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The impact of the adoption of remote working practices on onboarding of new hires in product development industry during the outbreak of Covid-19 world pandemic

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ABSTRACT

The following thesis aims to study the impact that the diffusion of remote working practices had on the onboarding experience of new hires in the context of product development industries. Specifically, given the importance of this process in new hire commitment and satisfaction, which are extremely important factors linked to the newcomer productivity and the organization's future capability of retention of the new resource, we wanted to investigate whether and how relevant the impact of the increase in remote work had been on the new hired overall onboarding experience. The research was conducted through the administration of a dedicated questionnaire to workers, employed in several organizations engaged in product development activities, who were hired during the Covid-19 pandemic outbreak. After collecting 125 responses, the data were analyzed through the use of a number of regression models. The research found that the increase in remote work negatively impacted the new hire's experience in developing a successful connection to the team, attachment to the organization, and performance of the job. Additionally, it was studied how the new hire's overall engagement in the job varied as the main areas identified as relevant to onboarding experience, and the percentage remote work changed. Specifically, experiencing a successful recruitment phase, being able to successfully perform the job, and building successful relationships with core team members and organizational coworkers are significant and positive predictors of the new hire's overall engagement, while increasing remote work is a significant and negative predictor. These findings, although with some limitations in terms of quantitative data analysis due to a number of factors, aim to provide valuable insights into how new hires have experienced the adjustment in the organization during the pandemic and can serve as a starting point for future research.

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INTRODUCTION

Between 2020-2021, the global spread of the Covid-19 pandemic led many companies to adapt the way they did business, effectively forcing all those companies that did office work to use remote work in order to protect the health of employees. In doing so, organizations have been forced to readjust their business model by integrating it with new operational and managerial forms through the support of IT tools for the management of activities. The following thesis aims to investigate, through the use of inferential statistics, in particular through the construction of regression models, how these changes have impacted the onboarding experience of new hires working in the context of product development and what were the main factors that influenced any differences with new hires who did onboarding in presence. Specifically, Chapter 1 introduces the field of product development, describing the main phases that make up the process and the main differences that distinguish it from other types of business processes. Next, the evolution of best practices for managing the complexities of product development activities is reported. In particular, the Stage&Gate process, the Agile Software development, the Agile product development, and the lean development are briefly described. Finally, the main drivers of the spread of remote working practices are outlined in order to show, apart from the acceleration due to the spread of Covid-19, the increasing establishment of remote working as a standard working mode for certain type of job, such as knowledge-intensive professions. At first, the motivations are exposed from the point of view of companies, that need to meet the increasingly demanding requirements of consumers and at the same time defend themselves against the growing competition introduced by globalization. Then, the major technological innovations that make the spread of this modality of working possible are briefly exposed. Finally, the benefits of the adoption of this modality of work from the point of view of workers and society in general are exposed, together with the significant impact that the spread of covid-19 has had on the steepening curve of the number of remote workers and the unique conditions of

work that introduced. In chapter 2, the main implications of remote working on teams and activities in product development are gathered through a literature review on the main differences of remote working compared to face-to-face working. Next, the literature on the onboarding process is analyzed in detail, starting with its importance and the main indicators of a successful onboarding and continuing with the detail of the various steps of the process to support the adjustment of the new employee in the organization. From the evidence gathered, hypotheses on the impact of remote working practices on the onboarding experience and on the overall new employee's engagement in the new job are developed. In the third and final chapter, data on the onboarding experiences are collected through the use of a questionnaire administered to new hires, during the period of the pandemic's spread, within the product development industries, and then analyzed. The analysis is carried out mainly through the use of ordinal regression models. First the impact of the introduction of remote working on each area identified as relevant for successful onboarding was analyzed individually. Subsequently, the impact on the new employee's overall job engagement was studied through a regression on multiple independent variables: recruitment and pre-boarding experience, formal and informal socialization, job performance, connection with the team and engagement with the organization, together with the percentage of remote working. To conclude, the results are integrated with a qualitative analysis of the distributions of the individual variables, together with the comparison between the averages of 3 groups of new hires, those whose percentage of work can be approximated to onboarding in presence, those who have carried out the onboarding partly remotely and partly in person and finally those who have done more than 80% of the onboarding remotely.

CHAPTER 1

In the following chapter two main themes will be introduced. First, a review of literature on product and service development process will be given to present the context in which this research will place. In particular, a presentation of the main phases that compose the development process, together with the key differences that distinguish it from other business process will be exposed. Then, an examination on the evolution of the main practices used by companies that undertake activities in development projects will be presented. This way, it will be possible to extrapolate the key features of the activities conducted during the development process in order to analyze in the next chapter how they could be impacted by the adoption of remote working practices. The second theme will explore the main drivers of the adoption of remote working practices in the product and service development industries, to show its diffusion and consequently the importance of studying their impact on new hires onboarding experience. Specifically, the theory on Remote Collaborative Product Development (RCPD) developed in 2003 by Ronal Lasser will be reported to show the importance for organizations of adopting remote working practices to cope with the complexity of current products and services offered in the global markets. Then, the main improvements in Information Communication & Technology will be summarized in order to understand the state-of-the-arts tools available to organizations and employees working in remote. Afterwards, the major benefits deriving from remote working from the point of view of organizations, employees and society at large will be collected. Finally, the unique remote working conditions derived from the Covid-19 pandemic exploded in the early 2020, and still present, will be exposed. In fact, the pandemic has led millions of people to work remotely almost overnight leading to a *De Facto global experiment of remote working* (Kniffin et al., 2020).

1.1. A review of literature on Product Development Process

The most common definition of product development describes it as the process of bringing to market an original product or service's idea. Therefore, it comprehends all those activities aimed at conceiving, developing, producing, and marketing a new product or service in the reference market. The product development process is inevitably related to the concept of innovation. Indeed, innovation has been defined by Roberts in 1987 as *the economic exploitation of an invention.* Two main drivers of innovation can be extracted from the literature review, the technology push and the demand pull, and innovation will be due to either of the two. Innovation through the push of technology occurs when a technological breakthrough takes place, within a firm or elsewhere, independently from market needs and is addressed to satisfy latent needs. Conversely, innovation guided by demand pull occurs when firms direct technological development to meet specific market needs. Generally, innovation determined by the demand pull is associated with incremental improvements to existing product and services whereas revolutionary innovations are more frequently associated with the technology push (Cantamessa, M. and Montagna, F., 2016). Another definition of the product development process describes it *as the business process that a company performs to deliver an innovation to the market* (Cantamessa, M. and Montagna, F., 2016). The degree of innovative content introduced in the new product or service will differ based on the improvements to existing product and service in the market. How products and services are developed differ not only across firms but also within the same firm over time, it is therefore not possible to define a predefined product development process. In fact, when it comes to knowledge-intensive professions, as the type of work that characterizes the product development process is often defined, some activities that constitute the process cannot be specified ex-ante since, in knowledge intensive professions, the process will be discovered while dealing with the problem. Therefore, organizations will not always follow predefined strategies, but will adapt their approach by continuously analyzing new information from projects and their attempts to deal with it (Shon, 1983, 1995). The organizational

structure of the companies that engage in product development activities and the processes and best practices implemented to successfully bring to market new products or services will differ greatly, depending, among other factors, on the type of development projects carried on and the degree of innovative content. For example, an organization engaged in carrying on radical innovation projects will be likely to require high interfunctional coordination and will consequently employ interdisciplinary teams. As radical new products or services are being developed, the issues that may arise and the types of interactions within teams cannot be foreseen ex-ante, so teams need to be flexible and able to communicate promptly and efficiently. On the other hand, an organization that is primarily concerned with carrying out projects with moderate innovative content on existing products or services may employ a more functional organizational form, since the type of coordination required can be known in advance. Considering what has been said, the product development process will vary greatly from company to company depending on the industry and the characteristics described above; despite this, the literature defines a series of activities that will be somehow implemented by organizations that engage in product and service development process and that will be described in the following section.

1.1.1. Main activities of Product Development Process & Key Features

The main sources used to depict below the various steps that typically characterize the product or service development process of organizations dedicated to that practice albeit with great differences in their implementation, are the works of Cantamessa and Montagna, 2016, and the one of Krishnan and Ulrich, 2001. For convenience, we will present below the main activities of product development process, but these have a great similarity in terms of objectives and activities with the service development process.

Typically, the initial phase of this process, is called concept development, whose main objectives are to define the high-level attributes that will characterize the product you want to develop, both in terms of the needs you want to satisfy and the way you intend to do it. To do that, organizations will perform two main macro

activities: product planning and conceptual design. In product planning, the focus is on gathering information on the various stakeholders involved in the process. Through the use of tools such as market research, the needs of customers and stakeholders will be investigated so that decisions such as product requirements and target markets are taken, together with the initial analysis of technological opportunities available. In addition, a first business case is drawn up to have an idea of the costs of the product, together with potential sales and revenues associated to the product specifications and the product's basic configuration and extended details such as life-cycle services. The main deliverable of this phase is usually a high-level definition of the product, where the attributes, that represent an abstraction of the product, refer to both customer needs and technical performance metrics. The second macro-activity, the concept design, is the first phase in which these attributes identified in the product planning are embodied into some type of technological approach and result in the core product or service concept. The goal of this phase, critical to determine product or service's future performance, is to find the solution that will fulfil the product attributes defined in the previous phase. Usually, at this stage the assigned teams perform two main activities: the concepts' generation and the concept selection. In the former one, typically, teams engage in divergent thinking with the aim of generating a variety of concepts characterized by different technical choices. The scope of this phase, hence, the variety of concepts generated will differ, among other factors such as allocated budget and required time to market, on the degree of innovative content introduced. Indeed, when the new concepts will contain radical innovation the scope of this phase will be much greater than the one aimed at introducing improving innovation. To do that, teams will leverage on a variety of sources and formal or informal methods. Examples of practices used to carry out preliminary research and collect information to generate concepts are interviews to key users and domain experts, review of the scientific and technical literature and patents, product or service benchmarking and reverse engineering. Afterwards, team engage in practice such as brainstorming to generate some product concepts. The concept selection to identify the winning product or service concept is subsequently performed by utilizing the most appropriate method of selection such as the analytic hierarchy process (AHP), the Pugh comparison tables or combination of more methods. Starting with the product or service

concept, the development team will have a clear idea of the functions and performance levels that the product will need to achieve.

The product design phase can be split in three smaller interrelated phases: System-level design, detailed design and supply chain design. The system-level design is the stage at which the firm makes important technical choices on of the components of the product or the functional requirements of the services. The main outcomes of this phase are the bill of materials, the geometric models of components in case of products and the service requirements and customer experience in case of services. The focal point of this phase is to identify the design parameters to achieve and refined the target performance characteristics. In particular, the winning product concept resulted from the previous phase will be translated in the definition of the product architecture. The product or service architecture refer to the scheme of a product or service's functional elements and the way these elements interact. It plays a major role in how the design, make, sell, use, and repair of the new product or service, and the key features will be analyzed further on. When defining the product architecture, decisions such as which components, subcomponents, or functions to offer and share across the firm's portfolio are taken (components' percentage of carryover), together with the definition of the interfaces that will connect the various components or functionalities of the product or service. Supply-chain design activities mainly focus on the make or buy decisions. Decisions such as which components specifically design for the products or standard off-the-shelf components, the owner of the design and production of the components, the supplier selection, the processes to assemble the product are taken. Hence, the distribution of work between the firm and its suppliers, after the decisions of making in-house or co-develop or buying from suppliers a particular component or function are taken.

Another phase that constitutes the product development process is the performance testing and validation where the design is prototyped and validated for fit and function. These activities could be performed once the detailed design is frozen or in parallel. Finally, the process is completed by the product launch and production ramp-up, where the product is introduced in different markets and the production processes are refined and launched.
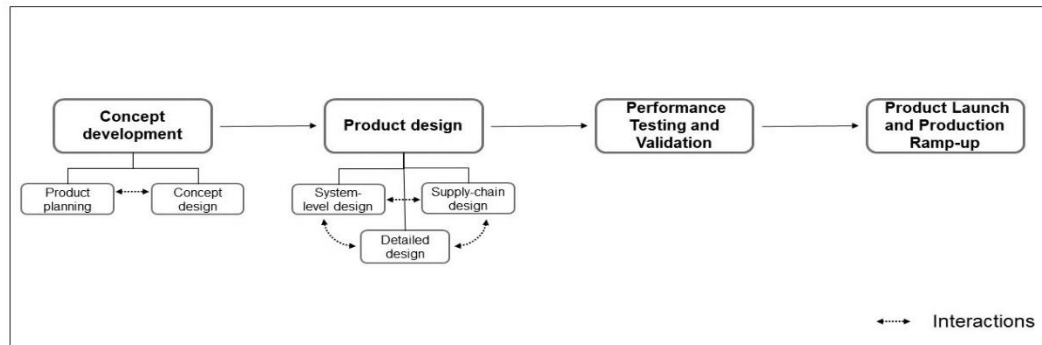
Figure 1: Product development process

Fig.1 shows a scheme representative of the product development process. It is clear from the activities delineated above that this process requires different actors and competences to carry out the different steps. In fact, if for example we look at the initial phase, where the product attributes and the target market are defined, the support of different business functions is required. The marketing area, depending on whether it is an incremental update project or a radical one, will in the first case have to understand the market needs and communicate them to the R&D function and the design team and in the second case identify a possible application of technologies developed by the R&D to meet latent customers' needs. The same cross-functional approach is also required for the other phases of the process, such as the product design phase, where it is important that the team in charge of detailing the design choices is always in contact with the R&D team so as to be kept up to date on the various technological solutions and with the other corporate functions as to clarify or require additional information on requirements of the product concept or of the product brief. In the final phases of the process, aimed at fine-tuning and commercializing the product, a fluent and efficient communication must be guaranteed to foster collaboration and enable the successful production of the

new product or service. In all scenarios, it will be essential to foster efficient communication between the functions involved, to connect interdisciplinary teams and stakeholders to both save time and improve the decision-making process (Ferreira et al., 2017). Hence, one of the key differences from other business processes is that product development is highly interfunctional and interdisciplinary in which is required the involvement of representatives from most corporate functions, from marketing to customer service.

Another key feature that we can extract from the nature of PD's activities analyzed is that it is a very complex activity and dependent on knowledge and learning (Goffin, K. and Koner, U., 2011). In Schon work known as "Reflection-in-action" the design process is presented as a process not knowable a priori but as a *learning process in which the solution evolves through repetitive cycles of problem formulation, solution evaluation, and documentation.* In his paper Schon describes the product development as a course in which designers continuously analyze new information arising from the problem, reframe it and devise appropriate solutions. This process, characterized by many iterations, helps the designers to formulate increasingly accurate new representations of the problem that lead them to arrive at the final solution. The professional role of designers, hence, is highly knowledge-intensive, and requires the design team to continuously collect, process, store, and update information to solve the problem. Moreover, in the work of Goffin and Koner, 2011, the new product development is described as an activity highly correlated with knowledge that is often tacit in nature, along with the explicit one. Tacit knowledge refers to the type of knowledge difficult to identify and articulate or verbalize, tends to be embedded in people and difficult to codify and incorporate in repositories or books. This kind of knowledge, held by individuals, play a major role in organizations, as it is often the determinant of the competitive advantage generated by organizations especially when placed in an environment characterized with great uncertainty, rapid changes and turbulence (Jafari et al., 2013). This is because, tacit knowledge contributes to understanding organizational routines, which in turn help to deal with new situations and adapt efficiently to new circumstances (Nelson and Winter, 1982). To date, the most effective way to transfer this type of knowledge is through the use of observation and apprenticeship processes.

Thus, organizational learning is therefore fundamental for PD process since *it change the way a company solves problems* (Michael and Palandjian, 2004*).* As a consequence, it is in the organizations best interests to implement the most effective procedures and practices in order to favor both individual and collective learning. Michael and Palandijian in 2004 identified individual learning as the basis for learning in NPD although how and what individuals learn in not clear. Allen in 1975, by studying dual-supply projects, had the opportunity to comparatively analyze the product development activities carried out by different organizations and made some important discoveries about the individual learning activity undertaken by designers. In particular, he realized that technical and scientific literature was of little help for inexperienced designed whereas was useful for experienced design. Allen explained this finding arguing that, given the high importance of tacit knowledge in PD activities, literature was not enough to compensate for lack of experience. Moreover, he found out that interpersonal communication played a major role in finding the solution to a technical problem, especially when characterized by high diversity, that is communication with people outside the team or the technical functions. Team learning is the outcome of the shared experience of the team members that engage in solving NPD problems. Through regular interactions, formal and informal, between the team members and their shared experience tacit knowledge can be transferred (Chen, 2004).

Another key characteristic of organizations engaged in product development activities is that often the organizational form reflects the product or service architecture of the product or service being developed. Ulrich defined the product architecture as *the scheme by which the function of a product is allocated to physical components.* This scheme is particularly relevant for the decisions being made during the innovation process since it will drive the design. There are two main types of product architecture: modular or integral. In the first one, the product is organized as a number of independent modules, and each module will fulfill a specific function. The interaction of all the modules will express the final purpose of the product. This form of architecture allows the easier allocation of tasks an outsourcing together with economies of scale and reuse and standardization of components. In integral product architectures, functions will be

fulfilled by more physical elements. Hence components will be characterized by functional interdependence and there will be greater complexity in mapping components and functions. Based on the decision taken on the product or service design phase, the development of components will be assigned to different design teams that may reside within the same organization or different organizational entities. Design teams will therefore need to communicate with each other, through dedicated channel, to define compatible interfaces, reflecting the pattern of intercomponent relationship. This is the reason why organization should reflect structure of the product architecture. The main difficulty derives from the fact that, as reported above, communication flows are not always formalized ex-ante, meaning that they could emerge out of experience and of trial and error. Once established the product architecture the organization will tend to be locked-in and it may be the cause of inertia when a major design change is needed, since organization will have to put its effort in discarding the routines and communication flows to adapt to this change.

1.1.2. Evolution of best practices

Focusing on the timeframes within which the various activities must be completed, there has been a big evolution from the time when all steps were carried out sequentially to a perspective that acknowledge today's environmental uncertainty and complexity.

In fact, the traditional approach, also known as waterfall methodology, stipulated that the PD process flows like a waterfall *through all phases of a project with each phase completely wrapping up before the next phase begins*. Hence, each activity should only be carried out after the previous one had been completed, for example the product concept should have been frozen before detailed product design commenced there were no iterations or design changes once you had moved on to the next activity. This is because design changes could be very harmful both in term of raised costs and in term of time to market. To avoid this,

decisions were made after receiving in input the output of the previous phase and design teams committed to adhering to those deliverables.
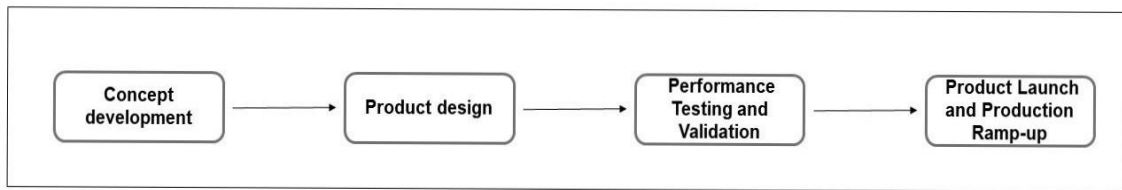
Figure 2: Traditional product development process

As the complexity of the products and services offered increased, and the environments became more and more dynamic, the need to carry out one or more process activities in parallel became more and more urgent. This is because new market needs could emerge later in the process and necessarily require redesign of products or services being developed. It became therefore unthinkable to be able to perform subsequently each phase. The best approach became trying to pursue concepts and select the best design process as well as finalizing specification later in the process (Srinivasan et all, 1997; Bhattacharya et al., 1998). It should also be pointed out that the great advances that have been made in the field of information technology make it possible to carry out many more engineering design activities with the powerful computer-based tools, such as simulations for the testing phase. Dahan and Srinivasan in 2000 stated that concept selection and testing through the use of virtual prototypes is as almost much as efficient the use of physical prototypes.

