et al., 2004). In their research they argue that social category diversity and information/decision-making diversities are not understood properly to conclude on outcomes. For this reason, Van Knippenberg et al. (2004) proposed collaboration-elaboration model (CEM) which suggests "social differences" are confounded with "informational differences". They suggest that any form of diversity for example 'gender or cognitive knowledge' can function in both social category diversity and informational diversity. Thus, contrary to previous research's their model indicates that social category-based diversities can have positive effects that is implied in information/decision-making perspective. And, at the same time informational differences of the team members may result in social categorization process.

While the previous researchers have focused on team diversity as a single group perspective, Lau and Murnighan (1998) suggested that teams may actually split themselves into homogenous sub-groups and they termed the splitting process as "faultlines". The subgroups are formed based on "combinations of correlated dimensions of diversity" (for example: gender and age; male employees above 45, male employees below 25, female employees below 30, etc.), They indicate that stronger the diversity faultlines, the more likely the subgroups will emerge and this in turn makes subgroups may have either positive or negative effects on team outcomes (Lau & Murnighan, 1998).

Dahlin et al. (2005) indicate inverted U-shaped relationship education diversity and information use (Dahlin et al., 2005). Chi et al. (2009) indicate inverted U-shaped relationship organizational tenure diversity and team innovation(Chi et al., 2009). Another set of researchers found inverted U-shaped relationship between gender diversity and employee productivity (Ali et al., 2011). Luan, Ling, and Xie (2016) showcase inverted U-shaped relationship between educational diversity and team creativity (Luan et al., 2016) and finally recent research by Li et al. (2018) show that functional background diversity has a curvilinear (an inverted U-shaped) relationship with team ambidexterity (Luan et al., 2016).

From the mentioned above studies, it can be observed that the mentioned studies consider only one aspect of surface-level diversity such as either gender diversity; educational diversity; functional background diversity; organizational tenure diversity; etc. These types of studies showcase results from either social-categorization perspective and information/decision-making perspectives (Joshi & Roh, 2009; Van Knippenberg & Schippers, 2007). The curvilinear effects presented by above mentioned studies offer straightforward relationship between certain type of surface-level diversity and tea outcomes. However, they result in inconsistent results indicating either positive, negative or null effects. This can be potentially avoided by considering both social and information/decision making perspectives of diversity in an integrated manner. When both types of diversities are interlinked, final outcome maybe positive and could lead to elaboration of task-relevant knowledge (Van Knippenberg et al., 2004). This type of integrated model are useful for diversity research and this research takes support of the same.

2.4 Service Vs Manufacturing/Product-based Firms

The fundamental difference between manufacturing/product-based firms is based on operations (Mills & Moberg, 1982). Compared to manufacturing-based firms, service-based firms have more unique operations and characteristics such as high-level customer participation, intangibility of service operations, lack of differentiation between production and consumption, heterogeneity and perishability (Frohlich & Westbrook, 2002). In service organizations, customers are not only involved in delivery of solutions but also in overall development of the process. Thus service operations have continuous exchange of information with customers,

collaborative development and production efforts and an unsystematic innovation process (Hipp & Grupp, 2005). Because there is high level customer interaction the success of service operations is dependent on communication, knowledge and energy (Mills et al., 1983). Thus, service firms need strong interaction with customers in order to succeed. This is the major difference service and product-based firms, and the research tries to understand how the diversity varies between these two firm types and thus in case of service firms, the research can help different dimensions of diversity and its effect on outcomes.

Second major difference between service and manufacturing based firms is that services are highly intangible in nature (Frohlich & Westbrook, 2002). Thus, services are highly dependent on subjective perceptions and generally there are no standardized or objectives measures for the same.

Third difference between service and manufacturing based firms is that production and consumption are inseparable. This adds to the complexity of designing service operations, new service development and other administrative mechanisms.

Fourth major difference between service and manufacturing based firms is that resulting output from service operations is generally heterogenous. This heterogeneity is related to quality of service firms (Atuahene-Gima, 1996). The heterogeneity is mainly because of close interaction with customers and needs of every customer can vary significantly. Heterogeneity can help firms generate customer specific value but at the same time it comes with uncertainty and risks. To add on to complexity, one customer may be happy with process while another customer with same needs may not be satisfied with same way of delivery the service although needs are same. Thus, trust and relationship with customers is also important for service-based firms. Thus, the team members in service environment must ensure collaboration and teamwork for better services (Atuahene-Gima, 1996).

Lastly service operations are subject to perishability and thus they cannot be stored or inventoried unlike manufacturing-based firms. Thus services firms are supposed to be more flexible in their approaches and they to adapt different process during various stages of services (Everett E. Adam & Swamidass, 2016).

Further manufacturing and service firms differ significantly with regards to drivers of ambidexterity. Manufacturing firms are generally dependent on decentralized structures in strategic management and informalization of non-routines to achieve organizational ambidexterity. While the service based firms are dependent on decentralization of operations management and formalization of routines to achieve organizational ambidexterity (Kortmann, 2012). Product based firms focus on structural configuration to achieve ambidexterity. In contrast to product based firms, service-based firms are very flexible and they provide decision making authority to employees to promptly respond to customer needs (Kortmann, 2012). Because employees in the service environment are in close touch with customer, they cannot contact their supervisor frequently. Thus, employees in service may switch between more routine exploitative activities such as providing established services and non-routine exploratory activities such as quick response to new customer needs (Kortmann, 2012). This freedom to switch quickly is restricted in manufacturing firms based on the structure. Manufacturing firms may allocate separate division such as R&D or Innovation department to attain exploration. At the same time, they try to attain exploration by informalization of non-routine activities. However, extent of informational is dependent on structural decisions and orientation of the firms.

2.5 Conceptual model & Research Questions based on Literature Review

Below simplified conceptual model is floated for the purpose of research design and case study analysis. Based on this conceptual model and preliminary knowledge from literature review, case interview questions are designed.
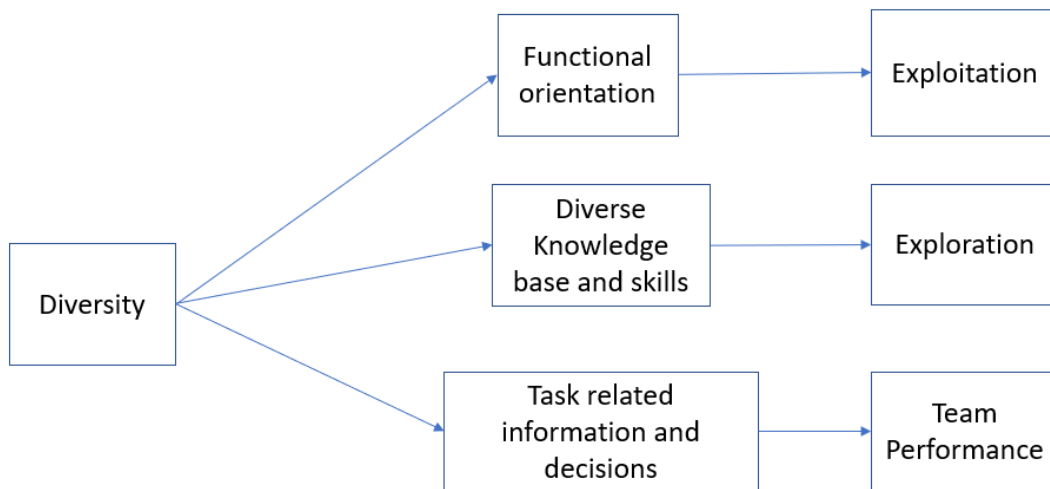
Figure 1 Conceptual Model Proposed

The research question is shared in this section. It is based on the conceptual model and the knowledge gap based on the literature review. The main research question (RQ) that is addressed in the thesis is:

"How does team diversity relate to team performance and team-level ambidexterity in product and service-based semiconductor firms?

To answer this research question (RQ) via exploratory qualitative analysis, it is further broken down into following sub-research questions:

SQ1: How is diversity conceptualized by team managers of product and service-based semiconductor firms?

SQ2: How does the different factors of diversity relate to team performance within the context of product and service-based semiconductor industry?