To date, one of the most common approach implemented by organizations engaging in product development is the Stage and Gate, also known as Phase-Gate model, and is the evolution of the cross-functional PD process. The benchmarking study produced by the American Productivity & Quality Center (APQC) in 2010, stated that this approach was used by 88% of businesses in America. Cooper, R.G. in 2008 defined this approach as *a conceptual map used for moving the new product projects from idea to launch and beyond, in order to improve the efficiency and the effectiveness of the NPD process*. Specifically, this approach is expressed by dividing the product development project into a series of stages, where, for each stage, the team gathers the necessary information, carries out the functional and technical analysis and undertakes the work, and at

the end of each stage, decisions are made on whether to proceed with investing in the project or to stop.
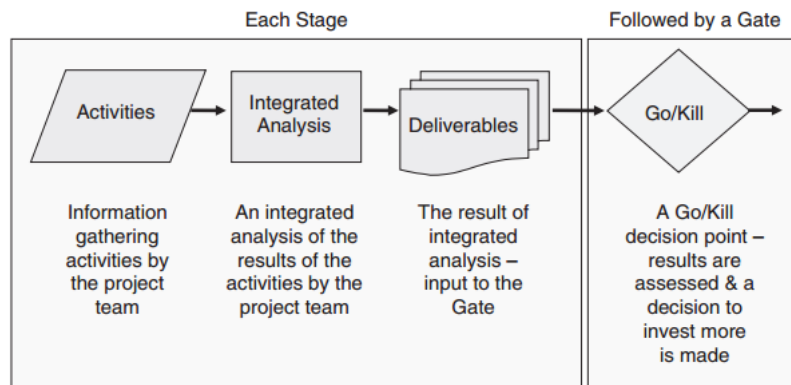
Figure 3: Stage & Gate, stage focus (Cooper R.G., 2008)

Fig. 3, extracted by Cooper's work, shows the typical process that takes place at each stage. The Stage & Gate approach aims at reducing the uncertainties and risk that characterize today's dynamic environments by dividing the project into several stages. At each stage, the team must collect the information requirements needed to move forward in the project, analyze it and process it to advance to the next gate or decision point. Like the traditional approach, this one requires that each stage is carried out by a cross-functional team composed of representatives from marketing, R&D, production and engineering. This way, it is possible that the different activities to undertake to arrive to the next gate are performed in parallel. Gates represent the go/kill decision point: after that the team in charge of each stage produce the required deliverables, these are reviewed and through a number of criteria such as must-meet criteria or knock-out questions the final decision is taken. Go decision imply that the project is developed further on, hence a plan for the next stage is developed. On the other side, kill decision permanently stops the project due to failure to pass the chosen criteria. Additionally, the review team may decide to put the project on hold because it is not ready to move to the next stage or it may decide to recycle it, meaning keep developing the project but making some changes in the scope.
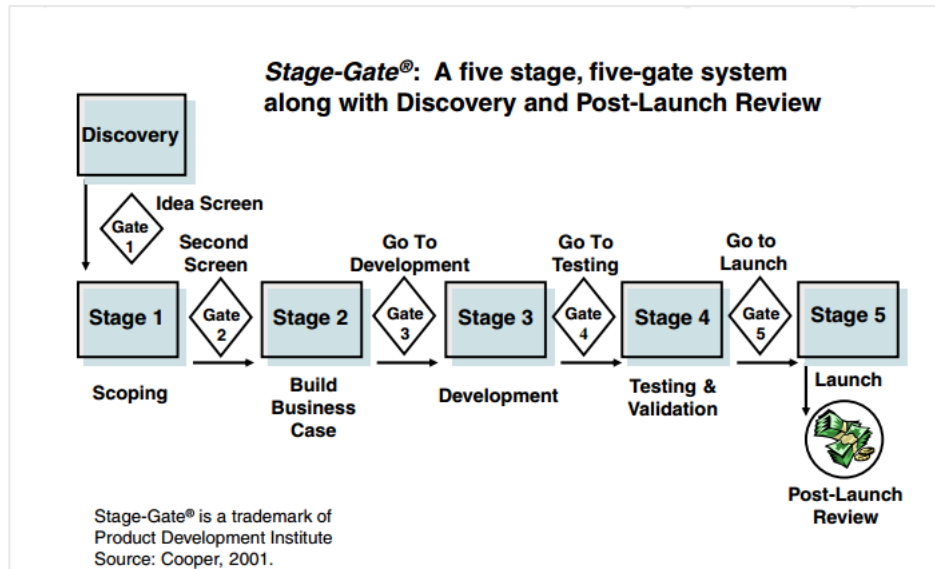
Figure 4: Stage & Gate process (Cooper R.G., 2008)

Fig. 4, extracted from Cooper's work, represents the Stage & Gate approach in its entirety. We can see a series of steps where the output of each phase is the input of the following phase, that starts from product planning, through design and development and into testing and manufacturing. Through the use of this model, organization can save money by *filtering out bad concepts and ideas through a funnel by the time the process is complete.*

Some studies questioned the application of Stage & Gate approaches in highly dynamic and uncertain environments by arguing that this view of product development process as a linear sequence of well-defined steps may limits flexibility speed and adaptability under turbulent conditions (Bhattacharya, 1998; MacCormack, 2001).

Among the several industries that engage in product and service development activities, the software industry is one of the most impacted by high degree of turbulence and changes. This is due both to the rapidity with which target users change their needs and the consequently need of software firms to adapt their services and to the complexity of developing corporate information systems for complex organizations whose specifications may not be easy to define (Cantamessa M, Montagna F., 2016). To face these challenges, in fact, given the fundamental role that iterative cycles and continuous feedback had in the design activity, software companies questioned the fact that software development could be controlled through a high formalization of the process. (Nerur, S. and

Balijepally, V., 2007), this led to a shift away from waterfall methodology. The Agile Software Development Manifesto written in 2001 by various actors summarizes the philosophy of agile practices in 12 principles. The first three principles state that the ultimate priority of software development must be to satisfy and create value for customers, and to do this, changes in requirements and the release of new updates in the short term are welcome. The following three principles states that the value of software development is highly related to the organization's ability to nurture learning, teamwork and personal empowerment, *business people and developers must work together daily throughout the project.* Teams must be composed of motivated individual that must be supported and trust and the best way to convey information it through face-to-face conversation. The final principles are directed at defining how responsiveness and flexibility are to be achieved. Specifically, individual involved in the development process must pay continuous attention in technical excellence, minimizing the time spent on activities that don't add value to the end software and spend time reflecting on how to become more effective in solving the development problem and adjust their behavior accordingly. These principles contained in the manifesto are made explicit in concrete software development activities through the application of the methodology known as Agile Software development. Edeky in 2015 studied the agile software development methodology. In particular, he delineated that these methodologies are based on short iterative software release cycles that provide for the constant involvement of stakeholders through meetings and demonstrations of the current state of the software, so that they are always updated and can express their degree of satisfaction or suggestions for change. Software Development teams must work together and break down the various requirements provided by stakeholders into smaller, simpler requirements so that they can estimate the time needed to develop them. As a result, it will be feasible to define an estimate of the planning of the various releases in collaboration with the stakeholders. Large upfront design plans and detailed documentation are of no use to agile practitioners. Agile approaches are people-centered, acknowledging the importance of skilled people and their relationships in software development. Sprint is the term used to refer to the timeframe needed to complete specific tasks or deliverables. Following this first analysis of time and costs to release the new features, the

customer must approve or reject the project and in case of rejection, the requirements analysis will be performed again to understand how to reach the customer's approval. At the beginning of each sprint, development teams will attend a meeting, known as a sprint meeting, where they will define updates to be made to the software, such as changing features or enhancing functionality in the next release together with the stakeholders The agile software development technique aids in the software development process tracking. According to Wysocky (2013), making a project progress agile necessitates daily or bi-weekly status meetings to keep managers up to date, who can then bring stakeholders up to speed, ensuring the functionality of the project and the budget supplied. Particular attention should be given to stakeholder management, which highlights the identification process, prioritization and communication with stakeholders. Seeking out as many stakeholders as possible and identifying them encourages the collection of different points of view and therefore new ideas. With this method, the number of stakeholders can be high, and it would be impossible for the software development team to satisfy everyone, but by being able to classify the different potentials and highlighting which ones need more attention, the development team can identify the way to communicate with each stakeholder. An example of another agile model is the SCRUM framework. SCRUM is a term retrieved from the game of rugby and refer to the fact that as in rugby Scrum relies on people with different responsibilities and competences that work together to achieve a common goal. This empirical model focuses on what can be done in the short term and split future work in smaller pieces in order to receive constant and immediate feedback on how the development project is going. Typical tools utilized by SCRUM software development team are the product backlog and the sprint backlog. The product backlog is a tool that consists of the main things to do in the project, with a prioritized list based on value and risk. The development team, by capturing as many requirements as possible on the current project, develops the solution, planning each identifying element in the product backlog and specifically including description, estimated effort required to complete it, ID, status and type. The product owner is responsible for maintaining the product backlog. The list of activities needed to reach the sprint goal is called the sprint backlog. It contains the sprint goal and milestone, the activities required

to meet each requirement, the hours expected to be required for each activity, and a burn down chart that reveals the status of the team's work during the sprint.
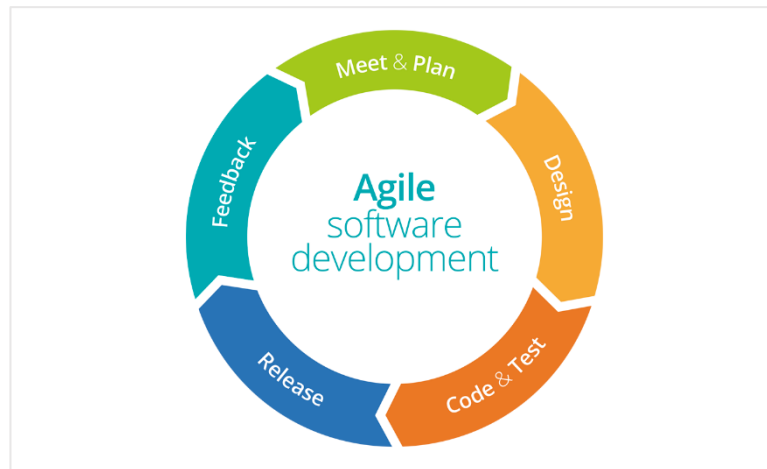
Figure 5: Agile software development

The techniques used by the agile philosophy can be easily adapted to numerous technological sectors, even very different from each other. The techniques inherited from this philosophy include rolling-wave planning, loose-tight planning and time-boxing (Cantamessa M., Montagna F., 2016). Rolling wave planning consists of developing a detailed program for the immediate future only and includes an approximate plan for the continuation and it is expected to be updated on a regular basis. Loose-tight planning consists of a strict planning of activities for certain areas in which the duration is certain and a looser planning for others. Time boxing, consists in split a project into regular times, called sprints. In this approach there are no delays, and project teams are required to report whatever results have been achieved.

Another approach developed in later years to cope with extremely large market and technological uncertainty is the Lean Development (Ward, 2014). Lean thinking was first introduced in manufacturing, developed by Toyota Motor Company. The main goal was to keep market and customer needs as the primary decision driver for development by making sure that they cared about what customer thought of their product. Together with this goal other objectives were empowering teams, reducing waste and optimize work stream. These principles were later inherited by many product development industries to reduce life cycle costs and increase efficiency and effectiveness through customer centric

development. Lean development paradigm developed by Allen Ward *is based on the idea that a firm can progressively fine tune its offering, by defining, developing and launching a minimum value product (MVP) as soon as possible* (Ebert, C., Abrahamsson, P. and Oza, N., 2012). By launching an MVP sooner in the market, the enterprise can test and fine-tuning the product collecting feedback directly through market response. The MVP will be continuously revised with respect to financial and marketing metrics through an ongoing interaction with the target customers. In case the continuous feedback from the market should be negative, the development team will be able to make a pivot, without the need to abandon the project, that is a substantial change or in the business model or to the product or service.
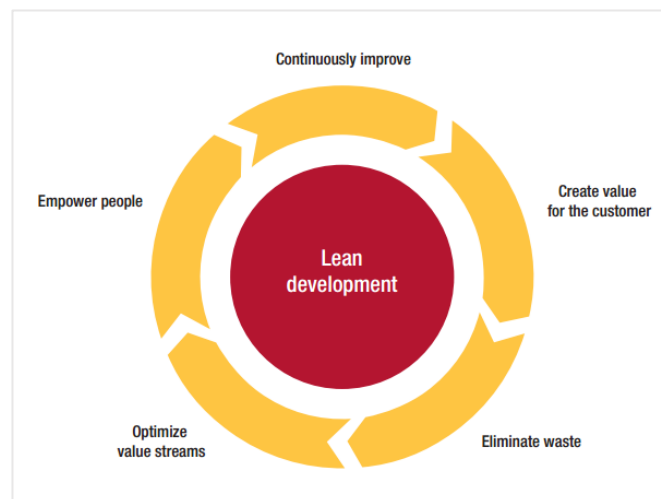
Figure 6: Lean development

1.2. Drivers of remote working practices' adoption

There are several definitions associated to remote working. The Cambridge English Dictionary describes it as *the practice of an employee working at their home or in some other place that is not an organization's usual place of business*. Usually, it consists of an employee that works outside of a traditional work environment, and it is often referred also as telecommuting or working from home (WFH). Remote working is not a new idea, historically, since the introduction and diffusion of means of communication such as telegraphs, typewriters and

telephones in the early 1900s, a minority of workers, belonging to categories of work with a high degree of autonomy began to adopt remote working practices as a form of work such as journalists and writers. In the mid 70's the first personal computer was invented and in 1983 the internet was born. As a result of the introduction of these revolutionary technologies, which allowed, considering the times, communication between very distant places in a relatively short time considering the period, the number of telecommuting employees increased significantly. In particular, it become a common form of work typically associated with freelancing, which was the most suitable type of work. Indeed, freelancing is characterized by high autonomy, and it is therefore easier to have a clear idea of the tasks to perform without being physically co-located with the organization for which the work is done (Oslon M. 1980). Freelancing is associated with different types of work, mostly with skilled services such as programming, marketing and consulting services. Moreover, since the 1990s, after the introduction of wi-fi, the improvement of information and communication technology, and the ongoing globalization, remote work involved also offshoring to low-cost global locations for office work such as work at call centers and software engineering centers.

In the last 30 years, in conjunction with innovations in the field of information and communication technology and the dissemination of increasingly powerful tools that facilitate their use, self-employed people and organizations have significantly increased the use of remote working practices. In 2021, the report published by the Organization for Economic Co-operation and Development reported that telework in the EU was increasing slowly in the 10 years before the Covid-19 outbreak. In fact, the percentage of teleworkers, as of 2019, that sometime regularly worked from home corresponded to 9%. Specifically, about 36% of self-employees and 11% of employees were using telework. As for the sectors that adopted this type of work the most, we find, precisely, knowledge and ICT-intensive services.
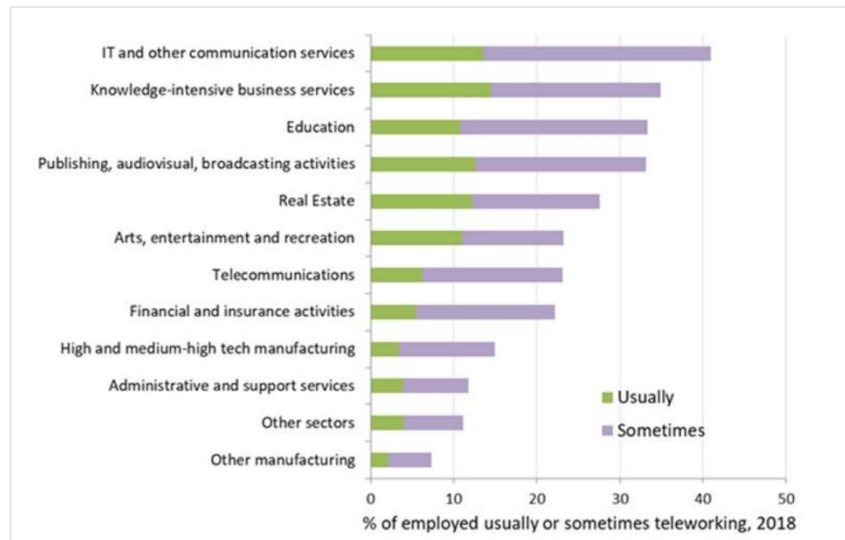
Figure 7: Prevalence of telework by sector, EU-27 (Milasi et al.,2021)

Figure 7 exhibits that remote workers working regularly from home (i.e. sometimes a week) in ICT services in 2018 were almost one out of two of the totals, reaching more than 40%. In the second position we find employees in the knowledge intensive sectors, followed by education, telecommunications, finance and insurance sectors. In practice, all those categories of work that can be carried out through the use of electronic devices such as computers or tablets, and information and communication technologies.

When a particular innovation is introduced in the market, a popular model used to represent it is called diffusion process. This framework studies this phenomenon by choosing a relevant indicator of the product or service under study and its improvement over time. The diffusion curve will not represent a linear process but *is subject to distinct and alternating phases of evolutionary and revolutionary progress* and will be represented by an s-curve (Cantamessa M., Montagna F., 2016). This is because the diffusion of an innovation will be characterized by an initial period in which research will focus on more technologies and applications and consequently the improvement in performance will be limited because of duplication of efforts and proliferation of technologies. Once the technology becomes established as a standard, the research effort will be cumulative and there will be a surge in the performance of the chosen indicator. In the end, once the technology has reached its intrinsic limit, the reference indicator will have reached the highest performance value and we will move on to the adoption of a new technology. To explain why some technologies

spread in the market and others do not, it is necessary to introduce the concept of technological paradigm, first presented by Giovanni Dosi. *A technological paradigm is a mixture of supply-side and demand-side elements that blend together in a coherent whole and give birth to a technological trajectory (i.e., the s-curve) that is at the same time viable for companies, and appreciated by the market* (Cantamessa M., Montagna F., 2016). In order for a technological paradigm to establish it is necessary that both demand needs and supply elements are met. Demand side comprehend elements such as needs, believes and objectives of society whereas comprehend complementors, suppliers, producers and research & educational institutions. Whereas supply-side elements refer to suppliers, producers, complementors and R&E institutions. In the next sections, with this process in mind, we will look at the main drivers influencing the work-supply side focusing on the preferences and behaviors of workers and in market and work processes that stimulate the work-demand side, in order to show the emergence of this mode of work as a standard for certain types of workers, such as those in the product development industry, and the subsequent importance of studying how it may impact the integration of new hires into companies. Specifically, we will present the urgency of using elements of remote work practices to enable collaboration across multiple organizations or entities due to complexity of carrying on today's products and services and the dynamic environment together with the need for remote collaborative product development (RCPD). Then the advancement in information technologies such as cloud-based tools or remote working software packages, hence the infrastructure allowing remote work, will be analyzed. Going forward, key benefits for individual workers and organizations will be presented. Finally, the unique condition of Covid-19 pandemic will be reported together with some data about the present numbers of remote workers.

1.2.1. Remote Collaborative Product Development

Focusing on industries that engage in product development activities, a number of factors are guiding the diffusion of remote working practices.

The increasing complexity that characterized today's products and services definitely play a major role. In fact, over the years, given the increasing need to satisfy specific needs and desires, product and service architectures have become more and more complex. Moreover, the need to commercialize products or services in a shorter period of time, given the competitive nature of global markets contributed to the demand for remote collaborative product development. In order to cope with this complexity, these industries are increasingly characterized by interfirm modularity. This term identifies the practice that *several firms are responsible for designing and developing the various subsystems of the industry's products* (Staudenmayer, N., Tripsas, M. and Tucci, C.L., 2005). The implication is that the product or service of a company require to interface or interact with other companies' services and products to provide value for the final customers. Using remote working practices for collaboration, in fact, firms can leverage on the expertise of different organizational entities and develop product components or service functions in parallel and hence shorten the time to market.

Lasser in 2003 developed a model known as Remote Collaborative Product Development for organizations to cope with this complexity and *expanding their product development capabilities to anticipate customer demands for mass customizations by sharing core competencies among partners*, which will be used to present below how organizations use elements of remote work practices to collaborate with other organizations to develop a product or service and the best practices for remote collaborative PD. Lasser pointed out that is not the distance between partners but the degree with which communication are synchronized and information is shared that define the degree of remote collaborative product development. The first driving force behind remote collaborative product development is the strategy to minimize time to the market. Being able to get a product on the market before competitors, particularly when it comes to innovative products, is a huge advantage. Different sites inside a company, various sites outside the organization, or a combination of the two are the three major forms of RCPD. The principle for this distinction is centred on intellectual property sharing. A collaborative company creates and disseminates expertise all over the world, joint databases and a heavy reliance on codevelopment are

key features of RCPD. The frequency of synchronization is determined by the number of collaborating organizations, the nature of work and the kind of innovation being managed. A fast changing market will involve more regular syncing cycles than one in more stable conditions. The organization's structure and its relations to external partners provide the foundation of a remote collaborative product development. Information exchange and co-ordination are the methods used to achieve RCPD. The model developed by Lasser is divided into three main areas: the cooperation layer, the infrastructure layer and the control layer. The cooperation layer refer to the way the distributed team works. The control layer houses the intellectual property book of knowledge, shared project information databases, data register of work activities and product documentation archive, that provide for all the actors involved to access updated information. The infrastructure links the two layers with a flawless mesh of components that include process, culture, web tools provider, metrics, and interactions, such as formal rules and procedures, data formats, access privileges, transfer methods, and how information is shared across partners and project team members. To define status and track progress across all parties, RCPD project management requires the constant update of crucial stages.

A shared identity is an instrument for facilitating collaboration and increasing communication. This bridge the gaps that exist between partners and build interfaces to reduce the barriers that stand in the way of progress. Each mutual identity between cooperative organizations is distinct since it connects the parties and specifies their interfaces. Open and honest information exchange is needed to design underlying principles and behaviors that contribute to the formation of good connections within members of the team. At the end of the RCPD development process's phase, a mutual identity is established.
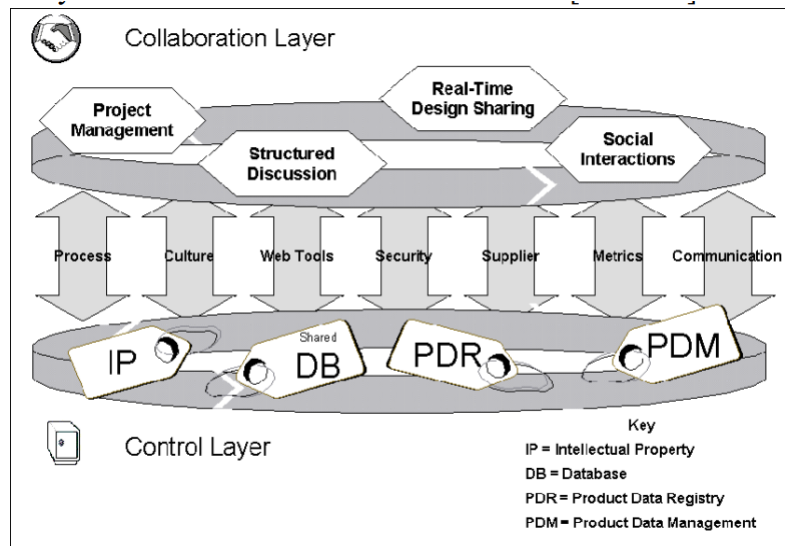
Figure 8: RCPD model (Lasser R., 2003)

The social identity will structure the layout of the shared workspace, including development tools, interaction patterns, analytics, and documentation formats. The advantage of developing a common identity is that gives the required structure for managing each partner's leadership position. The Project Formation process results in the selection of teams to develop the product of the market. According to the survey results collected by Lasser in 2003, when an efficient strategic structure mimics the product architecture, it strengthens this element of collaboration. The organizational priorities are the same. They streamline partner interfaces by aligning organizational roles and responsibilities with the product architecture's functions and modules. The partners in an RCPD system have their own versions and changes of the product development process that work best for them. Workflow determines the amount of handoffs (or transfers). As the number of handoffs is reduced, so is the time and expense. Through RCPD it is possible to exploit larger economies of scale, state-of-the-art technologies, and higher quality and expertise. Through the access to these complementary partner competencies, companies can develop and launch their products and services more quickly and offer total solutions to the marketplace. Firms have scarce R&D funds, hence, they need to focus on core competencies and need complementary competences. Example of adoption of RCPD approach can take the form of open innovation, co-development project, corporate venturing and alike. RCPD share

the risk and responsability among a firm and it partners rather than transferring them.

Open innovation is a business model that promotes collaboration with individuals and organization outside the company. Open innovation may be implemented through different practices, such as alliances between companies, crowdsourcing competitions or innovation ecosystem. Typically, the main goal of open innovation is accessing or developing competencies that are not possessed by a single firm. Through engaging in open innovation, firms may find applications for lost project that are not being deployed by the firm for a variety of reason or may acquire competences already existing in the market without utilized own resource to replicate it. Co-development, also called Comakership is another form of cooperation between companies. Co-development, unlike mergers and acquisitions, which are long-term collaborations, can be focused on one or a few initiatives. Typically, a company that needs to acquire abilities to develop one or more elements of a product in a short period of time uses co-development to form a partnership with another company to gain access to its skills. This form of cooperation, to mitigate risks on both sides, can take place in different contractual forms depending on the market and technology uncertainty. Revenue-sharing co-development requires that the supplier invests in R&D to develop the component needed by the principal, and the principal will share part of the revenue with the supplier by agreeing to a price that covers the investment costs plus an acceptable contribution margin. This type of agreement is unsuitable when there is a strong technological uncertainty because the supplier may not be able to develop the required component and therefore not recover the investment. At the same time, even in the event of market uncertainty, the supplier may find it difficult to repay the investment if the number of units sold is insufficient. Due to these risks and to the likelihood of post-contractual hold-up, an alternative is to use an investment sharing co-development agreement. In such an agreement the principal will pay the supplier's investment and then give the supplier for each unit the variable cost of production. this type of agreement brings risks with it especially for the principal because it is a principal-agent relationship, where it is not always easy to control the agent and moreover the result of the investment is not very appropriable; this type of co-development is unsuitable for projects

where there are uncertainties of market and timing. Finally, when technological uncertainty is the main risk companies might decide to use an innovation sharing co-development, planning to share part of the investment with the supplier (Cantamessa M., Montagna F.).

1.2.2. Improvements and investments in Information Technology

Diffusion of remote working is critically dependent on the diffusion of remote working tools. In fact, as outlined in the brief examination of the history of remote work, we noted that the adoption of this mode of work was closely linked to the diffusion and innovation in the field of information and communication technology. Technology is therefore the pivotal enabler that support remote working. So, below, we will take a brief look at the state of the art of these tools in order to get a clear idea of the current infrastructure available to remote workers. These include firstly physical devices, that may vary, depending on the type of job from personal computer to screens, tablets, electronic drawing devices and the like. Then you need the tools to quickly connect with your colleagues and business partners. At the first level, these include the Internet connection, which has a significant impact on the speed and effectiveness of communications. At the second level, there are tools that enable the creation of a digital corporate organizational identity. These include the infrastructure of the organization which comprehends for example preferred channels for secure and efficient communication between the company and its employees and corporate database such repositories, shared work folders that may enable collaboration both between employees and customers. Finally, we examinate the programs and software that allow the daily work to be carried out, which can vary from simple calculation programs, management software, document creators to more complex and customized ones.

Focusing on the diffusion of physical devices, remote tools are becoming the norm, even among non-remote staff (Lindson J., 2018) for all the type of work based on information and knowledge processing. Referring to the last two decades, many jobs can be done through the use of computers and a good

internet connection. In fact, even if the work is done in person, at the workplace, many organizations are accustomed to providing their employees with a personal computer along with other physical devices such as smartphones or tablets to perform the work. Moreover, it is quite a common practice, especially for large firms, utilized software communications tools even when you are in the same building of the person you intend to reach. Major advancements have been made in these physical devices, indeed, the computational power that we can find today, even in PCs or tablets, far exceeds what we could find 10 years ago. Considering then that the purchase price is much more affordable than they could be years ago with less power, it is easy to understand the spread and use of these tools in the work environment.

Regarding the World Wide Web, high speed connectivity is reaching more and more places, increasing remarkably the information bandwidth, connecting business partners and team members, co-located or not, through asynchronous and synchronous technologies. Thinking about, the early days of the internet, connection speed was an issue; in 1998 the best connection offered a speed of less than 60Kbps, which meant that downloading files, even small ones, was a time-consuming process. With the introduction of broadband and the consequent use of ADSL (Asymmetric Digital Subscriber Line) at the beginning of 2000s the connection speed had a great improvement, and it was possible to transfer large volumes of data at a much higher speed. The current evolution of connectivity is represented by broadband optical fiber which decisively improves the speed with which data is sent and received. In fact, the data transmission speed can reach about 300Mbps, 10 times the speed reached by ADSL which was characterized by about 30Mbps data transmission speed. Data report that fiber optic networks continue to spread around the world and in the period 2019-2020 more than 10 world markets covered at least 95% of residential buildings with fiber (Licata P., 2020).

As for the tools that allow the creation of the digital structure of a company and enable the organization to properly work through remote practices, there are numerous improvements made in this field. A network is a complex system of connections of computer devices through physical connections such as telephone lines, dedicated cables or radio waves in order to make the best

possible use of the available resources and to offer various communication services. In the last two decades, thanks to the rapid evolution of telematic technologies, there has been a frenetic expansion of networks both locally and worldwide. To create secure networks, organizations have several tools at their disposal to allow workers to securely access company information (Lavecchia V.,2020). For example, Intranet is a local area network (LAN) or a grouping of local networks, used within an enterprise for communication and access to corporate information, which can be restricted in the access. In practice it is an internal internet network, with features very similar to the internet, such as hypertext pages, links or e-mail to navigate within the structure of the company. In case part of the of the intranet is made accessible to customers, partners, or other people outside the organization, that part becomes an extranet. A more recent instrument, created at the end of the 20th century is the VPN (Virtual Private Network). VPN is a private network that uses a public network, the Internet, to allow computers belonging to the network to communicate with each other as if they were connected to the same server. The term "virtual" is due to the fact that computers are not actually connected only to each other, they do not have dedicated lines, but use a public structure such as the Internet. The VPN allows computers located in different physical locations to establish a private connection as if there were a virtual "tunnel" running between the public nodes of the internet. A VPN is therefore a particular network service that can be used to encrypt Internet traffic and, consequently, protect your online identity. Other invaluable tools for enabling remote work are remote desktop access software. This kind of tool allow remote workers to access a PC from another machine, even if placed in another building or even on the other side of the world, in order to control quickly and easily through a local network or the internet. For example, you can capture important files by using a PC in one office to access an operating computer in another office. This software must be installed on the remote computer (the host) and any other computer that you can use to access the host computer (known as the client). You can also use a powerful remote PC to handle complex tasks while showing results on a less powerful laptop. This kind of software are also useful for IT administrators, who can take remote control of a PC to identify and resolve any issues. Finally, among the many online services, cloud computing has fundamental importance. In fact, through this service it is

possible for authorized users to access shared resources available anywhere and accessible through different devices with an internet connection. It protects data and networks with backup services. Since it deals with online applications and data, it does not require special hardware compatibility, but a fixed or mobile device capable of connecting to the internet is sufficient. The available space and applications can be adjusted over time according to the needs of the user. This tool therefore allows multiple users to access the service and work on the same file simultaneously in real time. Cloud computing consists of saving files on remote servers instead of local mass storage to make them available on any device connected to the internet. Some of the most popular cloud services include Google Drive, Microsoft OneDrive, Dropbox, etc.

ICT provides a network infrastructure and services for remote collaboration. Using cloud computing-based tools it is possible to access multiple resources and programs provided by organizations that allow the daily work to be carried out, which brings us to the introduction of the last category of IT tools needed for remote working. Among the most used are:

- Productivity applications: among these tools we find applications such as word processing, spreadsheets, note takers, presentations, or task management, characterized by additional functionalities compared to the locally installed versions. In the storage space you can upload, download, and delete files and folders. There, you can share files and folders by defining access permissions to allow authorized users to view and/or edit documents. It is also possible to verify file versions because if several people can modify the same documents in real time, it may be necessary to restore previous versions. Among the most popular packages containing these productivity applications we surely find the office package developed by Microsoft, where we find well-known programs to all as Word, Excel, PowerPoint, etc.

- Communication tools: among the tools used for written communication, the most used tool remain e-mail services (i.e. Gmail, Microsoft Outlook). In addition, instant messaging programs have proliferated in recent years. Among the most popular are Microsoft Teams, Skype and Slack. These tools allow you to check the availability status and quickly exchange

messages with colleagues inside and outside your organization. In addition, video conferencing tools also play an important role enabling remote dialogue with others inside or outside the organization without the need to be co-located in the same room. Videoconferencing is the synchronous interaction of audio, video and data between two or more people and is a tool that allows people who are in different places to stay in touch for business meetings. Many advances have been made in video chat platforms, where an online environment is provided, the virtual meeting room (VMR), to conduct remote meetings while also being able to share related files or desktops and exchange messages via chat between individual participants. The most popular tools of this type are Skype, Microsoft Teams, Google Meets and Cisco.

- Shared online calendars: provide visibility into colleagues' schedules and facilitate the organization of meetings and gatherings. The online calendar is an agenda where it is possible to insert even recurring events. Once an event has been created, it is possible to send an invitation to participate to other people, usually by email. Examples of online calendars are Google Calendar or Microsoft Outlook Calendar.

- Online learning: consists in the use of multimedia and internet technologies to facilitate learning through access to resources, communication services and collaboration. Examples of these tools are Virtual Learning Environment, that is, a platform that offers content and tools for communication (email, chat, videoconferencing) and online collaboration and Learning management system, that is web-based application that provides the tools to administer the delivery of online training courses. Through these tools it is possible to provide services with a widespread distribution at a lower cost, simulate non-reproducible situations and repeat part of the lessons.

Allen in his work questioned the efficiency of utilizing ICT tools to perform product development activities. Since Allen published his work, about 30 years have passed and huge technological innovations have emerged in the field of ICT, partly exposed and summarized above; by studying the impact of remote onboarding new employees we will be able to question whether digital

technology has made more feasible for organizations to hire remotely and if the advances in video chat platforms, cloud-based services, and desktop virtualization have facilitated remote collaboration in Product development activities. It will therefore be interesting to gain some insights from the result of the survey on whether ICT have become robust enough to simulate face-to-face activities and interpersonal activities, overcoming the difficulties highlighted by Allen.

1.2.3. Benefits of remote working for employees, organizations and society at large

By focusing on the motivations that lead individual employee preferences to value remote work practices, some recurring factors were identified. In fact, from the worker's perspective, remote work can have different lifestyle's benefits. First and foremost, the time saved in getting to the work company location or work company partner, also known as commuting. Employees waste a lot of time on their daily commuting to and from the office, especially when living in metropolis; working from home or in other location different from the organization workplace, they can spend the time they normally dedicated to prepare and move to and from the office to be more productive. Moreover, remote work also offers an additional benefit which is that of flexibility; individuals may perform better at different times of the day and be more productive in hours other than the canonical working hours. When employees can work anywhere with internet access, they are able to choose where to do the work most effectively. Some employees work best in a home office or collaborative workspace, while others work best in a café down the street from their own home. In addition, another recurring theme is related to work-home balance, that is, employees need more independency and an increased equilibrium among work, family life and leisure. Telework could benefit households' stability, since often partners are forced in working at distant locations, for work's obligations, providing remote working solutions may help save some of the money (e.g., from dual renting) or increase work-home balance in savings time regarding transportation (Vartiainen, M., 2008.). Finally, remote work allows individuals to access many more job offers that no longer need to be limited by proximity to the city of residence. In fact,

among the reasons most often used by individuals to justify their distance from their native home is to move to the metropolis to get more job offers and access to the most cutting-edge companies. Through the introduction of remote working practices, those individuals who move to big cities for these reasons alone, might avoid making this sacrifice.

From the point of view of the organization, adoption of remote working practices has a number of benefits as well. Certainly the reasons presented above about employee preferences are valuable reasons for organizations as well. In fact it is in the best interest of organization to reduce employee stress by addressing the main preferences of their employees. Nonetheless, the main drivers remain the need for costs reduction and increased profitability. First, organizations can save the money that should be spent on utilities and other office supplies or those needed for expenses on real estate costs. Hence, reduce the need for office premises and transportation and the fixed costs linked to them (Vartiainen, M., 2008.). Some employers such as consultancy firms may eliminate dedicated office space as an entitlement, moving towards the assignment of office facilities as a resource to be allocated on an as-needed basis through various programs (e.g. 'hotelling', 'just-in-time' offices). Furthermore, reducing transportation, hence, decreasing traffic congestion and air pollution, organizations could cope with enivromental sustainability and associated governmental incentives. Finally, another important benefit is the possibility to access top talented employees, in fact, organizations will be able to hire someone who doesn't necessarily live within commuting distance. This way, organizations may enlarge the size of labor pool and become more inclusive also towards those individuals who are impaired in going to workplace (e.g. disabled workers) or those high-performing employees who ae perfect for the role but do not want to move from their present residence.

In conclusion by focusing on society in general, in light of the above, we may identify some advantages of remote working practice that benefit the society at large. In fact, though the wide diffusion of these practices correlated social advantages such as less traffic congestion, reduced energy consumption and polluting emissions from transportation costs can emerge. Additionally, interwined labour market such as the housing market, or the transportation market may benefit as well.

1.2.4. Unique condition of Covid-19 Pandemic outbreak

Although, as we have reported in the previous paragraph the diffusion of remote working was already spreading in several industries, the outbreak of Covid-19 pandemic in early 2020 caused an unprecedented situation. Indeed, the pandemic has caused millions of people around the world to work from home *leading to a de facto global experiment of remote working* (Kniffin et al., 2020), becoming the new normal in a very short time. Indeed, the Covid-19 pandemic has transformed the way businesses operate; in order to stop the spread of the virus governments around the world have implemented strict regulations such as lockdown and social distancing measures. As millions of people work from the safety of their homes, we have witnessed the creation of the largest-ever global remote workforce. IT teams have been relied upon to create work-from-home setups for entire companies, the role of IT teams in business continuity has never been more important.