SQ3: How does the different factors of diversity relate to team-level ambidexterity within the context of product and service-based semiconductor industry?

Answers to these research questions are addressed in results sections and are summarized in discussions section of the report.

Chapter 3 Research Methodology

3.1 Research Design

This research is of a qualitative in nature and has an explorative goal focused on semi-conductor industry. Maxwell (2008) mentions that while qualitative research design does not possess clearly defined instruments, hypotheses, and analytical procedures, it does contain five broader components. These components determine the context of the study and guide the researcher. The five broad components of qualitative research are as follows:

- **Goals**: A clearly defined goal, which is aimed at closing the knowledge gap and contribute towards scientific body.

- **Conceptual Framework**: Background Information and Literature review, which make up the theoretical foundation for research.

- **Research Questions**: Clearly defined scope and questions, in line with goals.

- **Methods**: Overview of researcher's data collection and analysis.

- **Validity**: A strategy to validate and review conclusions from the data collected.

The goal and Research Questions has been already introduced in the previous sections. Conceptual framework highlighting the link between team diversity, team ambidexterity and performance was introduced at the end of chapter 2. Components related to method and validity part of qualitative study is presented in later section of this chapter

Designing unique approach for research problems introduced in chapter 1 allows more in-depth focus on link between variable of interest as introduced in conceptual model part of chapter 2. Thus, the study allows an improved internal validity and contextual understanding, which is vital for forming theories out of explorative study. To conclude, tailored research approach enables generation of theoretical hypothesis while addressing issues related to reproducibility and generalizability.

The qualitative research employs case study methodology as explained by Yin (2006). As per Yin, case studies are appropriate for this research because the research involves understanding of contemporary events happening in real life settings. This allows the researcher collect data from multiple cases and thus helps focus on team issues within a broader semi-conductor

domain. Thus, embedded multiple cases is selected to understand the multiple units of analysis in multiple cases.

All the data for the research is gathered through semi-structed interview as they allow in-depth understanding of a case. Based on these cases further theory building is done. Through insights on gained from multiple case interviews, emergent findings which are common among few, or all the cases and selective case only dependent issues are identified. This gathering from multiple sources will thus enable better grounding, generalizable and identify different constructs and their relationships.

3.2 Case and Interviewee Selection

The selection of the case is essential aspect of every case study. How the case is selected influences the generalizability and reduce extra variations that possibly doesn't add new knowledge to the topic.

Since, the project is conducted for master thesis project, it is important to keep strict timeline in mind and therefore participants are selected based on convenience of the researcher. More than 100 potential participants from the both service and product-based semiconductor firms were approached for interview. More than 75% of participants did not respond to the request. Out of the remaining, only 10 participants agreed for the interview. Thus, total of 10 case study participants are selected based on voluntary participation of team managers. Out of this, six team managers are from product-based semiconductor companies and four are from service-based semiconductor companies. Each of the participants have read and signed the informed consent form for participating in the research before the semi-structured interview. The context of team and participant's designation is different and is case dependent. While approaching the participants for interview, care has been taken to ensure the participants are from different companies and thus enable different perspectives in the research. Participant's company names are anonymized for ethical reasons.

The table below lists the case study participants' characteristics:

Case	Interviewee's Designation	Industry Type	Team Size	Main Functional domain of the team
Case A	Senior Product Manager	Product	50 to 60	Internet of Things
Case B	Director of Innovation	Service	No fixed size, varies based on project. Flat organization with 35 members.	Services to Semi-Conductor suppliers
Case C	Marketing Manager	Service	3	Marketing and requirements gathering: IP products
Case D	Business Owner	Service	4	No fixed functions: Everything related to semiconductor circuits design
Case E	System Architect	Product	11 to 12 , 3 local and 6 to 8 at different geographical location	Enterprise architect (product lifecycle management and configuration management)

Case F	Functional Safety Manager	Product	6	Functional Safety
Case G	Technical Lead	Product	4	Program management
Case H	Head of Innovation	Service	700 to 800	Innovation
Case I	Strategic Sales Manager	Product	4	Sales
Case J	Head of R&D	Product	35 to 40	R& D and overall supervision

Table 1 Case Study Participants

3.3 Data Collection and Analysis

All the data for this research is primarily collected through semi-structured interviews. Compared to structured interviews which majorly involves pre-determined questions, semi-structured interviews are open-ended can freely vary between participants and flow of the interview. Semi-structured interviews are particularly useful in this research because context of team changes with the case and thus semi-structured interviews helps reveal deeper understanding on topics of interest. This also enables researcher dive deeper into specific cases, reduce going deeper into topics that are possible covered already in previous questions, confirm major links to theoretical assumptions based on literature review. Appendix x indicates an sample semi-structured interview and topics that were investigated during the research.

In total 10 interviews were conducted with various team managers from semi-conductor industry. All the interviews were recorded and transcribed for the final analysis. Participants' transcripts are later edited for removing normal discussions before starting the discussion on topic of interest, this ensures only relevant data is analyzed. Personal details and company name is anonymized.

Chapter 4 Results and analysis of case interviews

4.1 Perceived definition of 'Diversity'

One of the questions that was asked to case study participants was regarding perceived definition of 'diversity'. The answers reveal various perceived definition shared by case study participants that includes combination of both surface-level and deep-level diversities and few also indicated how diversity relates to performance and other team activities within the semi-conductor industry.

Case A participant answered *'I think for me the one of the biggest angles in diversity is what have you done in mainly in work and professionally before this. So, some people come from more of an academic research background. Like myself, I've I have a couple of couple of patterns and a bunch of publications, so I've done that academic rigor. Some people are coming from a sales role. Some are coming from technical expertise. Some leadership, some physics, or classical sciences? Uh, and jumped into technology from nowhere, so I think what we are qualification and expertise or other what have you done in the past? What problems have you seen in the past? Do you know different ways of working compared to the rest of the team? I think that's one of the big diversity's angles'. The demographic side is probably next. And then personal information like which country did you grow up in or what's your gender, Age, and demographic information. But this is what you basically understand when it comes. And in terms of context of work and themes'* (Case A).

Case B participant mentioned the importance of people functioning as 'group' and shared the following definition: *'Diversity is, let's say, the difference between people functioning as a group, and you could if you don't function as a group, you can't have diversity because you don't meet one another. But if you're functioning as a group, then that's diversity for me. Basically, the difference between people and there can be difference in gender, difference in age. There can be difference in education and difference in all aspects that we humans can use to say to identify your slightly different than I am? Yeah, that's what I consider diversity'* (Case B).

Compared to other participants, Case C participant shared a completely different perspective on diversity. Functional diversity was highlighted by the participant. Participant perceives diversity as *'Diversity in the work that you do and working closely with each and every*

department that is not in marketing. Let's say I am in marketing, but there are other departments in the company and how you work with them closely. So, there is an integrated approach that you are putting into gates then gain more business and increase customer interactions and engagement for the delivery and engagement for the customer who is coming to you and talking to. So, I believe apart from that the diversity that we see are multiple people from different locations and from different education background' (Case C).

Case D participant perceives diversity as 'different ideas'. Participant shared: *'It is a different ideas. OK. From person to person and seeing within different approaches. OK, that is called diversity from my point of view'* (Case D).

Case E shared three ways of interpreting the term the diversity: *'First thing of course is different cultural backgrounds or different country backgrounds and. And the second thing is, if it's a men and women are so the gender and then thirdly it's mostly whether one is younger and older and so on in that order. This is what I think, and I understand and interpret the term diversity. I did not mention qualification because for me that that goes without saying. So, if you have a good team, you have different roles and people with different qualifications, but also different strengths and weaknesses. But for me that's part of how you normally would build a team. Yeah, yeah, so you look at a different team role and the strong and weak points of people. Perhaps you know, but you try to have like people that are more doing more, have a focus on research. Others have focus on translating ideas into a more business and realistic things. Others are more like a project manager; others are more like I don't know we call them on the table, but they go all over the place and then they do things differently. But you need all of them, preferably. Let's say all of those different role types in your team. For me, that's not really diversity'* (Case E).

Case F participant perceives diversity almost same as Case D. Participant shared: *'For me diversity is related to ideas and Point of View. And for me that's the part which is the most enriching. Because you want to hear someone else's point of view, so that you can improve your own point of view. As I understand it. OK. So, point of view. A different point of view is what you would call 'diversity'* (Case F).

Next participant mentioned that *'diversity is not but a 'mix of all kinds of people'. Uh, like maybe a gender, maybe age, experience, expertise in terms of skills. So that's what I think is diversity '*(Case G).

Case H participant perceives diversity in 3 different angles. Participant shared: *'See diversity is probably viewed on two or three pillars. One is from a gender point of view. Correct combination of male and female staff, female colleagues. The percentage of involvement of I would say more importantly, the women employees. The second one in diversity also involves the combination of variously specially abled individuals within the team. The third one would be, of course, the LGBTQ perspective and how diverse and how valuable are our processes and systems to engage every other individual irrespective of their preferences? Right? And I think that would be defining the kind of individuals and peoples, of course including regional aspects. So, diversity also in terms of globally distributed teams, with having the signature of the same, the first three pillars that I referred to before. Additional point that I want to add to the first one is context of the generation. So, we have Gen X, Gen Y & Gen Z. Now the millennials, including the millennials and older generations, right? So right, that also plays a role'* (Case H).

Case I participant perceives diversity in three different dimensions. Participant shares: *'I think first thing that comes to my mind will be your ethnicity. That's about background. I think about the background, so it's kind of like what is your kind of home culture that falls to you before you get into 18 years old, yeah? And secondly, cultural diversity. You also see that even that you are, for example, ethnically European or kind of ethnically American. But you can raise them, grow up in China or Korea or Taiwan. So, then it's kind of like cultural diversity. So, these two things combined and then you have the third dimension. Sometimes it's your education or industry or function diversity, but I want to group them into the same dimension. So, for example, in the team you have some person, some people like a very strong statistical background, so everything he has in his mind it's more kind of statistically whether it is correct or not. But some people may have a very strong business. Right well, more kind of reading the mind of the people then his point of view is mostly oh. If you say this in front of a person like him, what will be his reaction and compared to another person that may relate to their personality. He may have a completely*

different reaction on the same thing. OK, so I will say these are the three dimensions I'm thinking about Diversity' (Case I).

Finally, the last case study participant shares that diversity can be 'anything'. *'What they do in their personal lives. It's where they live. I, I think diversity can be anything*' shared the Case J participant.

From the above definitions of diversity as shared by case study participants it is evident that both surface and deep-level aspects of diversity is presented by the participants. This follows the findings presented in literature review section that illustrates how diversity can be defined as construct in various ways. The below table summarizes various way in case participants perceive diversity.

Perceived diversity angles	Case Participant
Experience diversity and background diversity	Case A, G, I
Functional diversity	Case A, C, E, I
Demographic diversity	Case A, C,
Gender diversity	Case A, B, E, G, I
LGBTQ inclusion	Case H
Generational diversity	Case H
Age Diversity	Case A, B, E, G, H
Ethnicity	Case I
Education Diversity	Case B, C, I
Working style diversity: different point of view, different approaches & different ideas	Case D, E, F
Cultural Diversity	Case E, I
Skills diversity	Case G
Any differences	Case J

Table 2 Perceived Diversity

4.2 Managing Diverse Teams

This section analyzes how team mangers with semi-conductor industry manage diverse teams and what factors are important in managing diverse teams. This reveals how the composition of team members varies and related activities differs based on the context of work. Each case participant shares how diverse team members affect task-related information and activities and how the diverse team members can be managed.

4.2.1 Managing diverse teams based on function

One of the aspects of managing diverse teams would be identifying functional aspects of each team members and assigning the work based on functional expertise and making team members interact to produce diverse views on specific task at the hand. The functional diversity is not illustrated straightforward but combined with deep-level diversity traits such as skill level, working style, etc.

For example, Case A participant mentions managing diversity as:

> 'I think I could think about this by structuring this as two groups, right? Like one group is the business line and the other is for a product. All the people that get involved from start to end. That is a team around that product. Yeah, so for the first case, when it's the business line. The diversity is in the form of domain experts' (Case A).

Further within team members the expertise of different team members

Similarly other case study participants mentioned functional diversity as one of the key aspects of diversity that needs to be managed. This is summarized in the table below:

Managing Functional Diversity Aspects by	Mentioned by
-Having different functional domain experts	Case A, B, G, J
-Having members who understand customer requirements	Case A, B
-Having diverse skill sets that meet customer requirements	Case A, B, D
-Functional diversity that's naturally embedded in the team	Case F
-Some functional domains might dominate over others. This may lead to less functional diversity.	Case I

Table 3 Managing Diversity

4.2.2 Managing deep-level diversity

Previous section indicated the functional diversity aspect and related issues. However, functional diversity is not the only aspect of diversity that one needs to manage. Many case study participants mentioned deep-level diversity and managerial issues surrounding it. Example of deep-level diversities include soft skills: ability to interact with customers properly, decision making style, etc. As mentioned in the literature review section, deep-level diversity maybe readily visible or hidden. These deep-level diversity can play a crucial role on the team's outcome

or performance. The table below summarizes various deep-level diversities, managerial issues surrounding it and possible outcomes.

Deep-Level Diversity Category	Managing Deep-Level Diversity	Example Outcomes	Case Participants
Task-related	Skilled in interacting with customers	Handling customer interactions calmy and responding accordingly	Case A, B
	High level experts: Decision making authority	Critical decision making at high levels	Case A
	Non-technical skills: Change management & business skills	Making critical project related decisions	Case B
	Past experience	Handling similar tasks confidently	Case G
Working style	Technical depth vs surface	Addressing customer queries quickly	Case A, D, F, I
	Functional interests: Documentation vs Product Development	Addressing customer bugs too detail	Case A
	Risk taking ability and responsibility	Support person takes higher risk versus product personnel just delivering it	Case A
	Different personal beliefs	Influences motivation of the team member and working style such as self-initiative	Case C, H, J
	Communication style: Open vs closed	Depends on organizational hierarchies: May encourage lower-level employees to speak	Case E, H

| | Personal way of working: Detail oriented vs surface | Influences work motivation and decision-making style | Case J |

Table 4 Deep Level Diversities

4.2.3 Managing Cultural & Geographical diversities

Another important aspect of diversity that possibly influences deep-level diversities is cultural and geographical diversities within the team. Case study participants illustrated how these types of diversities needs to be managed and how they affect some of the team activities. Findings of the case interviews are summarized in the table below:

Type of Diversity	Managing Diversity Type	Outcomes / relation to deep-level diversity	Case Participants
Geographical Diversity	Flexibility based on time zones	Team collaboration and flexibility	Case A
	Hierarchies: that may differ based on geographical locations	Ability to communicate ideas freely	Case E
	Past experience	Facing similar situations differently	Case F
	Regional differences	Creates different priorities within the team and affects team collaboration	Case H
Cultural Diversity	Different beliefs	Influences working style and motivation	Case C
	Extent to which individual shares ideas and questions critical decisions: Open vs hesitant	Influences number of ideas generated, and critical decisions made in the team	Case E

	Personal way of working	Influences working style based on cultural background	Case J

Table 5 Managing Cultural and Geographical diversities

4.2.4 Diversity Policies

Many companies have specific diversity and inclusion policies these days. These policies majorly focus on increasing female count in the team, including LGBTQ community, specially abled people, etc. At team level, managers need not have a diversity policy because the diversity aspect maybe inherently considered at company level. This section of the report reveals data regarding diversity policies as shared by the case participants and related issues around the diversity policies.