The remote working practices spread with Covid-19 introduce some major differences with the "traditional" form of RW. In reality, whereas pre-pandemic remote working could have meant working from home or from a client's location once a week, during the pandemic, employees were compelled to stay at home for extended periods of time without the option of returning to the office. This may have caused together with the sense of being professionally isolated, recurring also in traditional RW, the sense of being isolated from social relationship in general by having daily less informal interactions, requiring organizations to cope with more anxiety feelings and loneliness and provide more social support. Furthermore, RW practices were more common to have place in different forms. Often some members of the team may have been co-located in the office whereas one or more other members working from home. Hence, we may have had different forms of dispersed team. The number of virtual interactions the firm's infrastructure should support and the risk securities issues to prevent and foresee increased exponentially, and with these the needs for administration of information security training to employees unused in this modality of work. A relevant number of organizations made substantial investments in digital tools and ICT. Data during pandemic reported massive expansion of remote working

practices, with estimates that vary from 40 to 60% of the workforce has been working from home (e.g. Bellmann et al. 2021). Furthermore, radical changes in supply chains and demand of customers resulted in a turbulent environment. A significant number of companies invested in digital technologies in order to allow employees to work from home, hence in secure networks, cloud web-based-tools and audio or video conferencing software. This pandemic find a number of business already committed to allow this form of work and others quite unprepared. In Italy, for example, the percentage of workers who worked from home at least several time a week during the pandemic increased from about 10% before the pandemic to about 40% during the first wave of the pandemic. Smart Working Observatory in 2020 estimated that during the national lockdown period (March-April 2020), 94% of public administrations, 97% of large companies and 58% of small and medium sized enterprises(SME) considered the possibility of remote working for 6.58 million workers, approximately one-third of employees. (Lodovici, M.S., 2021).

Figure 9: Share of population (18+) working from home before the Covid-19 pandemic and share of those who started working from home as a result of Covid-19 pandemic (%), (April 2020 wave), (Milasi et al.,2021)

The report produced by McKinsey Global Institute in February 2021 about the future of work after the pandemic stated that one of the trends accelerated by COVID-19 is that hybrid remote work is going to continue, indeed from 20 to 25 percent of workers in advanced economies in the computer-based office jobs are expected to work from home three to five days a week, about five times the level before the pandemic. This forced shift in massively adopt remote work has led companies, workers and policy makers to think in new ways to perform work and they are not expect to take a step back. In 2020 we saw a record number of high

profile companies announcing how they will whether remain remote even after Covid, like Dropbox Shopify and Twitter, or how they will become hybrid and more flexible in their approach of working from a specific location, like Facebook. MGI suggests that policy makers should focus on provide reliable digital infrastructure to allow more flexibility in the labor market by for instance removing barriers to worker mobility or equipping workers facing job transitions. *Remote working is not only becoming more ubiquitous because of the COVID-19 pandemic, the pandemic is just another reason for companies to embrace the trend (Lund S. et al., 2021).* There is strong evidence that both organizations and employees wants to retain elements of remote working, hence, it is of the maximum importance to study how RW practices impact the onboarding of new hires.

CHAPTER 2

As exposed in the first chapter, the adoption of remote working practices had already started long before the Covid-19 pandemic spread in the early 2020s in product development industry. As briefly reported, it is also important to note that the type of work currently occurring during the pandemic is not an example of the traditional remote work. The difficulties of day-to-day life are unique. The de facto global experiment of remote working occurred in the last 2 years, provided the largest-ever global remote workforce (Malecki, F., 2020), hence, it has given many practitioners the opportunity to study the various implications of remote working. Through the analysis of some of these studies together with previous literature on traditional remote working, primarily located in the product development industry, the main work implications experienced by remote workers were collected in order to understand the main challenges that may be experienced by new hires in product development industries. Then, the onboarding process will be studied in detail. First, the importance of the onboarding process and its key indicators of success will be presented in order to show why it is important to provide some insights on the impact of remote practices on it. Then, the process and its main phases will be delineated to collect the most relevant needs to be addressed for the newcomer to experience a successful integration in the new organization. This way, it will be possible to obtain the main areas to accurately investigate the onboarding experience of new hires, that will be used to developed the questionnaire that provide the basis for studying the impact of remote working practices on onboarding process. At the same time, hypotheses will be made about how new individuals are expected to have experienced onboarding with the introduction of remote practices, by virtue of the work implications collected on remote work.

2.1. A collection of remote working main implications

Four main areas impacted are detected in the adoption remote working practices: communication, coordination and collaboration, and connection to the team and

the organizations. This is caused by the change of habits experienced by the remote worker. During pandemic, due to government restriction to contain the spread of Covid-19, employees find themselves forced to engage in social distancing and in some periods, being confined to the home, except to meet essential needs. These conditions, impacted, among many other lifestyle's adjustments, the modality through which the work should be carried out, being physically isolated from the workplace, the team members and the customers. As a consequence, the way these people exchanged and transform information, as well as they collaborated, in order to perform work should take place through the virtual environment, which unavoidably resulted in different work implications.

2.1.1. Communication

The primary impact of the pandemic on work modality is that most employees who perform computer-based jobs were forced for certain period of time to work from home. As a consequence, they almost overnight find themselves at working in a completely different situation. Although many workers may have already had experience with remote work, the type of remote work introduced with the pandemic still had elements of novelty. For example, prior to the pandemic, working remotely might have meant that one employee worked somewhere other than the office while the rest of the team might be together at the workplace, whereas the pandemic necessarily meant that everyone worked from home. Working from home, the employees find themselves at having very limited physical space available, compared to what they could have in the office, and without the chance to utilize it to aid their day-to-day work. Being differently co-located, the first factor impacted in the performance of the job for the remote worker is the way they communicated with all the coworkers, within or outside the organization, and all the stakeholders involved in the development process. Colleagues need to communicate with each other for a variety of reasons, ranging from the need to exchange operational information for day-to-day work to an informal chat, for example, to share experiences or concerns about work situations or to take a break from work. In case of co-located development teams, communication can take several forms: online or offline, formally or informally,

synchronous or asynchronous, with several differences depending on the scope of the activity being carried out and the distance of the other working partner. The research conducted by Deshpande, Sharp, Barroca, and Gregory in 2016 on the remote working and collaboration in agile teams highlighted that information flows are impacted by remote working in the information's movement, transformation, hubs and buffers.

In terms of information movement, the study pointed out that whereas in a co-located office every unplanned activity, informal face-to-face chat or virtual interactions between coworkers contribute in information movement and transformation, for a remote worker the information flows is limited to the virtual environment. In the latter case, this implies that each exchange of information have to take place through virtual means such as instant messages, email or audio or video conferencing. Hence, the main difference between the two situations is that remote worker loose an important mean of communication, that is face-to-face interactions. As reported above, the Agile Manifesto relies on the principle that face-to-face conversation is the most efficient and effective method of conveying information within a team (Beck et al, 2001). Although major innovation in the ICT tools made possible for virtual communication to become as much effective as face-to-face interactions for conveying explicit knowledge, to date most of the times they are not as much effective as face-to-face to express tacit knowledge. The physical co-location favor information flows to be simple and open, which also allows for more implicit information sharing. On the contrary, in a dispersed team, information sharing must be more explicit. In virtual teams more of the knowledge being shared is of lower quality and less sensitive because it can be more difficult to share emotions, experiences and insights. The reduction in the quality of knowledge being shared can lower team performance and reduce members' intentions to remain on the team. Their findings indicate that in virtual teams increased knowledge sharing is associated with increased team effectiveness.

Regarding information hubs, for co-located workers they can be both physical tools such as the scrum board or the whiteboard for agile teams, in addition to the virtual project archives, while for dispersed teams physical tools are not available. Physical tools in development activities may be very useful because

they can help in effectively gather and display the most important and up-to-date information related to the project such as design changes or upcoming releases. For example, a common practice in agile development is the use of post-it notes to place in visible place such as white board to create reminders in carrying out activities such as brainstorming or to keep track of tasks. Remote workers cannot rely on this type of physical support tools. They can use electronic documents to take notes but most of the times these notes are for their own reference. Additionally, they have in their availability software tools (i.e., Jira for software developers) aimed at keeping track of the project process and display the main information such as release dates or design changes. Finally, within a co-located office product development team it is typical of agile practices to avoid excessive documentation and predilect an hands-on approach by using ad-hoc work-related conversations. Remote working, often require to explicit information by producing documents to summarize and define the main decisions in order for providing all the stakeholders to easily access information. Challenges experienced by remote workers sometimes refer to the proliferation of documents and versions or to the difficulty of retrieving the correct or most updated information that may be scattered throughout the project's virtual repositories (i.e., sharepoint, drive).

Area	Impact	Key differences from co-located work	Implications
Communication	Information movement and trasformation	Co-located worker may utilize face-to-face interactions, in addition to virtual tools. Hence, every exchange of information, formal or informal, contribute to its movement and trasformation.	• Reduced interaction space • Difficult to convey tacit knowledge • Information sharing needs to be more explicit
	Information hubs and buffer	Co-located workers they may utilize both physical tools or artfacts and virtual tools to store information. Remote worker needs more explicit information in order to store information for sharing it with the whole team	• Proliferation of documents and file • More time-consuming to obtain project related information

Table 1: Communication implications

2.1.2. Coordination and collaboration

Communication implications above described, required companies engaged in product development activities to organize work differently from the situation pre-pandemic, impacting on team's coordination and collaboration.

First, operationally, virtual presence only may result in reduced situational awareness of the project status and workload of team members. In an in-person office team in fact, members may have an additional situation awareness about project-related activities and events derived by the physical context (i.e. simply look around or make some steps to understand what is going on), through offline conversations and interactions, that remote employee cannot be part of in the same way. This reduced situation awareness may cause the remote worker to miss some key information about the project such as development or release most updated details or loose visibility of what is going on in other related streams of the project. In fact, while in a co-located office, employees be updated on the project status by seeing or hearing several things through informal office conversations with colleagues, for remote workers replicating these informal interactions may be more difficult. Furthermore, teleworkers who work from home are more usual to more virtually asynchronous interactions. Hence, they are prone to receive more interruptions in the normal performance of a task than when in the office. They may experience delaying in retrieving particular specifics or clarification about work-related tasks, experience difficulties in finding who the owner of the information is or in reserving some time for organize a virtual meeting. Software tools such as Microsoft Teams, Skype, virtual calendar, allowing scheduling video conferencing meeting and showing coworker status (i.e., available, in a call, presenting) helps in improve visibility of coworkers and business partners. Now, the reduction in situational awareness does not represent a problem in jobs characterized by high autonomy and loose coupled activities, but it may when the work is tightly coupled with the one of others, where there is a close and continuous collaboration between the team members, that is the case of agile product development. Koehne, Shih, and Olson, J.in their study conducted in 2012 found out that visibility within the team and the company was a common concern for all the participants in the study. Since remote workers cannot have access in the typical office conversations, he suggested that remote workers, in order to increase visibility, should learn to communicate the actions that would be observable in a collocated office work context and that they should be supported by explicit social processes. Examples of tools proven effective to increase situational awareness in remote collaboration are video portals, that are always-on video that connect two or more different locations (Karis, D., Wildman,

D. and Mané, A., 2016). Those tools indeed help to maintain common ground between team member, hence an easier and more open communication, reason why they are referred as *embodied social proxy* (Venolia et al., 2010). Their effectivity is however highly related to the size of the team and the nature of the works.

Secondly, another recurring theme is linked with workers' horizon of observations. Face-to-face interactions are often described as a tool characterized by higher bandwidth communication than other forms of interactions. In fact, they are more suitable for sharing context-related or tacit knowledge. A development team co-located in the same office will engage in much more informal communication than the formal one, since it is quicker and more effective for problem resolutions. Inevitably the physical distance presupposes a greater premeditation in the exchange of information with the colleagues since, by eliminating the casual conversations that can happen of the corridors of the workplace, it presupposes that the worker clearly knows who to contact and explicitly uses one of the virtual methods available in order to contact them. This often result in a dual outcome: first conversations are more formal and task-specific, second, remote worker is less involved in the overall development process and it is more common to be contacted only when the resolution of the task depend on him. As a direct consequence, the remote worker's horizon of observation is often defined as limited and focus only on the information available through his software tools.

The above-mentioned key implications on coordination and collaboration certainly impact on remote worker workload and productivity, both in positive and negative way. Focusing on productivity, among the potential advantages we find that, often being involved only when their contribution is strictly required, help them in focusing on the task in hand. Furthermore, the lowered number of interactions with coworkers stimulate the remote worker in make the most of opportunities to exchange information with colleagues*, there is something about the idea that the other party can disconnect and disappear at any moment that stimulates productivity* (McReynolds et al., 2020). On the other hand, among the potential disadvantages experienced by the remote worker, we find that the decrease exchange of tacit knowledge translates in reduced learning, that, in

turn, especially for unexperienced worker, affect productivity. Productivity will therefore be certainly impacted, although the severity of the positive or negative impact depends on a number of factors, such as the experience of the worker, the nature of the work, and personal traits of the worker such as self-confidence. Shifting now the attention on the impact of remote working in the employee's workload we can notice as for productivity, different impacts. When working from home, working hours may be blurred; as they no longer have to go to the workplace where there is a defined start and end time, lunch break, and where all colleagues and supervisors in the team have mostly visibility of each other's workloads. This can result in two harmful outcomes for both the organizations and the employees; some individuals, depending among other factors on personal traits, may decide to procrastinate tasks and end up working less than they would have in a co-located office. Others, on the other hand, may face greater stress in having to manage their visibility and coping with interruptions by e-mails, calls, and virtual meetings, thus resulting in high workload and higher than normal working hours, hence higher stress for the worker that on the long term may traduce in the employee leaving the organization.

Finally, another factor affecting coordination and collaboration regards monitoring and performance evaluations. Typically, monitoring with RW practices is more difficult for managers and supervisors than in a co-located office environment since there is not the possibility to check the work of team members by looking over their workstations. Remote worker may experience greater concerns in comprehend whether their effort and contributions are represented correctly in the eyes of managers or supervisors and team members. Thus, remote workers may fear that their performance is not correctly evaluated, since the outcome of their work may not directly be observed by the management chain. In order to address this problem, it is important that organizations foster communication between employees and managers or supervisors through the scheduling of frequent meeting to allow the actors involved to share feedback in both directions. Others solutions could be changing the metrics for evaluating remote workers' performance, such as evaluating the results of their work rather than on the hours spend on the project.

Area	Impact	Key differences from co-located work	Implications
Coordination and collaboration	Situation awareness	In an in-person office team, members have, through the physical context, a number of informal interactions and visibility that remote employee through virtual tools cannot be part of in the same way.	• Reduced awareness about project-related activities and events • Need for more explicit social processes
	Horizon of observations	Office team through the physical context has higher bandwidth communication	• Less involvement in the overall development project • Task-specific conversations
	Workload and productivity	Starting time and ending time of work as well as lunch break less strict for the remote worker Less distractions from coworkers in remote working Less informal interaction for the remote worker	• Procrastination or work-aholic • More focus on task in hand • Hindered learning
	Monitoring and performance evaluation	Less monitoring than in a co-located environment, results of remote worker may not directly observed by the management chain	• More effort required for showing the management the outcome of their job

Table 2: Coordination and collaboration implications

2.1.3. Culture and team connection

Product development is a process highly interdisciplinary and cross-functional, hence, it is fundamental that the employees involved in the process are able to communicate fluidly and collaborate in order to deal with the complexity of the activities to perform. Many practitioners highlight the importance of trust within the organization to increase collaboration and communication. The trust placed in colleagues is considered one of the most determinant factors of performance within an organization. It plays an even more important role in remote working, where a greater trust within the team and organization result in a more shared understanding and cohesive team. Trust is an indicator of the employee connection to co-workers. Thus, successful social and professional relationship are associated with higher level of trust. Trust can mitigate most of the above mentions RW mitigation.   In fact, for remote workers that have built successful professional and social relationship with their coworkers is easier to work using virtual communication tools and successfully work remotely. Firstly, the reduced situation awareness and horizon of observation are less relevant for coworkers who have a common understanding, shared vocabulary and work processes, since they need less clarification and have a more clear idea of what their coworkers' diligence and modus operandi. Furthermore, they are more comfortable in asking for help or support with particular work tasks, without "fear"

to interrupt their coworkers when needed. On the other hand, an employee who receives a request for support from a trusted colleague is more likely to help diligently. For example using communication tools other than audio or video conferencing such as email, it may be more likely they will be more responsive. Finally, trust give team members the confidence to make key decisions and in the resolution of conflicts. The most effective method to increase trust within individuals remain face-to-face meeting, in fact building trust only with the use of virtual tools is more difficult and take more time for people who do not know each other from past experience. Shared prior experience, hence help in working remotely (Olson, Olson, Voida, 2010).

The recurring theme of social isolation experienced by remote workers may create an obstacle in developing connection to teams and organization. Individuals, individuals may feel socially "distanced" from their colleagues. The reduced informal interactions impact workers' emotional status. Given the atypical situation derived from Covid-19, which led to the introduction of distancing and social measures and for certain periods to the national lockdown, the overall number of social interactions of a common individual usually had has substantially decreased. Thus, they may feel feelings of anxiety and social loneliness, in addition to the professional loneliness that can characterize traditional remote work. Hence, social connection with colleagues have further importance for remote workers during Covid-19, since it could led to overcome loneliness. The impossibility of casual encounters that can occur in the day-to-day running of work in the workplace in fact reduces interactions with team members and the organization. This, as a result, can lead to develop lower connection with the team and the organization. Organizations should therefore direct their efforts to providing remote workers with adequate social support by increasing interaction spaces.

Area	Impact	Key differences from co-located work	Implications
Culture and team connection	**Trust and social support**	Formal communication outnumbers informal one for remote workers.	• More time needed to create successful relationship with coworkers • More difficult asking for help • Increase need for social support from the organization

Table 3: Culture and team connection implications

2.2. A review of Onboarding Literature

"Onboarding" is the period of time when new hires become familiar with the new organization's culture and value, the job role and the team. At the end of this process the newcomers are expected to know that to do. *It is the process through which new employee move from being organizational outsiders to becoming organizational insiders.* In this period the new employee should learn the knowledge, skills, and behaviors they need to succeed in their new organizations *(*Bauer, T. N. & Erdogan, B., 2011). Originally, the term onboarding referred to the orientations of managers and executives (e.g., Gordon, 1999), but over time its meaning has become much broader and now refers to all practices and programs set up to help the adjustment of all type of new hires in the company. Onboarding is therefore aimed at helping all new hires to adjust in their new jobs quickly and smoothly. Hence, it is of the most importance for organizations to assess which onboarding activities perform and in which manner they should be delivered to new hires. Indeed, there are many ways through which organizations can set up onboarding programs, that can vary both in term of formality and in term of from being structured and systematic to unstructured comprehensiveness.