Many of the policies related to diversity is inherently built during the hiring process. One way the teams can build diversity in the team is by specifying generic skill sets in the job description. This will ensure that generic skill sets audience are targeted instead of highly specific skill sets. For example, instead of mentioning android developer, the hiring manager can mention knowledge of operating systems in the job description and follow the same during hiring process. This will lead to increased diversity during the hiring process and candidates can bring different perspectives to the table (Case A). Such policies such ensure that they are not favoring particular set of people, geography, etc. (Case C). Thus, while hiring actual age, background and education is not the crucial factor in developing diverse team members. But the skills and actual competence similar to team's requirements play a crucial selection factor (Case E). The practices at hiring level may differ based on the size of the companies. Big multi-national corporations may have more freedom to exercise diversity policies over smaller local companies. Also, diversity hiring practices can vary based on geographic locations of the companies (Case C). Some of the company policies may reward employees for referring certain type of candidates to bring in diversity. But such diverse candidates need not necessarily impact the team performance. Skills and competence are more important over gender, age, etc. (Case F). Other good way to ensure diversity policy at group level would be ensuring team members from different geographical

regions are included and some companies make conscious efforts toward ensuring the same (Case G).

Post hiring, to reap the benefits of diversity, the companies must enable proper means and mechanisms to individuals. This could encourage team members share their point of view, develop professionally over time, and take leadership opportunities. These things are built inherently in the company's culture and not necessarily derived from diversity policies (Case H). Having common way of working and holdings team meetings by deciding on common official language can boost inclusion and diversity within multi-national teams (Case I).

Other than hiring related policies few companies reported having ant-harassment policies, anti-discrimination policies, support networks, etc. (Case A). But these are policies at company level again.

Some of the companies shared that diversity at board level and supervisory level gains more conscious effort than at lower-level teams. There could be no such rules and regulations of having diverse members at department levels. Conscious efforts of having diverse members are mainly visible at supervisory and board level (Case B).

Hiring diversity team members calls for better knowledge management. Otherwise, the benefits of different perspectives may not be transferred across the organizational hierarchy efficiently. This can be avoided by having better knowledge management procedures (Case D).

In conclusion, most of the companies mentioned that they don't make conscious effort related to diversity policy at team level. But inherently the team composition is already diverse enough and is taken care of at higher level.

4.3 Team Performance

As indicated in the literature review section it is evident that diversity can lead to elaboration of task relevant information and thus result in increased team performance such as creativity, better decision-making ability, etc. Different teams have different tasks at hands and thus how one team measures their performance varies with another team. Most of the performance metrics shared by the teams are subjective in nature and qualitative in nature. However, some of these can be measured quantitively too. Quantitative measures of such outcomes of the team are beyond the scope of this research. This research just highlights

qualitative and subjective relation between diversity and performance as shared by the case study participants.

4.3.1 Different ways of measuring team performance or outcomes

From the case interviews, it was noted that each team has different ways of measuring subjective outcomes which is highly dependent on the context of task and team environment. The table below summaries list of all performance outcomes that is indicated qualitatively.

Team Performance Metric	Case Participant
Getting the problem right and solution right	Case A, J
Delivery on time on the agreed scope of the solution	Case A, B, D, E, H, J
Delivering within allocated budget and effort	Case B, H, J
Net Promoter Score (NPS)	Case B
Interest of team members to complete project under allocated team manager	Case B
Learning and adapting fast changing service environment	Case C
New research and information grasping ability	Case C
Delivering up to expected value and looking ahead for future opportunities (measuring whether team is lagging or following others or leading)	Case E
Yearly goals assessed quarterly	Case F
Monthly activities tracking: To balance time spent on a particular type of activity	Case F
Success of programs implemented: Check the progress of previous program, implementation success rate, and post implementation improvements	Case G
Right collaboration and leadership of thoughts	Case H

Project outcome and process by measuring milestones	Case I
Quality of product by measuring number of returns	Case J

Table 6 Measuring Subjective Team Performances

4.4 Link between Diversity and Team Performance

This section highlights how the different aspects of diversity links to performance. The case interviewees highlighted varying benefits of diversity on team performance. Some of the benefits are common to few teams, whereas some of them are unique to the case. Some of the sections illustrates the link by considering diversity in general terms as shared by the case study participants. And other sections show the link between specific type of diversity and its effect on performance.

4.4.1.1 Sub-groups and outcomes related to it

As explained in the literature review section, teams can form sub-groups based on various diversity factors termed as 'faultlines'. Some of the case participants reported how sub-groups are formed and the issues surrounding it. For instance, Case A participant mentioned existence of women's support network. Formation of such sub-groups forms sense of belonging among the women and they would feel conformable with speaking about issues they face and share their opinions. This follows the similarity-attraction theory where homogenous group members tend to perform better because of having sense of belonging. Case A further mentioned that such sub-groups need not be restricted and anyone else can join the group if they don't deviate from the agenda. For example, a person who has not done mechanical engineering too can join mechanical engineers group. Thus, it is evident that although sub-groups are based on social identity theory or such, they still lead to elaboration of task-related information and thus can help teams perform better. The sub-group team members can bring better ideas, better productivity and enhanced communication (Case A).

The sub-groups formation need not take place in terms of social categorization-based diversity but also based on information/decision-making perspective. For instance, people with

similar backgrounds facing similar issues might form natural alliances because they have shared interests (Case B).

Another way in which sub-groups are created is based on deep-level diversity such as personalities of the individual team members (Case G). Like minded individuals and similar personalities such as individuals might form sub-groups. This finding is in line with similarity-attraction theory presented in the literature review section. Case G also reported benefits of such sub-groups in long run and it results in task-related information. Individuals within the sub-groups can share their functional expertise and pass on important task-related information informally.

Thus, the results from case interviews indicate that formation of sub-group not only takes place from social-category perspective but also from information/decision-making perspective and they would have positive outcomes on team task and performance. For smaller teams, it would be difficult to visualize sub-groups and they may be even absent.

4.4.1.2 Effect of Diversity on Divergent Thinking and Elaboration of Task-Related Information

Among the many ways in which diversity and team performance is linked, link between diversity and divergent thinking was highlighted by many case study participants. Divergent thinking includes attributes such as different style of working, different ideas, etc. This results in increased task-related information and thereby enhancing the team performance. While some of the case study

Case A participant highlights the benefits of diversity on Divergent Thinking and Elaboration of Task-Related Information:

> *"If there is no diversity, everybody is very similar in their background thinking and skills. And I think you might expect that when we have a brainstorm about customers problems, everybody immediately thinks of only one way to solve it, right?"*

Different people with different experiences, say for example: one software developer, one hardware or one product manager with a research background and an architect who has worked at a different company, can all bring very different experiences and way of thinking (Case A). Thus, diversity can bring different way of solving this and team members collectively arrive at alternative solutions (Case A). Case A further mentions that diversity can not only help in generating multiple solutions, but also help implement them by minimizing risks. Because

experienced individuals within the team can have avert potential risks of failures and also debug potential problems.

While the diversity can result in better performance, the teams dynamics become complex to manage (Case B). Managing no-diverse teams is comparatively easier because everyone has uniform way of thinking and from team management perspective this could lead to reduced ability to solve complex problems (Case B). Thus, by having diverse teams one has different angles to solve the complex problems in hand. Diversity also helps in considering the solutions from different functional angles such as from engineering angle, business angle or humanist perspectives (Case B, D, E, H). Having functional team members also helps in garnering the information from customer point of view. For example, marketing expert can translate the needs of customers into technical in a better manner compared to other team members (Case D). Thus, diversity can result in richness of innovative solutions (Case B). This advantage can also come with drawbacks. Some of the team members with particular functional expertise can dominate others during the team task. For example, a team that has technical experts can spend 90% of the time on technology details for just 10% of value in dollar terms. Therefore, it is important to create an environment where functional minorities are also encouraged to share their ideas and though process. Otherwise, true value of diversity will not be harnessed to its maximum extent (Case I).

Having diverse functional diverse team members can lead to increased conflicts. However, conflicts are not necessarily bad. It is because of conflicts among diverse team members we arrive at different perspectives. These conflicts have different motivations of diverse team members that one needs to walk through. This results in deeper relationship through discussions. But at the same individual values of team members needs to included. Otherwise, people might feel unconformable depending on who they are. Thus, it is important to identity what are the conflicts and how do we work through them as a team to generate the value from the diversity? (Case J). A separate section on conflict and diversity is presented providing more information on the topic.

Diversity can also help in better interactions with customers. If the team is not diverse enough, the team members can fail to pick critical signals shared by the customer. Thus, having

diverse team members can help in capturing this missing information from the customers. And therefore, resulting in better interaction with customers (Case B, E). Having diverse team can also help in garnering the trust from customers. Also, having diverse team members from different geographies can help in better communication with the customers. For example, a European semi-conductor company can communicate better with Chinese customers if they have team members who can communicate in their local language. This can lead to increased trust because one of the team members can communicate in local language with customer (Case I). Because the diverse teams have different capabilities, some of the team member can possibly match the required capabilities as perceived by the customer and thus resulting in better trust with the team (Case C). Having diverse team members can thus help in investigating a issue from holistic angle and thus can help team design more human-centered solution (Case G).

While diversity can help in increased group performance. The environment and working style of the team members is critical moderating variable between the diversity and performance link. For example, just having diverse team members doesn't help in better performance. Collaborative environment must be created to bring in different culture team members together (Case E, H). This is more difficult to practice in virtual environments. Thus, bringing culturally diverse people together physically could be one of the barriers that can decide better collaboration thus resulting in better performance (Case E).

One of the case study participant also mentioned that diversity can help in bringing different perspectives in the long duration projects in the semi-conductor industry and thus keeping them engaged without getting bored. Long projects lasting three to 4 years may bring danger of routine activities. But having diverse team members, the projects get challenged on a timely manner and thus reducing the routine activities within the team. This also helps in increasing the team motivation from time to time in the lengthy projects (Case F).

Another way of looking at the link between diversity and team performance is based on working style of diverse team members. The diverse team members can have varied experiences and thus one of the team members can adapt to particular style of working. This can result in averting risks and potential delays in the project (Case H). Also working style of team members can vary based on diversity factors such as gender. Men can be aggressive in approaching solution

to a problem whereas non-male members can possibly investigate problem from different angles and these members can go into more details (Case G, H).

4.4.1.3 Perceived important aspects of diversity and its effect on team performance

One of the questions that was asked to case study participants was regarding important diversity aspects and its effect on team performance. By asking this question, we can identify dominant links of certain aspects of diversity and its effect on team performance. These perceived important aspects of diversity and its effect on team performance is summarized and listed in the table below:

Important aspect of Diversity	Effect on Team Performance	Case Participant
Functional Diversity	Increased diverse knowledge base	Case A
	Translate ideas into commercial products	Case E
No mechanistic approach in relating diversity	It is very difficult to model the relation between diversity such as age or gender and its relation to performance. Because team is inherently diverse and therefore this is no mechanistic approach on diversity by case study participant	Case B
Skills diversity	Limited discomfort while solving diverse challenges	Case C
	Holistic views	Case G, D
Experience Diversity	Limited discomfort while solving diverse challenges	Case C
	Prevents bad decisions & evaluate right process path	Case F, D
Aptitude & Attitude Diversity	Ability to learn and adapt quickly to new things in the industry	Case H
Competence diversity: Values and leadership of thoughts	Different way of working and critical decision making	Case I

No preference: Because diversity can be viewed in infinite ways	-	Case J

Table 7 Important aspects of diversity

To summarize, different aspects of diversity can have different outcomes on team performance. Formation of sub-groups for example can lead to better participation (for instance women only team). Further various deep-level diversities such as working style and personal motivations could lead to elaboration of task-related information and thus improve performance. Majority of the teams indicated benefits from functional and skills diversities however even geographic diversities could also help teams collaborate better.

4.5 Diversity and Ambidexterity

As explained in the literature review section, teams must decide between alignment / exploitation activities and adaptability /exploration activities. The teams that balance both activities are knows an ambidextrous teams. In this section of case interviewee results, motivation of team managers and team members on how they collectively decide resource allocation for two different types of activities is presented.

4.5.1 Role of Diversity on Exploitation activities

The resource allocation for exploitation activities can happen based on experience diversity. For example, Case A participant, mentioned that generally junior people are allocated to exploitation activities, since junior staff may not pick up new product development skills. Thus, junior people could be allocated to exploitation activities since these activities are less uncertain and there is comparatively less risk associated with it (Case A). Also, these activities are generally routine in nature and thus diversity need is not necessary for exploitation activities. On the contrary to Case A's view based on experience, Case I participant mentioned that experienced people too are involved in exploitation activities. They have keen interest in following due diligence. Thus, the case study participants point out mixed results and thus exploitation team could have both highly experienced and less experienced people.

Another approach that teams can use to divide the resources between two activities could be based on inter group functions. For instance, Case B reported that it has a separate

operations management team, and this function mainly manages exploitation activities. Similar, Case G participant also mentioned that all the team members must do what they have been assigned. However, when they must do something beyond, they generally collaborate with other functions. Thus, inter group activities are generally more diverse in nature compared to intra group activities. The team members within operations management function have skills towards following defined process and following instructions. Members within operations management need not produce weird ideas and therefore the team can be less diverse (Case B). One of the case study participant also mentioned that natural tendency of people when they are in core functions is not to explore (Case F). They are focused in delivering their core functions in they way they have been always doing. So, the team managers may have to intervene and push the team members learn new things (Case F). Thus, the automatic division of team members may be based on personal interests and competence, and it is difficult to say diversity plays an picture in deciding members for routine activities (Case I).

For smaller teams, the division of activities based on functions may be absent. Since all the team members are involved in both the activities. However, team members may contribute differently based on their personal working style. For instance, team members with less interests in learning new things may be happy by doing routine activities and may not take risks to learn new things unless the team managers allocate specific tasks on the same (Case B). Thus, team members whom like routine activities are more oriented in doing exploitation activities and would like to excel in the same (Case C, D, I, J). Team members who are involved in routine activities are more organized and they play a key role in improving efficiency (Case J). Contrary to some managers who differentiate team members based on functions, some managers don't put conscious effort in differentiate team members based on activities. The differentiation takes place automatically. People who have keen sense of interest towards following the process are more into exploitation activities (Case G). Because there are no conscious efforts in differentiating the teams it is difficult to say whether diversity really matters. Both the teams could be equally diverse (Case J) and categorization based on diversity necessarily doesn't help.

In addition to above, some of the team members dedicates certain percentage of time between two types of activities. For instance, 10 to 20% on researching new things, 50 to 60% on

implementing and testing out new things and the rest for presenting solutions. It is difficult to pinpoint role of diversity on the same, but in general team members delivering what they are supposed to do could be less diverse in nature (Case E).

The table below summarizes the role of diversity on exploitation activities.

Division based on	Exploitation activities characteristics	Case Participant
Experience Diversity	-Junior staff because they lack product development skills -Routine activities	Case A
	-All staff involved -Keen sense on due diligence	Case I
Functional diversities	-Separate function (operations management)	Case B
	-Ingroup activities on specified tasks -Following instructions	Case G, B
	-Natural tendency is not to explore; Core functions	Case F
	-Specific allocation of time	Case E
Skills diversities	-Automatic divisions of people, interest for routine activities	Case I, G
	-Personal interests towards routine activities	Case C, D, I, J
	-Activities focused on improving efficiency	Case J

Table 8 Diversity and Exploitation

4.5.2 Role of Diversity on Exploration activities

First way that team members can be assigned to exploration activities is based on functional experience (Case A, B). Thus, experience diversity can play a role in deciding who works on exploration activities. For instance, Case A participant mentioned that generally more experienced people are involved in new product development and innovation activities. These experienced members are experienced with innovation / new product development process, and they know how to handle uncertain and risky situations. However, these experienced members too face challenges in deciding which projects to prioritize (Case A). They members should not only understand customer requirements quickly but also deliver them on time. This makes it challenging for less experienced team members to contribute and they will be under pressure while working for exploration activities.

The exploration activities call for different functional members to collaborate with each other and team is generally interdisciplinary (Case A, G). For example, Case A's exploration team involves members from software, hardware and architectural functions and they must collaborate, have diverse angles on solving the problem to meet new customer requirements. Not only customer requirements gathering. The functional diverse team members also play a crucial role in implementing, analyzing potential risks and debugging the problems. Thus, exploration activities reap more benefits of having diverse team members in exploration activities (Case B).