In general, we can distinguish two pivotal approaches adopted by organizations for onboarding. The formal approach involves the use of an explicit organizational plan, which may consist of written policies and procedures aimed at making the new resource fully functional within the organization. The informal approach to integrating the new resource into the organization does not require the use of

predefined procedures but involves the new worker learning about his/her new job and workplace without an explicit plan (Bauer, 2010). Research shows that the implementation of formal onboarding through procedures and policies that help an employee in adjusting to their new role and to the norms of the company are more effective than those that do not (Bauer, T. N., Bodner, T., Erdogan, B., Truxillo, D. M., & Tucker, J. S. ,2007). In fact, with the implementation of a "sink-or-swim" approach, that is when organizations choose to provide little or no support to the new hires, they may struggle in figuring out how they should behave in the new workplace and what is expected. Human Resources' departments should cooperate with managers in order to evaluate which approach may be more appropriate to help the new hires in achieving productivity as soon as possible. In practice, organizations will have different degree of formalization of their onboarding programs depending on a number of factors, such as size and structure of the organizations, the type and purpose of the activity, the scope and timing. The organization should try to adapt the onboarding process according to the new employee's specific role in order to help the new employee gain a better understanding of their role in the larger context.

Considering what has been said on the major role played by tacit knowledge in product development activities and the difficulty that may emerge in grasping it from the adoption of remote onboarding practices we expect that formal onboarding practices are associated with a more positive onboarding experience, especially for remote worker. Given the less informal interactions caused by the use of virtual tools to connect with team members and the organization, highlighted in the first paragraph, Indeed, an explicit organizational plan to integrate the new hire containing measurable, role-specific, and achievable goals may favor their interaction with the organization which, in turn, may help them in detecting norms and unwritten rules of the organization (Luvas & Handal 2015).

It is important to distinguish onboarding from organizational socialization. In particular onboarding, as aforementioned, refer to all formal and informal practices and policies enacted by an organization to facilitate the adjustment of new hires, whereas organizational socialization is the process that occurs within the new hired and takes place when the individual learns to adapt to new jobs, roles and culture of the workplace (Fisher, 1986; Van Maanen & Schein, 1979).

Usually, the onboarding process include the initial orientation and the following three to six months, but the time frame varies greatly from organization to organization. Krasman in 2015 reported that, although literature states that onboarding place should be performed over several months most onboarding processes take place within a very short time frame. *The onboarding process does not end after the new employee's first day* (Krasman, 2015) but, on the contrary, the first three months are of the most important to the decision of the new hire to stay in the organization (Bauer 2010). Moreover, it is of major importance not to overwhelm new employees with too much information but share all the relevant information in a smoother approach. Indeed, new hires learn new things at different rate over time (Ashford et al, 2007) and consequently change their information seeking both in terms of sources and content accordingly (Chan and Schmitt, 200), highlighting the importance of considering temporality. Klein and Heuser in 2008 introduce the concept of providing information on a just-in-time basis, that is, delivering information to newcomers when it is most salient; this should result in more effective understanding and learning. It is therefore important that organization, through onboarding practice, provide the necessary knowledge to new hire in the right order, for example basic information should be delivered at the beginning of the employment whereas more in-depth information later in the process (Krasman 2015). Organizations therefore need to decide on the optimal time frame for their onboarding process and take advantage of the time between the completed recruitment process and the new employee's first day (Bauer 2010).

2.2.1. Onboarding Process

Onboarding can be summarized as a broad concept that includes many different activities and it begins the moment an individual signs the employment contract (Bauer, 2010). There are several frameworks that try to capture the primary purpose of the onboarding practices. Among the most famous there is the one known as the Four C's model, developed by Bauer. This model identified four different categories in terms of scope and content: compliance, clarification, culture and connection. Compliance refers to teaching new hires basic legal,

rules of conduct and policy-related regulations. Clarification consists in ensuring that employees comprehend their new jobs and the expectations placed on them. Culture delineates the need to provide employees with both formal and informal organizational norms and values. Finally, connection refers to the interpersonal relationships with colleagues and information networks that new employees should establish. According to Bauer, the overall onboarding strategy of an organization is defined by the degree to which organizations leverages on these four building blocks. The strategy can be divided in three different levels: passive onboarding, high potential onboarding and proactive onboarding. The first one mainly includes the compliance category, a review of formal rules and policies and partly the clarification structure. High potential onboarding refers to processes in which beyond the compliance and clarification categories that are well addressed also culture and connection are included to some extent. In the last strategy all four categories are fully addressed.

Another framework of relevant importance is the one developed by Klein, Polin, and Sutton (2010), which states that onboarding process consists of three major categories inform, welcome and guide. The first category is aimed at transferring information, materials and know-how to new hires to help in the integration and to provide newcomers with realistic job preview. Considered the wide scope it can be further split into 3 sub-categories: communication efforts, providing resources and training. Communication efforts consists of the many types of information and feedbacks provided by coworkers such as supervisors, mentors and team members to help the newcomer in understanding the job role and in accessing social networks necessary for social integration. Providing resources' building block comprehend the provision of materials such as equipment and workspace required to perform the job. The last sub-category consists of all the practices aimed at *helping newcomers in the acquisition of knowledge and skills related to their positions.* Newcomers benefit both from observing or shadowing one or more coworkers for some time and receiving on-the-job training (Klein et al., 2010). Overall, inform category provides an initial form of socialization but is not sufficient to give a complete understanding of all the things the new hire needs to know. Welcome activities have the main goal of promoting team building. In order to do this organizations should provide opportunities to newcomers to

socialize both with their core team members and with key individuals that may favor the integration and the creation of networks. The last building blocks comprehend all the activities aimed at navigating the newcomer in the transition such as assign a coworker to work closely together and provide an initial reference for guiding the new resource. Among the employees that could provide a guide for the newcomer we can find collegues from HR department, team members or supervisors and mentors.

In the following sections, starting from the two models described above, the main variables of interests that impact the newcomers' experience during the onboarding process will be delineated. This way it will be possible to extract the area to investigate the differentials between new hires onboarded remotely and the one onboarded on-site. In particular the main challenges will be explored studying three different phases of interest: recruitment, pre-boarding and on-boarding.

2.2.1.1. Recruitment

Although the onboarding process starts after the new employee has signed the contract, the recruitment process also plays an important role in the final goal of a successful integration of the resource, and it is worth exploring the most important purposes of this phase. *The recruitment is the process of analyzing the job requirements and then finding the prospective candidates who are then encouraged and stimulated to apply for the job in the organization*. Organizations spend a lot of time and resources on implementing the recruitment process and choosing the right candidate. Therefore, the recruitment process should be seen as the first step in an onboarding process, where a better recruitment process correlates with higher organizational commitment. By integrating the recruitment process as part of the onboarding, employees can understand the organization and work tasks. This facilitates the new employee's conditions for adaptation in the business, above all by strengthening the employee's belief in its own ability, understanding of the organizational culture, and improving perceived clarity in the role (Bauer 2010). These parts are of great importance for the new employee's success in the new workplace (Bauer & Erdogan 2011). Therefore, in this phase, part of the clarification and culture categories derived from Bauer's Four's C

model should be addressed as well as part of the inform category derived from the model of Klein, Polin, and Sutton.

From the organization point of view, a proper recruitment process should be focused on choosing the right candidate. The first step in the process should be determine the job requirements, hence, the required competences, skills, experiences and knowledge that an employee need to correctly perform in the job position. This way using or the organization's website or employment-oriented online services (i.e., Linkedin) the companies can display a proper preview of the job position and attract the right types of candidates. Thereafter, during inter cognitive and selection interviews the HR resources and/or the supervisors should assess the candidates' fits. In this phase, it is very important to both evaluate the technical skills required for the job and the cultural fit. The interview process should be developed depending on the type of job position offered. Internships' interview process may be more focused on assessing soft skills, such as personal traits or educational paths, whereas senior role's one may be developed on testing more deeply the previous knowledge and competences. Hence, the recruitment process should be contextually dependent and present different degree of competences' testing activities. Furthermore, the candidates should be provided with realistic job previews (Morse & Popovich, 2009). Secondly, the recruitment process should be seen as a first opportunity to introduce the organization value and culture. The recruitment process is an important part of the onboarding, which makes it reasonable to believe that this is the *organization's way of creating an early understanding of the organizational culture and the organization itself* (Bauer, 2010). A successful start and a commitment to the organization will later result in employees being satisfied in their role, thriving within the organization, and internalizing the organizational culture and embracing it (Bauer & Erdogan 2011). It is therefore important choose individuals who are perceived to fit into the organizational culture.

From the side of new hires, it is of the most relevance that they feel that there is an open and clear communication on the part of the organization, in order to avoid ambiguities in what the work role entailed. If participants gained an understanding of the organizational culture early in their recruitment process, it can be seen as something that facilitated the conditions for adapting to the organization when

taking on the new role. Moreover, considering the time candidates invest in finding the right job they should be provided with realistic job previews. In conclusion, it is important to give a candidate a realistic picture of their future work tasks and workplace even before the employment. This way it will be possible, that the expectations they developed of their professional role and the organization beforehand corresponded to the reality. New employees who experience role conflicts may find it difficult to perform at work and for this reason it is important to give the candidate a realistic picture of their future work even before the employment (Bauer 2010).

In the developed questionnaire we will therefore investigate the recruitment process. In particular whether the new hires were satisfied with the presentation of the organization, the assessment of their competences and finally if they were provided with realistic job expectations.

Given the reduced situational awareness and horizon of observation of the new hired remotely onboarded, we expect that there will be an increase in the divergence between the expectations the new hires made of their professional role during this phase and the reality.

Phase	Activities	New hires challenges & expectations	Onboarding objectives
Recruitment	**Job description and interviews**	Understand the job role & reasonability's Understand the organization	• Provide realistic job previews • Find the right cultural and competences fit

Table 4: Recruitment process objectives

Hp1*: Remote onboarding practices has a negative impact on the recruitment experience.*

2.2.1.2. Pre-boarding

The time between the contract signing and the new employee's first day at work is a critical time where the days in between can be filled with stress and uncertainty. During this period is therefore important to provide new hires with

materials or assistance. In particular, organizations should deploy this period of time to further provide information on the organization and the work role to the newcomer. Hence, clarification and compliance categories of Bauer model should be addressed or the inform, especially the part concerning providing resources, and welcome category of the model developed by by Klein, Polin, and Sutton. The new resource should feel supported by the organization and be provided with help, if needed, on carrying on the burocratic paperwork and activities. Examples of good practices are reserving preferred channel such as organization hotline to new hires in order to contact HR department or other corporate functions to ask for support or clarifications. In order to mitigate the stress and anxiety that may characterized this period he or she should be informed about the various step through the first day and the kind of support and assistance available. Hence, the organization should provide employees with a timeline of when they can expect to hear from the organization and what the new employees should do to prepare for their new role (Krasman 2015). For example, they could provide written onboarding plan or roadmap to new resources that lays out that lays out objects, timelines, goals roles, and responsibilities. From the perspective of the functional area or project team into which the new hire will be placed, they should be alerted to the period in which the new resource will be introduced so that they can prepare for how their roles will need to relate to the newcomer and how they should work together in the future. This type of activity is very important especially with remote work, where, given the limited situational awareness and the narrow horizon of observation, colleagues may not notice the newcomer or take it for granted that they have already been welcomed by others, especially when the team is composed by a large number of members. Research exposes the importance that the first day on the job plays on the new hire's experience. Krasman affirmed that the first day in a new organization which will affect the individual's perception for many months forward, hence, organization should strive to create a pleasant and memorable first day as possible. In order to create a first good impression, the organization should prepare the newcomer's workstation prior to the first day of work. Klein et al. (2010) found that a common practice in this category that is viewed by newcomers as highly beneficial is having their workspace ready for them (including all supplies, materials, and equipment) prior to new employees' start date. On site pre-boarding required the

organization to prepare the physical environment in which the new resource will be able to work, together with the devices needed to perform the job tasks. During remote onboarding it is of equal importance, if not greater, set the new hires' workstation prior to the first day of work. In fact, while in face-to-face work in the workplace, newcomers can still communicate with colleagues even without a properly functioning workstation, in remote work the workstation and the tools made available by the organization are the primary means of communication. Hence, the recruit should receive the necessary devices and be able to prepare, with the support of the organization where necessary, all the equipment required to carry out the work and the user configurations before the actual start of work so as to mitigate the anxieties which, as mentioned, can characterize this period.

Several practitioners underline the potentiality of using technology to facilitate onboarding in a variety of ways. For example, in this phase, onboarding can be facilitated by information systems programs by providing valuable information on new hires' status, coordination and tracking of progress. They provide means to ensure the open communication is maintained for all the time period through the first day. Programs can also have built-in compliance checklists and send e-mail prompts to assist with legal and policy compliance and to verify that onboarding activities are occurring when they should, both before and after the start date.

Phase	Activities	New hires challenges & Expectations	Onboarding objectives
Pre-boarding	Prepare for the first day	Prepare the documentation to be ready for the first day	Support new hires with legal and burcratic paper
		Knowing useful info's such as when to expect to hear from the organization, reference contacts for support	Support new hires with workstation settings
		Receiving instructions for the first day (es. remote worker need to set up of the workstation, devices, Credentials, configuration of the User in the organization)	Provide information and support on what should be done to prepare for the first day to reduce stress and anxiety

Table 5: Pre-boarding process' objectives

In the survey it will be important to study this phase to explore whether the new employee receive a proper support from the organization in the arrangement of the bureaucratic paperwork necessary to enter the company and in the preparation of the equipment required to do the job. In addition, the preparation of the workstation at the correct timing should be investigated. Remote

onboarding increase risk for new hires to experience delay in both receiving support from the organization and prepare the workstation for the very first days.

Hp2: Remote onboarding practices has a negative impact on pre-boarding experience.

2.2.1.3. Onboarding

Collins dicitionary define socializations as *the process by which people, especially children, are made to behave in a way which is acceptable in their culture or society*. We can distinguish two different level of socialization; the primary level refers to processes within which individuals learns to adapt to family and society and provide the basic perspective; the secondary socialization consists in applying the basic perspective to a new context, for example when a person starts working in a new workplace or when they need to adapt to new social norms. The secondary type of socialization allows the individual to acquire new interpretations, unwritten norms, and tacit knowledge and specific new context knowledge. *It is about learning the actions, behaviours and communication patterns that exist* (Berger, Luckman & Olsson 1999). By definition, socialization is therefore a process strongly connected with learning and that is always ongoing, although it may require greater effort in the initial phase of the introduction in a new context. Nielsson et al. in 2018 delineated learning as a process that can be seen both as a pre-requisite, but also the outcome of the socialization.

Whereas onboarding refers to the practices implemented by organizations to integrate a new resource, socialization refer to the process through which the new hire develops and acquire behaviors, knowledge and attitudes to successfully participate in the new organization (Van Mannen & Schein, 1979). Practitioners' articles focus on the importance of implementing effective onboarding practices for the organizations. In case newcomers fail in this process they could struggle in becoming part of the new context. Lauvas & Handal in 2015 highlighted the importance of learning the unwritten rules and norms of the workplace, referred as informal professional socialization, in addition to the professional skills or formal professional socialization. Formal professional socialization refers to the learning of the job role for which one has been hired,

hence developing the competences that enable the correct performance of tasks and understanding of role responsibilities. It is therefore related to individual learning and refers to all concepts, notions and technical or functional skills necessary for the proper performance of the work. On the other hand, informal professional socialization refers to the integration of the new hire into the core team and culture of the organization, through learning of the behavioral patterns and opinions that prevail in the company. This second type of professional socialization places great emphasis on the importance that coworkers such as mentor supervisors and team members, referred also as socializing agents, have in providing newcomers with different types of information, hence, in the training of the new hire. In fact, by providing information and feedback these agents help newcomers in making sense of the role and in developing their identity in the new organization (Sluss & Ashforth, 2007; Louis, 1980). Moreover, they can provide very important support in helping the newcomer accessing to social networks, essential for their integration in the organization. Both of these components of professional socialization are critical to the successful integration of the new resource. In fact, the lack of either component may result in the inability or difficulty of the newcomer to perform his or her job. Organizations should therefore aim at favoring both type of learning since they complement each other.

Organizations' onboarding programs to facilitate learning the job role and main tasks of new hires, thereby fostering formal professional socialization, can take many forms depending on the complexity and the specificity of the role undertaken. A lot of papers highlight the importance of providing effective training, designed on specific needs of new hires, depending on the context these are placed in, to maximize learning and retention (e.g., Barbazette, 2011). They can vary from simply providing various sources such concerning projects under development, context and industry documents, to structured courses to develop technical and functional skills, company specific language, which can be administered either by peers or via digital platforms. The progress and innovations in the field of ICT have been very important in this sense. In fact, more and more organizations decide, especially large ones, to train new employees through the adoption of virtual learning platforms through which it is possible to provide training courses that can take the standard form of video

teachings or more innovative forms of interactive games and simulations. Among the major benefits, we find that the digitization of training processes frees up time and resources for those types of activities that do not necessarily have to take place physically or in real time, which translate in economic terms into lower costs. Moreover, organization could revise and update the technical training based on the feedback received by employee performing the course in order to meet their need more accurately. On the light of the major developments and investments made in ICT, we hence expect that formal training will be positively impacted by the use of remote working practices.

Hp3*: Remote onboarding positively impact new hires formal socialization.*

However, an onboarding program which is based only in providing information to develop the technical skills of the newcomer is not enough to make them fully understand the role and organization. Bauer and Erdogan in 2011 highlight the importance of face-to-face interactions for increase learning for new hires. Indeed, they affirm that increasing the opportunity for socializing, by favoring interactions with coworkers and the creation of informal work relationships, provide more valuable outcomes for the long run of organizations. For organizations to convey the informal professional socialization is necessary they provide opportunities for the interaction and talk of the new resource with coworkers, referred as interaction space. In the case of face-to-face working in the workplace, larger interaction spaces could be created through the use of solutions such as office layouts that allow interaction with both team members and those outside the team through, for example, open spaces. In addition, areas used by employees during breaks such as cafes, coffee shops and recreational areas can help to increase interaction space and therefore networking. From articles of practitioners, it is clear, on the other hand, that is very difficult for organizations to convey this informal professional socialization through digital interactions and organizations should focus their effort in replicating this kind of interactions' spaces in virtual environment. In fact, make contacts and build networks when onboarding takes place remotely may result more difficult. New hires may encounter difficulty in building good relationship with coworkers both within the core team and especially outside. Some research shows that in a remote working environment it is more typical that an employee may be involved

in the resolution of a problem or in the generation of a solution only when his direct contribute is needed This, in turn, may influence the new hired performance of the job. In a co-located office instead, as pointed out above, a lot of informal interactions may take places with different team members given the rapidity and easiness in exchanging informal chat and opinions. New employee may feel uncomfortable in interrupting a coworker considering the limited situation awareness and horizon of observations. Indeed, isolation between teammates due to the nature of remote work, scheduling difficulties, the lack of running into peers in the hallway may impact the newcomer integration in the team and organizations. This, in turn, may influence the new hired performance of the job. Finally, another major challenge that should be addressed by onboarding practices is that they should reinforce the acquisition of the organization's culture. The knowledge exchange theme in fact can be also linked to the way new employee can adapt to the organizational vision and values, that refers to the understanding of the rules or principles that maintain the integrity of the organization. With the adoption of remote onboarding practices conveying to new employees organization's vision and values may be more difficult since the social distance may threaten the feeling of belonging to the organizations. Therefore we expect that new hired through remote onboarding practices will experience more difficulties in engaging in informal professional socialization.

Hp4*: Remote onboarded new hires will encounter more difficulties than co-located new hires in being aware of their professional performance.*

Hp5*: Remote onboarding practices negatively impact new hires' performance of the job.*

Hp6*: Remote onboarded new hires will experience a lower connection to the team than the ones onboarded in a co-located office team.*

Hp7: *Remote onboarded new hires will encounter more difficulties than the one onboarded in a co-located team office in detecting organization's norms and value* and *will experience a lower degree of attachment to the organization than the one onboarded in a co-located team office.*

Organizations should therefore focus on delivering orientation programs, that are, *formal training programs intended to introduce new employees to the*

organization and the people that make it up (Klein & Weaver, 2000), in order to increase informal professional socialization. These kinds of programs can be administered in different forms remotely, varying from more general orientations meeting to more dedicated meeting for the new hire. Examples of the first methods may include the provision of virtual meeting involving a mix of new hires around the same time, representative of the human resources department and employees with company experience as managers or supervisors. This kind of practices has dual objectives, firstly, provide new hires with support to the resolutions of doubts and insecurities, secondly providing them opportunities for both meeting people who are experiencing their same situation in terms of adjustments and employees beyond those in their immediate workgroup more knowledgeable than others. Through the use of these methods, hence, organizations aimed at ease the building of social relationship and taking into account the emotional needs of newcomers, that, especially with the physical distance from the organization require to feel welcome, relevant, and appreciated (Lundberg and Young ,1997). Examples of the second category can be assigning to the newcomer a coworker "buddy", that may take the forms of colleagues within the core team, a representative of Human Resources department or mentors. Mentors can be identified in the figures of managers or supervisors within or outside the core team. All of these figures should help the new hire to navigate the transition into an effective member of the organization, by providing a more "hands-on" personal guide (Klein, H.J. and Polin, B., 2012). Through these preferred channels of interactions newcomer may be helped in the adjustment in the organizations. In fact, by providing valuable feedbacks on the newcomers performance, support and advices these figures may help them new hires in adjusting their behavior to meet company expectations seeing and helping them in seeing the big picture, hence, show them that their work contributes to the overall success of the team. Rollag et al. in 2005 suggested that providing a buddy both allows easy accesses to resources and a confidant to help facilitate sensemaking, particularly for understanding unwritten rules and learning tacit information, and can further facilitate the development of work and social relationships in ways a supervisor cannot. We expect that mentors are highly beneficial for new hires onboarding remotely, as mitigator of the lower number of informal interactions that may take place virtually, hence the connection to the

team and the organization. In fact, they should help the new resource in accessing different employees in the organization and create useful network.

Hp8: *Remote new hires provided with mentors who correctly fulfill their function experience more positive onboarding experience that the one who do not.*

Phase	Activities	New hires challenges & expectations	Onboarding objectives
Onboarding	Formal socialization	Receive the functional/technical training required to successfully perform the job	• Job role training
		Understand the job's role and responsabilities and the performance standard	• Conveying information on performance standard
		Learn team competences and dynamics	• Conveying information on who does what
	Job performance	Retrieve information such as clarification or help from coworkers Receive Technical Instructions and Asking for help	• Provide efficient means for new hires to perform their job such as interaction space
	Job performance awareness	Receive feedbak in order to be aware of the to be aware of how the work is being done	• Guarantee open and clear communication between new hires and the rest of the team.
	Organizational identity and connection to the team	Develop good relationships with coworkers	• Supporting new hire in feeling part of the team
		Understand organization's values and culture Feel a sense of belonging to the company	• Supporting new hire integration in the company

Table 6: Onboarding process' objectives

2.2.2. Importance of Onboarding process and Key Performance Indicators of successful onboarding

It is important to identify the main reasons why it is important to focus on the onboarding process and the relevant performance measures characterizing a successful onboarding in order to analyze the impact on them of the adoption of remote working onboarding practices.

Organizations devote a significant amount of time and resources to implementing the recruitment process and selecting the best candidate, thus it is equally crucial to devote time and resources to guiding the new employee through the onboarding process in the most effective manner possible (Snell 2006). The individual may have taken time and resources from the business as a new employee, but a successful onboarding process, built with the organization's goals and vision in mind, can be a successful strategic move for the organization as well as create productive conditions. Although organizations spend a lot of

time, money, and effort recruiting, selecting, and training new employees, newcomers also put in time and effort to become productive members of the organization. Hence, the onboarding process play a major role both from the point of view of the organization and from the one of the employees. From the point of view of the organization onboarding represent the best way to prepare new hires to succeed in their job as quickly as possible. From the literature analyzed the most recurring key performance indicators of successful onboarding are time to productivity, and engagement and retention. (Dai, G. and De Meuse, K.P., 2007). A successful induction process can result in effective employees with positive work attitudes who stay with the organization for a longer period of time, whereas an ineffective one can result in premature departure of employees from their new jobs or ineffectiveness on the job, which often forces the organization to restart the recruitment and selection cycle, wasting time and resources. The costs of a botched new recruit integration cannot be underestimated. In fact, onboarding is intimately linked to high personnel turnover and, as a result, high costs. Employee turnover or departures carry with them tacit information that is critical to an organization's success (Polanyi, 1958). According to research, the onboarding process is critical because it influences new employees' effectiveness, job satisfaction, organizational commitment, and organizational withdrawal (Bauer, Bodner, Erdogan, Truxillo, & Tucker, 2007). A well-functioning introduction process will also contribute to enhanced dedication and loyalty among new employees, lowering the risk of staff turnover in the long run. Furthermore, firms that fail to develop a good onboarding procedure risk negatively impacting their employees' happiness and productivity (Cirilo & Kleiner 2003).

In light of the additional difficulties introduced for remote workers in the various phases of the onboarding experience, we expect that new hires remotely onboarded will experience lower commitment to the organization.

Hp8: *Remote onboarding practices will negatively impact the overall new hired engagement in the job.*

CHAPTER 3

The next chapter will expose the analysis of the impact of remote work on the onboarding experience and the new hire's overall engagement with the job. First, the rationale used to set up the analysis and infer from the data how remote work has impacted the onboarding experience of new hires will be delineated. Next, the questionnaire used to substantiate the model's hypotheses and study relevant variables will be exposed. Finally, the responses collected through the administration will be analyzed. Specifically, first the effect of increased remote work on individual areas, identified as relevant to the onboarding of the new hire, will be studied through a simple ordinal regression of each individual variable on the independent variable of remote work. Then, through the use of other ordinal regression models, the impact of all variables identified as relevant to the onboarding experience on the dependent variable measuring the new hire's involvement in the job will be studied.

3.1. Research

The type of research conducted in this analysis is deductive, hence, starting with the analysis of the literature on remote work and the onboarding process, the consequences that the introduction of this work modality could have had on the overall onboarding experience of new hires and more specifically on the main performance indicators of successful onboarding, which are job satisfaction and perceived productivity, were deduced. Hence, from the relevant factors identified in the previous chapter, the questions to be included in the questionnaire to best intercept the onboarding experience have been outlined. In order to test the hypothesis, the data on the experience of new hired will be then analyzed through the use of both ordinal regression models and the singular study of distribution and mean.

3.1.1. Questionnaire

Data have been collected through the use of a questionnaire, constructed specifically to investigate the challenges encountered by new hires during their onboarding experience in an organization in the industries of product development. From the various phases of interest derived from the literature review, we develop the survey in order to study the influencing factors of the onboarding experience. The questionnaire was organized into 3 sections, including open-ended responses of a few characters and multiple-choice questions, for a total of 43 items. The questionnaire was designed to investigate a specific period of the new hire's experience, which is the first six months of employment. In each section, it is therefore noted to refer to this period in the response to the various questions. In this way, an attempt was made to homogenize as much as possible for new hires the reference period on which to base responses. This period of time had been mentioned several times in the literature as a period of interest for carrying out onboarding activities. In this research, we wanted to specifically investigate the hiring and onboarding process that occurred during the covid-19 spread, from March 2020 to December 2021. In doing so, it is possible to analyze, both in general, the data related to the adoption of practices from remote due to pandemic status, as well as the impact on the onboarding experience. Below we briefly summarize the content by section, the details of the questionnaire can be seen in *Appendix 1*.

Section 1: Request for personal information about the respondent and information on the job and organization for which they were hired. Specifically, in the first step, in addition to the personal information, the level of previous work experience of the new hire was investigated. Then, the information on the job, was aimed first at gathering insights useful both to describe the sample and to discriminate any respondents who did not conform to the survey that was intended to be conducted, such as period of employment and industry of the hiring organization. Next, the size of the team, the type of role held, and the type of autonomy of the team in performing the task were investigated. Finally, information was collected on the figure of the mentor and the relative use of this figure.

Section 2: Information was collected on the percentage of individual and team remote work, so as to be able to discriminate the prevalent modality of work. In

addition, the type of formality characterizing the onboarding offered by the company was investigated. This evaluation took place on a Likert scale with values from 1 to 5.

Section 3: The last section was, in turn, divided into 4 sub-sections. In all sections, likert scales were used to assess the degree of agreement with statements designed to study the type of challenge encountered by the new hire through the various phase of the onboarding process. The scale ranged from 1 to 5, where 1 express strong disagreement with the statement and 5 express strong agreement. The first and second sections investigated the recruitment and pre-boarding phase. Next, in the third sub-section, the actual onboarding phase was investigated, analyzing the challenges encountered by new hire. In particular, it was studied the effectiveness of new hired onboarding in various areas: formal and technical training, the daily performance of the job, the new hire awareness of the goodness of its own performance, the connection developed with the core team and the organization's value and norms understanding together with the attachment to the organization. Finally in the last section, the degree of job satisfaction and the level of perceived productivity at the end of the 6 months of the new hires were investigated.

3.1.2. Sample Analysis

In the next section, the sample of questionnaire respondents will be analyzed so that we can present how the questionnaire was administered, the number of responses collected, and the type of individuals that characterized the sample.

3.1.2.1. Administration and respondents

Questionnaire responses were collected in February 2022. The sample of respondents was chosen in a selected manner using two methods of administration: at first it was sent to university engineering acquaintances and to other acquaintances made up during internship in a technology consulting firm. Subsequently, through a targeted search using the Linkedin platform, it has been sent to profiles consistent with the type of investigation that we wanted to carry out. Specifically, individuals contacted should have been hired between March

2020 and December 2021 and should have worked in the product or service development sector. In order to more easily select the correct respondent profile, the research focus on the profiles of graduates in engineering subjects from some Italian universities, mainly the Polytechnic of Milan and Turin. We tried to vary the number of organizations as much as possible in order to capture the experience of both subjects who have been onboarded remotely and those who have done it on site or in a hybrid way. Given the number of questions characterizing the questionnaire, 43, the target number of respondents was for at least 100 responses. Over a period of about two weeks, 137 responses were collected. Of these, 12 profiles were eliminated after a thorough analysis of the reliability and consistency of the data. In particular, some of the profiles did not meet the constraint of hiring starting date or greater than March 2022 or less than December 2021. Others, who specify as employment relationship the internship, were excluded from the sample, at the suggestion of the professor, as a potential factor of distortion of the model. In fact, often, organizations do not devote the same attention to this type of employment relationship than to the onboarding of new hires. Finally, 2 profiles were excluded because all the responses to the likert scale items identical. It is worth mentioning that among the 180 profiles contacted via linkedin, 117 of the people contacted completed the questionnaire, hence, with a response rate of about 65%. In addition, several people have taken the time to make explicit through dedicated chat messages to explain the main difficulties encountered, pointing out in some way, the interest in the subject matter.

3.1.2.2. Personal Information

The sample consists of a majority of male individuals, as could be expected from the type of industries studied, mainly profiles belonging to STEM subjects (Science, technology, engineering, and mathematics). In fact, 56% of respondents are male and 44% female.
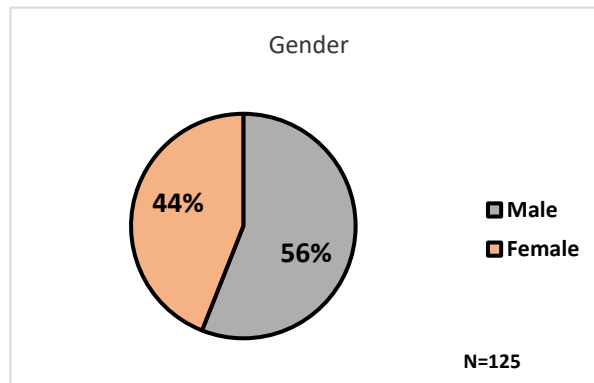
Figure 10: *Gender*

The age range of respondents varies from 24 to 35 years, with the highest frequency at 25 years. This number is consistent with the type of educational qualification of most of the respondents, which is master's degree or single-cycle master's degree, usually obtained at the age of 25. In fact, the sample is composed of 10.4% of people who have obtained a bachelor's degree and the remaining 89.6% who have obtained a master's degree or equivalent. The totality of the answers were submitted by people of Italian nationality, and of whom only 5.6% resided in a state other than Italy, in particular Germany and Belgium. With regard to the respondents' work experience, 30.4% had no previous experience in the job for which they were hired, 38.4% had previous experience but in a different function or role from the one for which they were hired, and the remaining 31.2% had previous experience in the role or function for which they were hired. Furthermore about 20% of the total respondents were hired in 2020 as of March, with the rests hired in the year 2021.
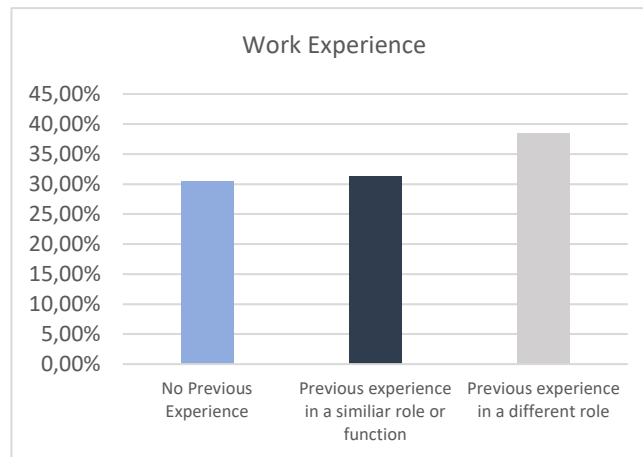
Figure 11: Previous work experience

3.1.2.3. Job and company information

As for the industries of the survey respondents, we find a majority of workers employed in the IT industry, with 46.4%, followed by employees in the automotive and aerospace industries, with 14.4% and 12.2% of respondents, respectively. Finally, the rest of the sample consists of workers in the banking and financial services development, consumer goods, fashion, chemical, pharmaceutical and energy industries.
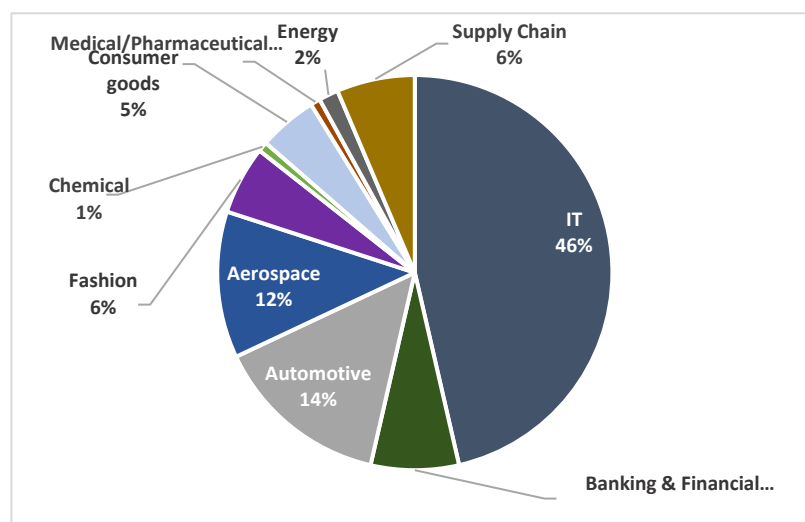
Figure 12: Respondents' Industries

Regarding the size of the companies in which the individuals were hired, 47.2% belonged to very large companies with more than 5000 employees, 14.40% belonged to large companies with an approximate number of employees ranging from 1000 to 4999 employees, the third group representing 21.6% of the respondents were hired in medium-sized companies and the remaining 16.8% in small companies (less than 50 employees).
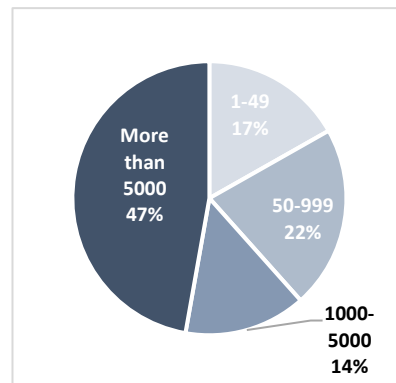
Figure 13: Companies' size

With regard to the category of role for which they were hired, the majority of the sample was hired as junior professionals, 84.8%, 8.8% as senior professionals and the remaining 6.4% in the role of manager or supervisor. Regarding the degree of autonomy of the respondents, 84% responded that they needed to interface with one or more members of the core team a few or several times a day to get the job done, as can be expected from job roles engaged in product development, while the rest split between interacting about once a day and a few times a week.
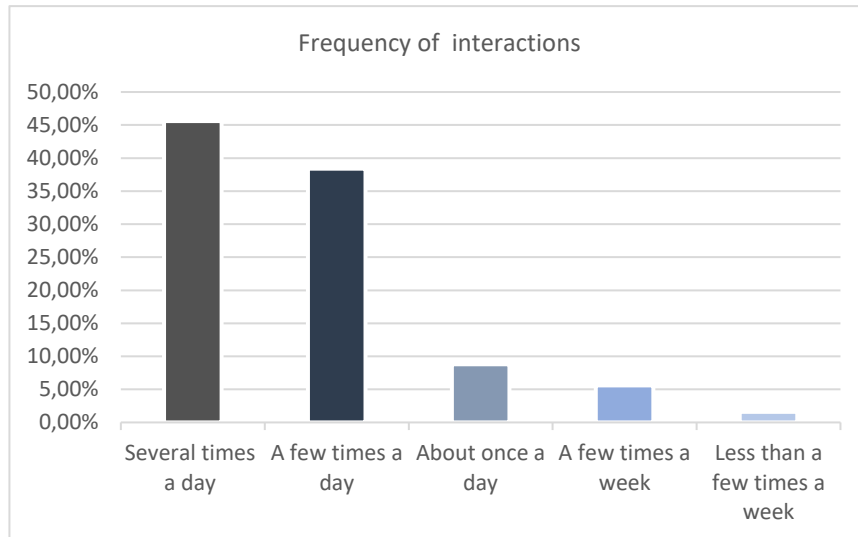
Figure 14: Frequencies of interactions with one or more team members

In terms of respondents' teams, the majority of new hires work closely with teams ranging in size from 3 to 6 members. Nevertheless, some respondents were part of larger teams reaching up to 18 members. Details of the distributions can be found in Figure 15. Furthermore, 77% of the respondents take parts in interfunctional teams whereas the 23% do not.
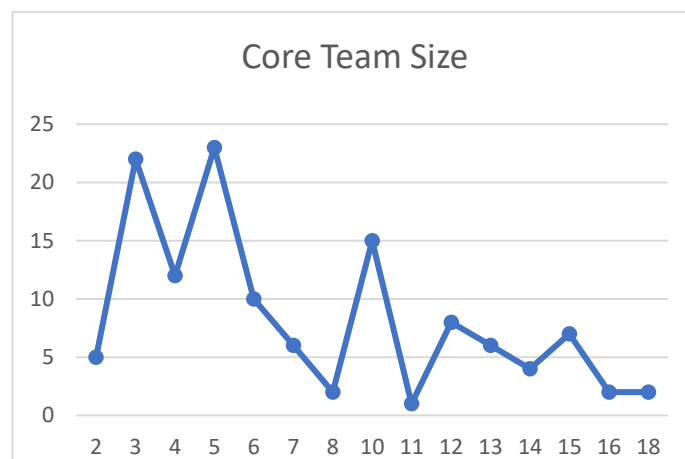
Figure 15: Core team size distribution

Finally, the figure of the mentor was analyzed. From the results we can see that for 52.8% of respondents, the team manager was the main figure of reference, while for 33.6% the mentor was a figure within the team, who was not the team manager. For the remaining minority of respondents, the mentor was played by a figure outside the main team. Relative to the degree of utilization of the mentor, i.e., to what degree the identified figure actually performed his or her role, 20%

of respondents reported that the mentor did not perform his or her role at all or very little while for the remaining 80% of respondents, the mentor performed his or her role fairly or very much. Table 7 shows the degree of mentor fruition in relation with the figure of the mentor; from the table we can see that there does not seem to be a specific category of reference associated with a lesser or greater degree of fruition of the mentor.