While some of the team managers mentioned conscious effort on assigning functional and experienced members on exploration activities, some team managers mentioned that they don't necessarily differentiate the team members. The team members generally differentiate themselves based on personality and work preference (Case J). Personal attributes, values and motivation of individuals can drive them towards exploration. These members generally have higher learning capabilities, and they like to update their knowledge base periodically. The team mangers however can put conscious effort in creating supportive environment that enables such type of individuals excel in exploration activities and expand their knowledge base (Case C). Similarly, Case D also mentioned that diverse team members can help in elaboration of task-related information and thus try to capture rapidly changing technology requirements of customers. The team environment and support also play a crucial role in helping team members contribute towards exploration activities. These supports include trainings on new tools, conducting workshops etc. But these things too face a risk of becoming obsolete, but they are necessary to bring exploration culture in the team (Case F). Thus, environment that supports team members learn quickly and adapt are more innovative in nature. People having hunger and a passion to learn new things must be supported to reap benefits of exploration (Case H).

The benefit of diversity is more visible in exploration activities. Since diversity can lead to different role types, different way of working, different backgrounds which helps in overall innovation (Case E). Whether one involves in exploration or not maybe based on his personal competence and skills. Diversity is not key factor, but competence could be deciding factor (Case I).

The table below summarizes the role of diversity on exploration activities.

Division based on	Exploitation activities characteristics	Case Participant
Experience diversity	-Risk aware	Case A
	-Different perspectives	Case E
Functional diversities	-Ability to handle uncertain situations	Case A
	-Intergroup collaboration	Case A, G
Working Style diversity	-Personality and work preference	Case J
	-Personal interest to expand knowledge base	Case C
	-Self learning	Case H
	-Competence	Case I

Table 9 Diversity and Exploration

To summarize, how one views diversity can affect ambidexterity. For instance, functional diversity could be the deciding factor for dividing the tasks. Other diversities although hidden such as working style and learning abilities could create division of activities automatically without the need of conscious efforts of managers.

4.5.3 Diversity and Ambidexterity: The differences in relation based on firm types (product vs service-based firms)

From the results it is evident that product-based firms generally try to achieve ambidexterity by focusing on structures-based strategic decisions. Various types of diversities could aid such structural decisions for instance functional diversity, that is dividing the people based on functional domain (Case A, G, E, I). Further the results indicate that structural division need not take place due to strategic decisions, but it can take place automatically in product-based firms based on skills diversities (Case I, G, J). In contrast although the service firms can have structures based on functions, there is flexibility to employees switch between the same and the functional roles are not properly defined in service organizations (Case B, C, D, H). All the service-based firms reported that employees need to have skills and abilities to capture customer needs and deliver them on them (Case B, C, D H). Therefore, it is evident that all the employees in service-based firms could be involved in exploration. Thus, naturally the employees in service organizations are involved in both the types of activities. Diversities such as skill and working style can thus enable contextual ambidexterity in service-based firms by enabling employees to serve

customers better. While in product-based firms, structural decisions drive ambidexterity and division could take place based on diversity types such as functional diversity, experience diversity etc. However decentralized structures and informalization of non-routine activities in firms can enable better exploration (Kortmann, 2012). And diversity types such as experience, function or skills act as deciding factors in determining extent of structural decentralization and informalization of non-routine activities.

4.6 Advantages & Disadvantages of Diversity

Case study participants shared varying advantages of having diverse team members. How the team members perceive the advantages of having diverse team members can vary based on context of the team environment, major task of the team and supporting environment at the company level.

Various benefits of diversity were reported by the case study participants and some of them point towards innovation and problem solving (Case A, C, E, F). Diversity could also lead to holistic view on the problem (Case G), better interactions with customers (Case B), etc.

The tables below list all the advantages of diversity as shared by the case study participants.

Advantages of Diversity	Case Participants
Better innovation: By building on different ideas, experiences, information, different point of view	Case A, C, E, F
Coming up with unique solution together	Case A
Investigating problem from different angles: Richer solutions	Case B
Better interaction with customers	Case B
Spin off ideas from different geographical locations	Case B
Capturing new technological opportunities & customer needs	Case D
Holistic view on the problem	Case G
Diverse functional skills: Capturing future industry needs and initiatives such as ESG	Case H

Language diversity: Overcome communication barriers and better interaction with the customer	Case I
Better overall value to the team, product and customer	Case J

Table 10 Advantages of Diversity

While the teams can reap benefits from diversity, it comes with inherent complexities. Managing diverse teams is very challenging and it may take time to understand team members (Case A, B). Further different working style and preferences makes it challenging for team managers to manage diversity. The table below list all the disadvantages shared by the case study participants.

Disadvantages of Diversity	Case Participant
Takes more energy to understand team members	Case A
Complex team management	Case B
Individual members could be sensitive to cultural differences	Case B
Increased conflicts: But conflicts can be present even in on-diverse teams	Case C
Different working style and preferences	Case D
Failure to conclude and arrive at a decision	Case E
Senior members can dominate and push their ideas	Case F
Too many points of views: Difficult to sort and select suitable solution	Case F
Increased time and effort: Different parameters & lot of things to evaluate	Case G
Different style of communicating	Case I
No disadvantages as much: Conflicts and agreements are necessary	Case H, J

Table 11 Disadvantages of Diversity

4.7 Improving Diversity

Because there are many ways in which diversity can help in team outcomes, the case study participants where asked areas where they would like to improve. This question thus helps

in identifying further benefits of diversity on outcomes which may have not been reported by case study participants earlier. The table below summarizes diversity improvement areas reported by case study participants

Reported Diversity Improvement Aspects	Reported Benefits on Team Outcomes	Case Participant
Functional Diversity: Experts in their functional domain and from non-semiconductor industry and related to customers domain	-Better collaboration with customer -Different angle on problem solving	Case A
Gender Diversity: More female staff in some teams	-No added advantages, inclusion perspective	Case B
Functional Diversity: With higher learning ability	-Better decision making with customers and increase in task-related information	Case C
Generational Diversity: More young employees	-Ability to capture new generation customer requirements -Better product to customer	Case D
Gender, Experience and Geographic Diversity	-Female staff may not necessarily do things differently, more of inclusion perspective -Different level of experienced individuals can see things differently -Geographic diversity can increase performance, provided they collaborate properly (preferably physically)	Case E
Non-technical	-Unlearn and look things from different perspective	Case F
Functional diversity: With new generation skills	-Coding, software and data analytics individuals can enable team do business analytics	Case G
Skills based diversity	-Reflect what's important for team and hire respective individuals with better skills: May lead to improved decision making, higher learning rates and agility	Case H
Geographic diversity	-Increased collaboration and communication with customers	Case I

	-Innovation and survival over long run	
Functional diversity	-More R&D can help team think from different perspectives	Case J

Table 12 Improving Diversity

Chapter 5 Discussions & Conclusions

This chapter discusses main findings of the research that has been carried out. First section addresses main research question. The section illustrates how the link between diversity on team performance and ambidexterity varies in service vs product-based semiconductor companies. Key differences that are visible from research are presented. Next section addresses sub research questions based on case study findings and literature review. After that research's scientific contribution and managerial relevance is presented along with limitations of the study. Finally, personal reflection and relevance to MoT, future studies and practical relevance and conclusions is presented.

5.1 Main Research Outcomes

Through this case study, the results indicate the difficulty of analyzing diversity topic in industry context. The research illustrates that diversity as construct can be conceptualized in many ways. Case study interviewee's illustrates that diversity can be conceptualized in both social and information/decision-making perspectives. Diversity can be managed in many ways to reap positive outcomes. Various strategies of team mangers in managing diversity within service and product-based firms is identified and presented in the results section. The effect of diversity on team performance and ambidexterity is presented in results section. Advantages, disadvantages, and improvement aspects of diversity is also presented. Finally, this section of the report further illustrates the differences in results based on firm types.

5.1.1 Answering the main research question

Let's recall, the aim of this study was to provide an in-depth understanding of diversity and its effect on team's performance and ambidexterity in the context of semi-conductor industry. Further the research tries to identify if there are any differences in findings based on firm types. Thus, to address this the main research question that was articulate based on literature review was:

"How does team diversity relate to team performance and team-level ambidexterity in product and service-based semiconductor firms?"

To address the main research question, this section tries synthesizing the key research outcomes based on case interviewees and analysis with relevant prior studies.