Have you been assigned a mentor or the team manager was your main reference?	To what extent did your mentor actually exercise this role?				
	Not at all	Very little	Quite much	Very much	Total
I was assigned a mentor outside my core team	1,6%	2,4%	6,4%	3,2%	13,6%
The team manager was my main reference	0,8%	9,6%	20,0%	22,4%	52,8%
I was assigned a mentor within my core team, was not the team manager	2,4%	3,2%	10,4%	17,6%	33,6%
Total	4,8%	15,2%	36,8%	43,2%	100,0%

Table 7: Mentor figure per mentor fruition

3.1.2.4. Remote working insights

The remote working information was collected by asking the respondents to express a percentage of remote working during the first 6 months of employment both in terms of the individual and the core team. To synthesize the data, 3 categories of new hires have been created: the first, that can be approximated to an onboarding made in presence, with a percentage of remote work that varies between 0 and 20%, the second that can be considered as an hybrid onboarding, with workers whose percentage of remote work varied between 20% and 80% finally, the last category the new hires in full remote, with a percentage of RW greater than 80%.
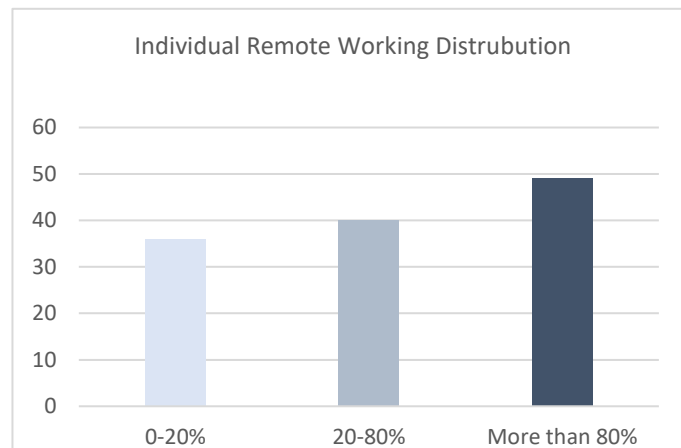
Figure 16: Remote working individual percentage

In Figure 17 we can see the distribution of respondents in the quarters of the years 2020 and 2021, with the breakdown by percentage of remote work. We can notice, as can be expected, that the number of in-person hires increases in the last quarter of 2020 and in 2021, consistent with the gradually opening from the Italian national lockdown that characterized the second quarter of 2020. During 2021, the distribution between new hires onboarded in presence, in hybrid and in remote is quite homogeneous, except for the second trimester of the year. In fact, that period coincides with the third wave of spread of Covid-19, where the various regions had more or less restrictive measures based on the number of individual infected.
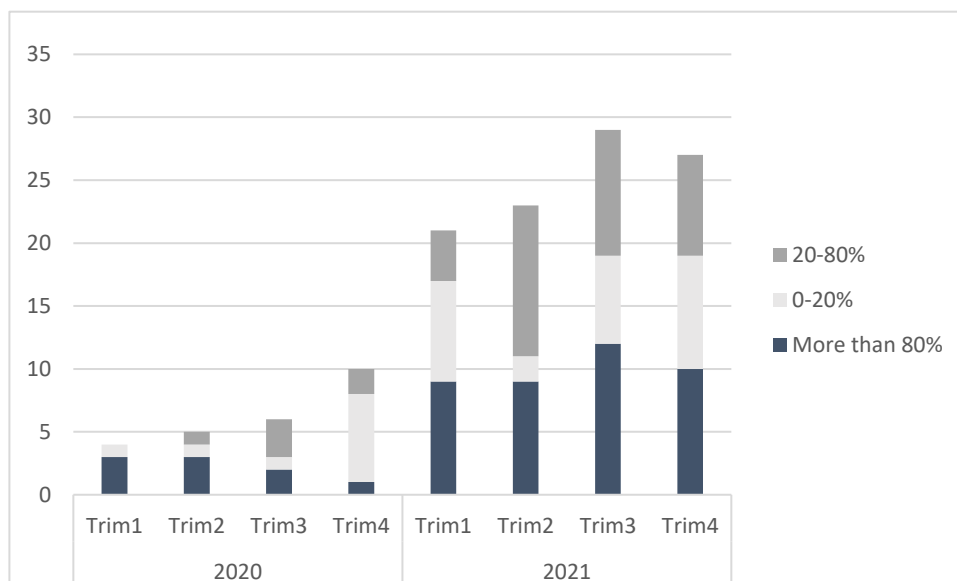
Figure 17: Starting date per remote working

3.1.2.5. Exclusion of Likert items

To finish the preliminary analysis, the frequency distributions of the Likert questions were analyzed. In this way, it was possible to briefly identify the presence of items with anomalous distributions. As a result of this analysis, it was decided to exclude the item that assess the respondents' agreement with the statement "I have formed a good relationship with only part of the team". Probably from the way in which it was put the statement, the respondents have not understood well the meaning of it, as it can be deducted from the figure.
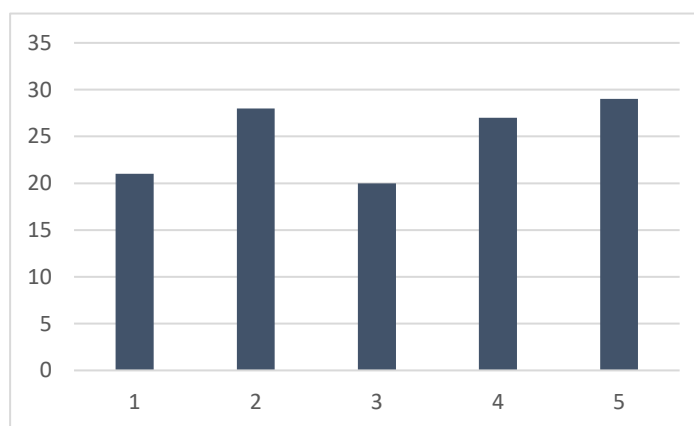
Figure 18: Likert item distribution – i have formed a good relationship with only part of the team

3.2. Regression analysis

The responses were then analyzed in detail using SPSS statistics software. In particular, in order to study the goodness of the model in representing the new hired individual engagement in the job and its dependence on the onboarding experience, new aggregate variables were created from the Likert items

3.2.1. Aggregated Variables

The table below summarizes the new variables resulted as the aggregation of the likert items and the aggregation method.

Variable typology	Computed variable	Calculation method	Likert Item	Type of variable
Scale	**Recruitment**	MEAN (1,2,3)	1. Goof presentation of the company, the role, and responsibilities	Ordinal (1—5) 1=SD 5=SA
			2. Background, motivation, and technical/functional skills good investigation	Ordinal (1—5) 1=SD 5=SA
			3. Correspondence between expectations and reality	Ordinal (1—5) 1=SD 5=SA
Scale	**Pre-Boarding**	MEAN (4,5,6)	4. Organization support in the preparation of paperwork for placement in the company	Ordinal (1—5) 1=SD 5=SA
			5. Workstation preparation for the very first days	Ordinal (1—5) 1=SD 5=SA
			6. Organization support in technical configuration of work equipment	Ordinal (1—5) 1=SD 5=SA
Scale	**Formal socialization**	MEAN (7,8,9)	7. Technical training	Ordinal (1—5) 1=SD 5=SA
			8. Job role and responsibilities understanding in proper time	Ordinal (1—5) 1=SD 5=SA
			9. Understanding of work dynamics, roles and skills within the core team	Ordinal (1—5) 1=SD 5=SA
Scale	**Performance of the job**	MEAN (10,11,12,13)	10. Situational awareness	Ordinal (1—5) 1=SD 5=SA
			11. Effectiveness in retrieving information from team member/asking for help	Ordinal (1—5) 1=SD 5=SA
			12. Information retrievement from project archive	Ordinal (1—5) 1=SD 5=SA
			13. Effectiveness in concluding the various tasks during the established working hours	Ordinal (1—5) 1=SD 5=SA
Scale	**Performance awareness**	MEAN (14,15)	14. Receiving timely and unambiguous feedback on the new hire performance from manager/supervisor and/or colleagues.	Ordinal (1—5) 1=SD 5=SA
			15. Fluidity in the communication within the team	Ordinal (1—5) 1=SD 5=SA
Scale	**Team connection**	MEAN (16,17,18)	16. Feeling of belonging to the team /perception of the contribution of own job work to the work of the team.	Ordinal (1—5) 1=SD 5=SA
			17. Informal chat with member of the organization	Ordinal (1—5) 1=SD 5=SA
			18. Good relationship with all the team	Ordinal (1—5) 1=SD 5=SA
Scale	**Organization engagement**	MEAN (19,20)	19. Undestanding of the organization norms and values	Ordinal (1—5) 1=SD 5=SA
			20. Feeling of belonging to the organization	Ordinal (1—5) 1=SD 5=SA

| Scale | **New hired engagement in the job** | MEAN (21,22) | 21. Job Satisfaction | Ordinal (1—5)
1=SD
5=SA |
| | | | 22. Perceived Productivity | Ordinal (1—5)
1=SD
5=SA |

Table 8: New aggregated variables

3.2.2. Reliability index of aggregated variables

According to Classical Test Theory (TCT), any measurement made by testing consists of a true component and an error component. To assess this error component objectively, reliability measures are used. In fact, evaluating the reliability of a test or questionnaire means measuring how accurate the scores obtained are. Thus, reliability indices allow you to objectively assess how well a group of items can be grouped together in the same dimension. Cronbach's alpha is the most widely used statistical index to assess this reliability. In order to use this index, it is necessary that the item scores all have the same direction. This condition is met for the construction of the likert scales used in the questionnaire. In numerical terms, Cronbach's alpha is a number that ranges between 0 and 1. The typical classification, regardless of the specific field of investigation is as follows:

• Alpha less than 0.4: low reliability

• Alpha between 0.4 and 0.6: uncertain reliability

• Alpha between 0.6 and 0.8: acceptable reliability

● Alpha between 0.8 and 0.9: good reliability.

To test the reliability of the aggregate variables in our study model, this statistical indicator was used. The table below summarize the value of Cronbach's alpha for each aggregate variable created. All aggregate variables are between the value 0.6 and 0.8, which is considered an indicator of acceptable reliability. In particular, the most reliable variables are those related to the recruitment phase, engagement to the organization, connection to the team and formal socialization, with a value above 0.7. While the variable related to performance awareness and work performance are those with lower values.

Variable	Cronbach's Alpha	Elements number
Recruitment	0,759	3
Preboarding	0,672	3
Formal socialization	0,736	3
Performance of the job	0,607	4
Performance awareness	0,606	2
Team connection	0,757	3
Organization engagement	0,701	2
New hired engagement	0,675	2

Table 9: Reliability measures

3.2.3. Study of the normality of dependent and independent variables

In order to choose the most suitable regression model to perform to analyze the data, the frequency distributions of each variable were studied to verify the assumption of normality. In fact, to utilize the most common regression model, the linear one, the assumption of normality have to be met. To perform the analysis, graphs of distributions and box plots, were analyzed. In addition, Kolmogorov-Smirnov and Shapiro-Wilk normality tests were used. As shown in the table below, no variables met the assumption of normality. In fact, each variable was characterized by a p-value of less than 0.05. Consequently, it was necessary to reject the null hypothesis underlying the tests that the theoretical distribution of the data is normal.

Normality Test

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistica	gl	Sign.	Statistica	gl	Sign.
RECRUITMENT	,138	125	,000	,919	125	,000
PREBOARDING	,195	125	,000	,852	125	,000
FORMALSOC	,220	125	,000	,910	125	,000
JOBPERFORMANCE	,107	125	,001	,972	125	,010
PERFORMANCEAWARE	,179	125	,000	,914	125	,000
TEAMCONNECTION	,152	125	,000	,908	125	,000
ORGANIZATIONENGAGE MENT	,179	125	,000	,913	125	,000
NEWHIREDENGAGEMENT	,197	125	,000	,921	125	,000

a. Correzione di significatività di Lilliefors

Table 10: Aggregated variables normality tests

Given the presence of some outliers in the box plot of some variables, these were eliminated from the dataset and normality tests were re-run, but without obtaining a different result. Finally, as suggested by practitioners, we proceeded with the study of the logarithmic functions of the variables listed above. New variables were then created as log base 10 functions of the starting ones, and normality tests were re-performed. Obtaining again a p-value of less than 0.05 the null hypotheses of normality were again rejected. Given the fundamental assumption of normality necessary to perform linear regression models, it was decided to use ordinal regression to study how the independent variable identified impacted on the dependent one.

Normality Test

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistica	gl	Sign.	Statistica	gl	Sign.
LGRECRUITMENT	,196	125	,000	,822	125	,000
LGFORMALSOC	,252	125	,000	,843	125	,000
LGJOBPERFORMANCE	,146	125	,000	,941	125	,000
LGPERFORMANCEAWARE	,218	125	,000	,848	125	,000
LGTEAMCONNECTION	,193	125	,000	,826	125	,000
LGORGANIZATIONENGAG	,213	125	,000	,797	125	,000
LGNEWHIREDENGAGEMENT	,229	125	,000	,826	125	,000

a. Correzione di significatività di Lilliefors

Table 11: Log10 of aggregated variables normality tests

3.3. Ordinal Regression models

Through the data collected in the Likert scales and subsequent computations to define the aggregate variables, it was then possible to proceed through SPSS software to analyze the causality between the dependent variables and the independent variables.

To test the hypotheses developed regarding whether and how much remote work singularly influenced the individual areas identified as relevant during the onboarding of new hires first, single ordinal regression analysis of each area was performed on the variable summarizing the approximate percentage of remote work. Information related to remote work was collected through the use of two

questions, the first related to the new hire's percentage of remote work and the second related to the percentage of their core team. By analyzing the various responses obtained, it was decided to use a combined function of the two pieces of information as the overall measure of remote work that captured new hires first 6 months. Specifically, the variable that was entered into the simple ordinal regression model, was calculated as the arithmetic mean of the two variables mentioned above. Before moving on to describe the results that show how the various areas identified during the onboarding experience are affected by the variance of percentage of remote work, it is important to present the main performance indicators of the ordinal regression model that allow us to describe the goodness of the model. The first useful information is the one related to the adaptation of the model. The null hypothesis behind this indicator is that there is no significant difference between the intercept only model and the final model where we bring the predictors. Another useful indicator to evaluate the ordinal regression model is assessing the goodness of fit, that is, the ability of the model to improve the prediction of the variable Y considering like value of reference the estimated value through the regression model rather than the average value of Y. The null hypothesis for the goodness-of-fit tests is that the model fits the data well. The Nagelkerke pseudo-R-squared indicator, like the R-squared of a linear model that indicate the variance accounted for by the model, can take a value from 0 to 1 and can be interpreted in the same way, but with more caution. Finally, the test of the parallel lines completes the information on the model, with the null hypothesis indicating that the location parameters (slope coefficients) are the same across response categories. The optimal result in this test is that of a non-significant p-value.

The main results are reported below. At this stage of the analysis, it should be noted that we will only comment on the statistical significance of the coefficients that can explain the variance in performance in new hired engagement.

- Recruitment: the test for model fit was non-significant, with a p-value of 0.259. Therefore, the null hypothesis is accepted. Thus, we can say that remote working has not significantly impacted the recruiting phase experienced by new hires.

- Pre-boarding: the test for model fit was non-significant, with a p-value of 0.446. Therefore, the null hypothesis is accepted. Thus, we can say that remote working has not significantly impacted the preboarding phase experienced by new hires.

- Formal socialization: the test for model fit was non-significant, with a p-value of 0.183. Therefore, the null hypothesis is accepted. Thus, we can say that remote working has not significantly impacted the formal socialization experienced by new hires during the first 6 months of onboarding process.

- Performance of the job: the test for model fit was significant, with a p-value of 0,008. Therefore, the null hypothesis that there is no significant difference between the intercept only model and the final model where we bring the predictor is rejected. Thus, we can say that remote working is a significant predictor of the job performance of new hires during the first 6 months of onboarding process. The tests for goodness-of-fit result in non-significant p-value for both Pearson indicator and deviance, indicating that the model fits the data well. Pseudo r-squared is 5,4% indicating that the variance in the dependent variable is little explained by the variation in remote work. Concerning the estimated parameter, the p-value found is of 0,009, indicating that how new hired experience job performance is a significant predictor of the dependent variable. The estimated value is negative meaning that for every unit increase on remote working there is a predicted decrease of 1,142 in the log odds of falling at a higher level in the job performance. Remote working is therefore a negative significant predictor of job performance.

- Performance awareness: the test for model fit was of little non-significant, with a p-value of 0.058. Therefore, the null hypothesis is accepted. Thus, we can say that remote working has not significantly impacted the learning experienced by new hires during the first 6 months of onboarding process.

- Team connection: the test for model fit was significant, with a p-value of 0,01. Therefore, the null hypothesis that there is no significant difference between the intercept only model and the final model where we bring the

predictor is rejected.   Thus, we can say that remote working has significantly impacted the connection with the team developed by new hires during the first 6 months of onboarding process. The tests for goodness-of-fit result in non-significant p-value for both Pearson indicator and deviance, indicating that the model fits the data well. Pseudo r-squared is 9,2% indicating that the variance in the dependent variable is little explained by the variation in remote work. Concerning the estimated parameter, the p-value found is of 0,001, indicating that how new hired connection with the team is a significant predictor of the dependent variable. The estimated value is negative meaning that for every unit increase on remote working there is a predicted decrease of 1,553 in the log odds of falling at a higher level in the job performance. Remote working is therefore a negative significant predictor of team connection.

- Organization engagement: the test for model fit was significant, with a p-value of 0,000. Therefore, the null hypothesis that there is no significant difference between the intercept only model and the final model where we bring the predictor is rejected. Thus, we can say that remote working has significantly impacted the engagement with the organization developed by new hires during the first 6 months of onboarding process. The tests for goodness-of-fit result in non-significant p-value for both Pearson indicator and deviance, indicating that the model fits the data well. Pseudo r-squared is 10,4% indicating that the variance in the dependent variable is little explained by the variation in remote work. Concerning the estimated parameter, the p-value found is of 0,000, indicating that how new hired engagement with the organization is a significant predictor of the dependent variable. The estimated value is negative meaning that for every unit increase on remote working there is a predicted decrease of 1,553 in the log odds of falling at a higher level in the organization engagement. Remote working is therefore a negative significant predictor of organization engagement.