At first glance, it is difficult to point out differences in results based on whether the firm is service vs product-based firms. However, with assistance of previous studies, the key differences based on firm types is presented. Before jumping to differences, it is evident that both in service and product-based firms social categorization and information/decision-making perspectives are present and are presented in results section (Ashforth & Mael, 1989; Knippenberg & Schippers, 2006; Van Knippenberg et al., 2004). Both in service and product-based firms surface-level diversities such as education, background, etc. and deep level diversities such as individuals work preference, values, beliefs, etc. visible (Harrison et al., 1998). These are some of the commonalities irrespective of industry type.

The first major differences in the link based on firm type is customer orientation. As showcased in the literature review section, the major difference in product vs service-based firms is customer orientation. Thus team activities in service industries are mainly customer oriented and activities in service firms are heterogenous in nature (Frohlich & Westbrook, 2002). The findings of case study interviewees are in perfect alignment with these previous studies. All of the case participants from service sector mentioned team activities related to customer (Case B, C, D&H). And hence these firms relate diversity and its outcomes on customer related activities. The results section further illustrates various types of diversities and its effect on customer related activities. For instance, work style of individuals with higher learning abilities and adapting is positive for service-related firms customer centric team outcomes.

The second major difference that is visible based on the case study results and previous studies is that in service industries, the activities are highly intangible (Frohlich & Westbrook, 2002). Thus, diversities such as higher learning ability of individuals is more important for service industries than product-based firms. Thus, the service environment is changing rapidly compared to product-based firms and teams have to adapt themselves to changing external environment (Case C). Because the environment is changing rapidly different functional expertise and skillsets-based diversity can enrich team's performance and meet customer requirements on time (Case B, C, D &H). Thus, functional and customer centric individuals skills-based diversity are more

relevant for service industries. The functional diversity at the same time is also important for product-based firms, but the outcomes are more related to product development unlike customer centric activities in service-based firms. For the benefits of deep-level diversity such as working style, higher learning ability is more important in service over product-based firms. This is mainly because service-based firms have comparatively shorter project cycles over product-based firms (Case C).

Further the results indicate that incase of product-based firms, structural ambidexterity is more relevant, and division of activities based on diversity factors such as functional diversity is more relevant. Whereas in case of service-based firms the employees have high flexibility and can work on both exploitation and exploration-based activities. Thus, in case of service industries, contextual ambidexterity is more relevant over structural ambidexterity. And diversity factors such as working style, higher learning capabilities, etc. enables contextual ambidexterity and characteristics of such divisions was discussed in the results section.

5.1.2 Conceptualization of diversity in semi-conductor-based service and product-based firms

This section of the report tries to answer the first sub research question (SQ1) by synthesizing the findings with existing literature review:

SQ1: How is diversity conceptualized by team managers of product and service-based semiconductor firms?

Based on the literature review, it is evident that diversity can be conceptualized in many ways, and it is multi-dimensional constructs mainly in terms 'separation', 'variety' and 'disparity' (Harrison & Klein, 2007) . Thus, how one perceives diversity is highly context dependent and varies with the teams and work context. The participants of case study indicated both surface-level diversities such as functional background, expertise, and deep-level diversities such as working style differences including differences in values, attitudes, and beliefs etc. These results are in sync with literature review that indicates conceptualizing of diversity in both surface and deep-level aspects (Harrison et al., 1998).

The literature review section indicates mixed view of diversity on team outcomes based on social-categorization perspective. However, in practice, closer investigation of social categorization perspective diversity can also lead to better outcomes by enabling elaboration of task-related information. Thus, social category and information/decision-making perspectives cannot be viewed in isolation, and they are interlinked to each other resulting in positive team outcomes (Van Knippenberg et al., 2004). The findings of the research follow the previous studies. Some of the report task-related advantages of diversity are better innovation by having different perspectives, capturing new technological opportunities and needs of customers, holistic view on problems, better communication with customer, etc.

At the same time, managing diversity has its own issues and downsides. The disadvantages of diversity found in the research include complex team management, increased conflicts and disagreements (but conflicts can be present even in non-diverse teams), failure to arrive at decisions, etc.

5.1.3 Role of diversity on team's performance

This section of the report tries to answer the first sub research question (SQ2) by synthesizing the findings with existing literature review:

SQ2: How does the different factors of diversity relate to team performance within the context of product and service-based semiconductor industry?

Based on the case study results it is clear that diversity can indeed have various positive, negative or null benefits based on the context of work. Because the diversity can be viewed from both social and information/decision making perspectives, it can different outcomes based on how one views the diversity. Previous studies have generally shown negative effects of heterogenous teams on outcomes. But this is not the case in the results of this research. Such social differences can also lead to elaboration of task-related information and thus leading to improved performance (Van Knippenberg et al., 2004). Thus, the research tries to fill the gap in understanding important task-related diversity within semi-conductor industries. The results show that functional diversities, skills diversities, working style diversities, etc. are some of the

highly relevant task-related diversities. These task-related diversities can have various benefits on team outcomes such as better decision making, better abilities to handle customer related activities, etc. Similarly other types of diversities and their effects on outcomes was presented in the results section of the report.

5.1.4 Role of Diversity on Team Ambidexterity

This section of the report tries to answer the first sub research question (SQ3) by synthesizing the findings with existing literature review:

SQ3: How does the different factors of diversity relate to team-level ambidexterity within the context of product and service-based semiconductor industry?

As mentioned in the literature review section, the team members have a choice of activities. Individual team members can focus on aligning their activities to goals or towards adapting (Birkinshaw et al., 2004). The results section on the same topic indicate various manner in individuals can chose between exploration and exploitation activities. The results indicate that division of activities could take place of diversity, for instance younger employees might be inclined towards more of exploitation activities since they have less experience and risk-taking ability compared to senior members (Case A). Some of the teams mentioned structural approach (Duncan, 1976) towards dividing the team members on two different types of activities (for example Case B). The results further indicate that division between activities can take place without conscious efforts. For instance, employees having interests to learn new things might automatically orient towards exploration activities. Thus, working style diversity could play a important role in deciding team's ambidexterity and collective behavior. Functional diversity also plays a role and intergroup functional diversity could lead to better team outcomes. Benefits of diversity is more visible in exploration activities over exploitation activities. For instance, diversity can lead to different way of working, risk taking ability and decision-making style resulting in innovation.

Further the results indicate that incase of product-based firms, structural ambidexterity is more relevant, and division of activities based on diversity factors such as functional diversity is more relevant. Whereas in case of service-based firms the employees have high flexibility and can work on both exploitation and exploration-based activities. Thus, in case of service industries, contextual ambidexterity is more relevant over structural ambidexterity. And diversity factors such as working style, higher learning capabilities, etc. enables contextual ambidexterity and characteristics of such divisions was discussed in the results section.

5.2 Scientific relevance and contributions

In the literature review section, various ways one can conceptualize diversity as a construct was discussed. There are limited number of research that discusses effect of diversity on team performance and ambidexterity] This thesis contributes towards the same and by exploring various diversity factors and its relation to team performance and ambidexterity.

One can analyze diversity from both social categorization and information/decision-making perspectives. Very limited research tries to link both. The thesis contributes towards this area. Finally, the role of diversity on team performance and ambidexterity might be different based on firm types: product vs service-based firms. The thesis illustrates that for service-based firms, diversities that can enhance customer related activities is more relevant compared to product-based firms.

The results indicate that teams various diversity factors can lead to divergent thinking and elaboration of task-relevant information thus improving team performance. Some of the reported benefits of diversity include increased knowledge base, better service to customers, better decision making, etc. Realization of diversity benefits is not straightforward; it comes with challenges. Some of these challenges due to diversity include complex team management, increased conflicts, increased time and effort. Thus, the study also highlights challenges related to diversity and that be further topic of study.

The studies explore diversity factors and division of exploitation and exploration activities. The results indicate that product-based firms generally use structural decisions to achieve ambidexterity and diversity such as functional diversity is more relevant. Whereas, for service-based firms, employees have higher flexibility can take part in both exploration and exploitation

activities. Thus, contextual ambidexterity is more relevant for service-based firms and diversity factors such as decision-making style, higher learning abilities, etc. is presented in the research.

To conclude, key scientific contributions of the study is exploring diversity factors in service and product-based teams from semi-conductor industry context and exploring role of team diversity on team outcomes and ambidexterity. The research also indicates associated issues in managing diverse teams.

5.3 Discussion of results in the context of semi-conductor industry

The exploratory study highlights the diversity factors and relationship to team performance and ambidexterity. Many of the findings of the research are highly specific to semi-conductor industry. Because of challenges associated in obeying Moore's law and increasing difficulty due to competition, semi-conductor firms have to be technically clever at rapid rates (Mollick, 2006). This makes semi-conductor firms look for constant innovation. Thus, semi-conductor firms can have inherent need for ambidexterity unlike the other industries. The thesis indicates structural approach of ambidexterity is more relevant for product based semi-conductor firms and contextual ambidexterity is more relevant for service-based firms.

Further unlike other industries, duration of projects in semi-conductor can be lower and thus rate of innovation is much rapid. This indirectly further indicates that there could be increased focus on exploration activities in semi-conductor industries compared to industries. Some of the results such as ability to capture customer needs quickly, have higher learning abilities etc. points towards the same. This higher learning abilities is furthermore relevant to service-based semi-conductor firms than product-based firms because they closely interact with customers.

5.4 Limitations of the study

The drawback of qualitative research is that there is no fixed "cookbook" prescribing the methods to be used Qualitative research is context dependent & quality cannot be guaranteed by methodological rules (Maxwell, 2014). This does not mean that there is no structure for the qualitative study, it only means that structure is designed specifically for the research and keeping goal of the study in the mind. The study is first limited to semi-conductor industry and thus findings of the research cannot be directly generalized into other industries. Also, the sample

size of study is very small (N=10) and therefore it is not possible to statistically generalize the results even within semi-conductor industry. Thus, due to time limitation of research, the results are valid only for ten case studies conducted.

The drawbacks while conducting the research could be based on social desirability of the case study participants. The participants may have mentioned only positive benefits of diversity, thus creating social bias. Further, due to time limitation limited information of team's background, composition and activities was collected. The actual numbers and data can significantly vary if statistically tested. The interviewees have provided only rough figures and very limited data.

Much of the results positive benefits of diversity on team outcomes when viewed from both social categorization and information/decision-making perspective. However, in practice there could be potential moderating variables that are not presented in this research. For team which provides better learning environment and support systems can reap higher benefits of diversity than teams that doesn't have supporting environment. Thus, culture or strategy of the organization could be potential moderating variables. These variables are not considered in the research due to limited time and scope of the project.

5.5 Personal reflection and relevance to MoT

Management of Technology course deals with handling corporate resources to design technological product and services. Such activities might call for diverse ideas to design efficient products and effective services. Thus, the topic of study is highly relevant to Management of Technology (MoT). Personally, I enjoyed conducting qualitative case study. Although I faced many challenges, through critical reflection and feedback from thesis committee, I am finally able to complete the report. Through this thesis, I have learnt how to do research in business environments and link the academic world. I did face some issues in translating academic words to business environment, however as time progressed, I overcame the hurdles. I really enjoyed talking to case study participants from different continents. The participants themselves were truly diverse in many aspects: reflecting the topic of study!

5.6 Future Studies

This thesis has mainly focused towards exploring diversity factors and its association with team performance and team-level ambidexterity. While the study is exploratory in nature, it has high internal validity but low external validity of the results. Thus, empirical studies can be further be carried out by quantitatively testing the relationship between various factors of diversity with team performance and ambidexterity. In this study, potential mediating variables has been simplified. Data regarding these mediating variables for example: 'to what extent does diversity lead to elaboration of task-relevant knowledge and thus affect team performance' can be statistically tested.

Further the results have been generalized irrespective of team size and team task in this study. Further study can be done exploring role of team size and task-complexities and designs. These studies can potentially indicate ideal mix of diversity and its relation to team performance and ambidexterity.

Finally, the study can potentially have social desirability bias indicating positive benefits of diversity on team performance and ambidexterity. To avoid this bias one can do time-series analysis showing results without diversity and with diversity and its effect on team performance. If the study indicates no changes in results, the social desirability bias factor may be present, and some other factors could affect team performance in the absence of diversity. These hidden factors could be thus figured out by conducting further time-series studies.

5.7 Practical relevance and conclusions

The thesis that has been concluded has high practical relevance. It assists team managers understand different ways in diversity can be conceptualized and complexities surrounding it. The thesis results indicate both surface-level and deep-level diversities of various team. Diversities that are highly task-related are presented in the findings and this can aid practicing managers make better decisions while managing diversity. Further the thesis indicates added benefits of diversity for exploration activities. However, practicing managers should create an environment where diversities can be reaped. Otherwise just having diverse team members may not lead to better outcomes. The practicing managers are further assisted with possible effects of diversity on team outcomes. The thesis results concludes that service-based semiconductor

firms must focus on any type of diversities that related to customers. The thesis shows that these diversities could be hidden/deep level, for example: personal motivation and beliefs of an individual team member. While for product-based firms diversities associated with core functional activities are more relevant and practicing managers can focus on the same. The thesis can further aid practicing managers strategically manage exploration and exploitation and thus achieve competitive advantage. Finally, advantages and disadvantages of diversity is presented.

The exploratory study indicates that semi-conductor team mangers conceptualize diversity from both social and information/decision making perspectives. Common surface level diversities such as function, experience, gender etc. were reported. At the same surface level diversities such as working style, task motivation, etc. were reported. The results indicate that teams various diversity factors can lead to divergent thinking and elaboration of task-relevant information thus improving team performance. Some of the reported benefits of diversity include increased knowledge base, better service to customers, better decision making, etc. Realization of diversity benefits is not straightforward; it comes with challenges. Some of these challenges due to diversity include complex team management, increased conflicts, increased time and effort. Thus, it is important for organizations to provide necessary support and environment for reaping the benefits from diversity. Such organizational control is more in terms of structures of teams in case of product-based firms; structural decisions drive ambidexterity and division could take place based on diversity types such as functional diversity, experience diversity etc. However, decentralized structures and informalization of non-routine activities in firms can enable better exploration. And diversity types such as experience, function or skills act as deciding factors in determining extent of structural decentralization and informalization of non-routine activities. Decentralization of non-routine activities can thus enable ambidexterity. Contrary to product-based firm, all the service-based firms reported that employees need to have skills and abilities to capture customer needs and deliver them on them. Therefore, it is evident that all the employees in service-based firms could be involved in exploration. Thus, naturally the employees in service organizations are involved in both the types of activities. Diversities such as skill and working style can thus enable contextual ambidexterity in service-based firms by enabling employees to serve customers better.

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Appendix

Sample Case Interview Questions

The case interview questions are dependent on the flow of interview to make case study participant conformable. Whenever the case interviewees faced problem understanding the questions, supporting statements were made to explain the topic to the interviewee. Illustrative case interview questions are highlighted below indicating main topics that were researched:

Questions on Diversity

- How do you understand/interpret the term diversity?

- Do you think that you manage a diverse group? In what aspects?

- How do you think that team diversity can relate to group performance? Could you give us some examples from your team?

- Are their diversity policies enforced at your firm? Does this policy help your team?

- While assigning team members on a particular task, do you choose diverse team members? If so, how do you chose different team members?

- What are the functional backgrounds of your team members?

- What is the average tenure of your team members in your organization and team?

- Does your team face conflict frequently?

- Does diversity help in resolving team conflicts?

Diversity and Team Performance

- How do you measure team's performance?

- Do you believe having diverse team members helps in improving performance? If so, how?

- Which aspects of diversity contribute the most to increased group outcomes?

- What improvements do you think are necessary to improve diversity in your team and how can diversity improve performance in future?

Diversity and Ambidexterity

- Could you describe team members who are involved in executing daily activities related to firm's core focus area (exploitation)?

- Could you describe team members who are involved in new production development/ innovation activities more frequently (exploration)?

Conclusion

- What are the advantages of having diverse team for innovation?
- What are the disadvantages of having diverse team?