The table below shows the detail of the various tests briefly described above.

Dependent variable / Independent variable	Model information fitting	Goodness of fit Pearson Deviance	Pseudo R-squared	Parameters estimate Sign.	Parallel lines test
Recruitment **RW**	0,259	0,2 1	0,01	-0,500 0,248	0,148
Preboarding **RW**	0,466	0,888 1,000	0,005	0,331 0,488	0,640
Formal socialization **RW**	0,183	0,801 1,000	0,14	-0,590 0,176	0,185
Performance of the job **RW**	0,008	0,838 1,000	0,054	-1,142 0,009	0,06
Performance awareness **RW**	0,058	0,998 1,000	0,029	-0,826	0,062
Team connection **RW**	0,01	0,908 1,000	0,092	-1,553 0,010	0,278
Organization engagement **RW**	0,00	0,741 1,000	0,109	-1,689 0,00	0,000
New hire engagement **RW**	0,00	0,915 1,00	0,159	-2,107	0,000

Table 12: Single independent variable ordinal regression models

The analysis proceeded by analyzing the dependence of new hired engagement and on the various areas identified as relevant during the onboarding process. First, it was decided to analyze the results of the model without involving the discriminant of remote working. The first useful information is the one related to the adaptation of the model.

Model fitting information

Modello	Logaritmo della verosimiglianza −2	Chi-quadrato	gl	Sign.
Solo intercetta	440,606			
Finale	337,818	102,788	7	,000

Funzione di collegamento: Logit.

Table 13: Model fitting information (no RW)

As it is shown in the table 12 the resulting p-value is 0.00, we hence reject the null hypothesis, and it can be affirmed that the predictors are significant. Next, regarding the goodness of fit, for which, the null hypothesis is that the model fits the data well, having obtained a non-significant value for each indicator, which is that of Pearson and that of deviance, equal to 1, as shown in table 11, we can therefore accept the null hypothesis and affirm that the model fits the data well.

Goodness of fit			
	Chi–quadrato	gl	Sign.
Pearson	495,741	854	1,000
Devianza	337,818	854	1,000
Funzione di collegamento: Logit.			

Table 14: Goodness of fit (no RW)

The pseudo-R-square indicator gives an insight on how much of the variance of the dependent variable can be explained by that of the independent variables. If we focus on the Nagelkerke index, reported in table 14, which can take a value between 0 and 1, the value found is 0,578.

Pseudo R–squared	
Cox e Snell	,561
Nagelkerke	,578
McFadden	,233
Funzione di collegamento: Logit.	

Table 15: Pseudo-R-squared (no RW)

Parameter estimation allows us to describe how the value of the dependent variable varies as the specific independent variables change, allowing us to have an idea about the order of magnitude with respect to the other independent variables in the model, together with sign of the impact. Table 15 shows the parameters estimates obtained for the independent variables of the model.

In particular, below is the interpretation of the estimates for each independent variable:

Parameters estimate

		Stima	Errore standard	Wald	gl	Sign.	Intervallo di confidenza 95% Limite inferiore	Limite superiore
Soglia	[NEWHIREDENGAGEMENT = 1,00]	3,838	1,596	5,786	1	,016	,711	6,965
	[NEWHIREDENGAGEMENT = 2,00]	5,331	1,427	13,962	1	,000	2,535	8,127
	[NEWHIREDENGAGEMENT = 2,50]	7,354	1,447	25,812	1	,000	4,517	10,190
	[NEWHIREDENGAGEMENT = 3,00]	9,429	1,550	37,015	1	,000	6,392	12,467
	[NEWHIREDENGAGEMENT = 3,50]	10,791	1,620	44,388	1	,000	7,616	13,965
	[NEWHIREDENGAGEMENT = 4,00]	12,628	1,705	54,880	1	,000	9,287	15,969
	[NEWHIREDENGAGEMENT = 4,50]	14,591	1,785	66,851	1	,000	11,093	18,088
Ubicazione	RECRUITMENT	,764	,297	6,608	1	,010	,182	1,347
	PREBOARDING	-,262	,235	1,247	1	,264	-,723	,198
	FORMALSOC	-,314	,308	1,038	1	,308	-,918	,290
	JOBPERFORMANCE	,762	,342	4,957	1	,026	,091	1,433
	PERFORMANCEAWARE	,388	,296	1,725	1	,189	-,191	,968
	TEAMCONNECTION	,724	,293	6,085	1	,014	,149	1,299
	ORGANIZATIONENGAGEMENT	,946	,281	11,377	1	,001	,396	1,496

Funzione di collegamento: Logit.

Table 16: Parameter estimates (no RW)

- Recruitment: the p-value found is of 0,01, indicating that recruitment is a significant predictor of the dependent variable. The estimated value is positive meaning that for every unit increase on recruitment experience there is a predicted increase of 0,764 in the log odds of falling at a higher level in the retainment value. Hence, as the scores of recruitment experience increase there is an increase probability of falling at a higher level of retainment of the new hired. Recruitment is therefore a positive significant predictor of the dependent variable.

- Pre-boarding: the p-value found is of 0,264, meaning that recruitment is not a significant predictor of the dependent variable. The estimated value is negative meaning that for every unit increase on pre-boarding experience there is a predicted decrease of 0,262 in the log odds of falling at a higher level in the retainment value. Pre-boarding is therefore a non-significant negative predictor of the dependent variable.

- Formal socialization: the p-value found is of 0,308, indicating that recruitment is not a significant predictor of the dependent variable. The estimated value is negative meaning that for every unit increase on formal socialization there is a predicted decrease of 0,314 in the log odds of falling

at a higher level in the retainment value. Formal socialization is therefore a non-significant negative predictor of the dependent variable.

- Performance of the job: the p-value found is of 0,026, indicating that how new hired experience the performance of the job is a significant predictor of the dependent variable. The estimated value is positive meaning that for every unit increase on recruitment experience there is a predicted increase of 0,762 in the log odds of falling at a higher level in the retainment value. Hence, as the scores of job performance experience increase there is an increase probability of falling at a higher level of retainment of the new hired. Job performance is therefore a positive significant predictor of the dependent variable.

- Performance awareness: the p-value found is of 0,189, indicating that learning is not a significant predictor of the dependent variable. The estimated value is positive meaning that for every unit increase on learning there is a predicted increase of 0,388 in the log odds of falling at a higher level in the retainment value. Hence, as the scores of learning experience increase there is an increase probability of falling at a higher level of retainment of the new hired. Performance awareness is therefore a positive non-significant predictor of the dependent variable.

- Team connection: the p-value found is of 0,014, indicating that how new hired connected with the core team is a significant predictor of the dependent variable. The estimated value is positive, meaning that for every unit increase on the perception of team connection there is a predicted increase of 0,724 in the log odds of falling at a higher level in the retainment value. Hence, as the scores of team connection experience increase there is an increase probability of falling at a higher level of retainment of the new hired. Team connection is therefore a positive significant predictor of the dependent variable.

- Organization engagement: the p-value found is of 0,001, indicating that how well new hired understood the organization's norm and value and their feeling of belonging to the organization is a significant predictor of the dependent variable. The estimated value is positive meaning that for every

unit increase on organization engagement there is a predicted increase of 0,946 in the log odds of falling at a higher level in the new hire engagement value. Hence, as the scores of organization engagement increase there is an increase probability of falling at a higher level of retainment of the new hired. Organization engagement is therefore a positive significant predictor of the dependent variable.

In terms of absolute value, the largest coefficient among the significant ones is that of organizational engagement, followed by recruitment and job performance. Finally, to conclude the interpretation of the model, the parallel lines test was conducted, with the null hypothesis indicating that the location parameters (slope coefficients) are the same across response categories. The optimal result in this test is that of a non-significant p-value allowing for the null hypothesis to be accepted therefore affirming that the slope coefficients found are the same for each new hire engagement value found, hence, confirming the credibility of the model. Table 16 shows that the p-value that emerged from the model is non-significant, being 0.467, thus allowing us to accept the null hypothesis.

Parallel lines test[a]

Modello	Logaritmo della verosimiglianza −2	Chi-quadrato	gl	Sign.
Ipotesi nulla	337,818			
Generale	295,722[b]	42,095[c]	42	,467

L'ipotesi nulla indica che i parametri di ubicazione (coefficienti di pendenza) sono gli stessi tra le categorie di risposta.

Table 16: Parallel lines test (no RW)

From this initial model, it was hence possible to infer which were the main variables that impacted the new hire's engagement in the job, measured as a function of the mean of the overall satisfaction and perceived productivity of the new hired. Next, the variable related to the percentage of remote work performed in the first 6 months was introduced into the model in order to analyze how this independent variable impacts the dependent variable and whether the introduction of this variable increased the overall variance explained by the model. Information related to remote work was introduced through the use of the same variable previously introduced, function of the new hire individual percentage of RW and the team's one.

Regarding the first 2 indicators related to information on model fit and goodness of fit the values obtained confirm the goodness of the model. In fact, as visible in the table 15 the p-value related to the adaptation of the model is significant, with a value of 0,00 while that related to the goodness of the model is not significant with both indicators, that of Pearson and that of deviance equal to 1.

Model fitting information				
Modello	Logaritmo della verosimiglianza −2	Chi–quadrato	gl	Sign.
Solo intercetta	440,606			
Finale	329,604	111,003	8	,000
Funzione di collegamento: Logit.				

Table 17: Model fitting information (RW)

Goodness of fit			
	Chi–quadrato	gl	Sign.
Pearson	460,511	860	1,000
Devianza	329,604	860	1,000
Funzione di collegamento: Logit.			

Table 18: Goodness of fit (RW)

Relative to the value obtained in the indicator of Nagelkerke, we note that compared to the previous model this has increased reaching the value of 0.606. Indicating that due to the introduction of the additional information on remote work, the variance in the dependent variable is better explained by the model.

Pseudo R–squared	
Cox e Snell	,589
Nagelkerke	,606
McFadden	,252
Funzione di collegamento: Logit.	

Table 19: Pseudo R-squared (RW)

Focusing on the estimation of the parameters shown in Table 17, we note that the significant predictors for the dependent variable, remained the same, namely,

recruitment, job performance, connection to the team, and engagement to the organization, although with some differences in the estimated values. In fact, we can see that in the first model the variable with the highest estimated parameter was that of organizational engagement, while now, after the independent variable of remote working which has the greatest value in absolute terms, it is that associated with the recruitment process. This reduction in the estimated organization engagement may be explained from the finding of the significance dependence of this area on remote working practices. Regarding the new independent variable introduced related to remote work, we can state that it is a a significant predictor of the dependent variable. In fact, the p-value found is of

0,004. The estimated value is negative, meaning that for every unit increase on remote working practices there is a predicted decrease of 1,458 in the log odds of falling at a higher level in the new hire engagement value. Hence, as the percentage of remote working increase there is a decrease probability of falling at a higher level in the engagement of the new hired. Remote working is therefore a negative significant predictor of the dependent variable.

| | | | | | | | Intervallo di confidenza 95% | |
		Stima	Errore standard	Wald	gl	Sign.	Limite inferiore	Limite superiore
Soglia	[NEWHIREDENGAGEMENT = 1,00]	2,544	1,648	2,383	1	,123	−,686	5,774
	[NEWHIREDENGAGEMENT = 2,00]	4,128	1,477	7,816	1	,005	1,234	7,023
	[NEWHIREDENGAGEMENT = 2,50]	6,228	1,503	17,170	1	,000	3,282	9,174
	[NEWHIREDENGAGEMENT = 3,00]	8,371	1,602	27,323	1	,000	5,232	11,510
	[NEWHIREDENGAGEMENT = 3,50]	9,786	1,670	34,328	1	,000	6,512	13,059
	[NEWHIREDENGAGEMENT = 4,00]	11,675	1,746	44,730	1	,000	8,254	15,097
	[NEWHIREDENGAGEMENT = 4,50]	13,715	1,815	57,117	1	,000	10,158	17,271
Ubicazione	RECRUITMENT	,925	,304	9,259	1	,002	,329	1,520
	PREBOARDING	−,194	,238	,665	1	,415	−,660	,272
	FORMALSOC	−,271	,310	,767	1	,381	−,879	,336
	JOBPERFORMANCE	,700	,343	4,159	1	,041	,027	1,372
	PERFORMANCEAWARE	,342	,297	1,323	1	,250	−,241	,924
	TEAMCONNECTION	,624	,297	4,425	1	,035	,043	1,205
	ORGANIZATIONENGAGEMENT	,845	,284	8,887	1	,003	,290	1,401
	RemoteWorkingaggr	−1,458	,508	8,220	1	,004	−2,454	−,461

Funzione di collegamento: Logit.

Table 20: Parameter estimates (RW)

Given the non-significance of experiences related to preboarding, formal socialization, and performance awareness, the regression was re-run excluding these variables from the model. Regarding the information on model fit and goodness of fit, these are the same as in the previous model, i.e., significance of model fitting information value and non-significance values of model goodness of fit. The new pseudo r-squared assumes a slightly smaller value than that of the previous model, equal to 0.597, confirming the unnecessary inclusion of the identified variables as non-significant in the model.

Pseudo R-squared	
Cox e Snell	,580
Nagelkerke	,597
McFadden	,246
Funzione di collegamento: Logit.	

Table 21: Pseudo-R-squared (RW2)

The analysis of the data proceeded with the introduction in the model of the mentor fruition ordinal variable, to text whether the effect of a mentor who successfully perform his role mediate the effect of remote working in the overall new hire engagement in the job. Being an ordinal variable, it has been introduced in the factors of the ordinal regression model. Although, the Pseudo R-squared increased achieving the value of 0,616, the parameter estimates are non-significant as shown in table 20.

Parameters Estimates

		Stima	Errore standard	Wald	gl	Sign.	Intervallo di confidenza 95% Limite inferiore	Limite superiore
Soglia	[NEWHIREDENGAGEMENT = 1,00]	2,933	1,776	2,726	1	,099	−,549	6,415
	[NEWHIREDENGAGEMENT = 2,00]	4,781	1,520	9,894	1	,002	1,802	7,760
	[NEWHIREDENGAGEMENT = 2,50]	7,339	1,533	22,922	1	,000	4,335	10,344
	[NEWHIREDENGAGEMENT = 3,00]	9,508	1,630	34,039	1	,000	6,314	12,702
	[NEWHIREDENGAGEMENT = 3,50]	10,886	1,698	41,083	1	,000	7,557	14,215
	[NEWHIREDENGAGEMENT = 4,00]	12,781	1,784	51,350	1	,000	9,285	16,276
	[NEWHIREDENGAGEMENT = 4,50]	14,842	1,863	63,483	1	,000	11,191	18,493
Ubicazione	RECRUITMENT	,827	,286	8,385	1	,004	,267	1,386
	JOBPERFORMANCE	,911	,343	7,048	1	,008	,238	1,583
	TEAMCONNECTION	,630	,291	4,673	1	,031	,059	1,201
	ORGANIZATIONENGAGEMENT	,831	,282	8,665	1	,003	,278	1,384
	RemoteWorkingaggr	−1,391	,510	7,451	1	,006	−2,390	−,392
	[Mentorfruition=0]	−1,231	,878	1,965	1	,161	−2,953	,490
	[Mentorfruition=1]	,773	,544	2,015	1	,156	−,294	1,840
	[Mentorfruition=2]	,385	,387	,994	1	,319	−,372	1,143
	[Mentorfruition=3]	0ᵃ	.	.	0	.	.	.

Funzione di collegamento: Logit.
a. Questo parametro viene impostato su zero perché è ridondante.

Table 22: Parameters estimate with mentor fruition (RW2)

In particular, the results shows that new hired engagement is not significantly impacted by the new hired support received from their mentors. To study the effect of the mentor fruition in more detail, it was decided to perform a simple ordinal regression of the individual areas significant for the new hired engagement on this independent variable. The table below shows the results obtained.

Dependent variable Independent variable	Model fitting information	Goodness of fit Pearson Deviance	Pseudo R-squared (Nagelkerke)	Parameter estimates	Parameter estimates significance

Recruitment **Mentor fruition**	0,01	0,505 0,222	0,121	MF=0, -1,999 MF=1, -1,731 MF=2, -0,380 MF=3, 0	0,010 0,000 0,283 -
Performance of the job **Mentor fruition**	0,000	0,214 0,423	0,131	MF=0, -0,764 MF=1, -1.917 MF=3, -1.093 MF=4, 0	0,311 0,000 0,003
Team connection **Mentor fruition**	0,04	0,701 0,491	0,101	MF=0, -1.928 MF=1, -1,494 MF=2. -0,424 MF=3, 0	0,012 0,002 0,230 -
Organization engagement **Mentor fruition**	0,03	0,018 0,030	0,107	MF=0, -1,977 MF=1, -1,579 MF=2, -0,355 MF=3, 0	0,011 0,001 0,320 -

Table 23: Single regression model of significant variables for new hired engagement in the job over mentor fruition

This model allows us to see how the difference in mentor utilization impacted the dependent variable. Specifically, maximum mentor fruition is taken as the reference value and all other degrees of fruition are compared with that.

Disregarding the regression model on the organization engagement variable for which the goodness of fit test was significant and therefore the model does not fit the data well, for all others the level of mentor fruition impacted significantly the dependent variable. In particular we can see that for each dependent variable, i.e. job performance, team connection and recrtuitment, the decrease in mentor fruition is associated with a negative coefficient, thus indicating that it is a negative significant predictor. For example, if we focus on the regressive model related to team connection, we can affirm that:

- New hires for whom the mentor did not perform his or her function at all (MF=0) developed less connection than those for whom the mentor fully performed his or her function (MF=3). In fact, the estimated coefficient is -1.918 and the p-value is 0.012. Thus, non-fruition of the mentor is a significant negative predictor of team connection.

- New hires for whom the mentor performed poorly their function (MF=1) developed less connection than those for whom the mentor performed fully (MF=3). In fact, the estimated coefficient is -1.494 and the p-value is 0.002. Thus, poorly fruition of the mentor is a significant negative predictor of team connection.

- New hires for whom the mentor performed fairly their function (MF=1) developed less connection than those for whom the mentor performed fully(MF=3). In fact, the estimated coefficient is -0.424 and the p-value is 0.230. Thus, fairly fruition of the mentor is a non-significant negative predictor of team connection.

Finally, the ordinal variable relating to previous experience was introduced in the model, to verify whether, a new hired with experience had developed a greater involvement in the work than one who did not. The results showed the non-significance of this variable, and decreased pseudo-R-squared Nagelkerke value therefore the result will not be discussed.

3.4. Singular variable sample distribution and mean, and discussion of hypothesis results

Given the limitations of using an ordinal regression model to explain in detail the effect of increased use of remote work practices in the onboarding of new hires, in the following paragraph results will be supplemented with the study of the variables singularly both in terms of distribution of sampling and in terms of average values. Although this analysis is qualitative, it is useful integrate the result obtained in the regression models and to get an idea if within a certain threshold remote work is less impactful on the onboarding experience. To explore this hypothesis in more detail, we decided to group the data from the questionnaire into 3 groups. These three groups were chosen, through the use of graphical and trial-and-error methods, to minimize intra-group variance while maximizing inter-groups variance. The first is formed by all those new hires who performed less than 20% of the first six months of remote work and can be approximated to in-person onboarding. The second consists of all those new

hires whose percentage of remote work varied between 20% and 80%, approximating to hybrid onboarding. Finally, the third group, from all those new hires who performed more than 80% of the first six months in remote working, approximated to full remote onboarding.
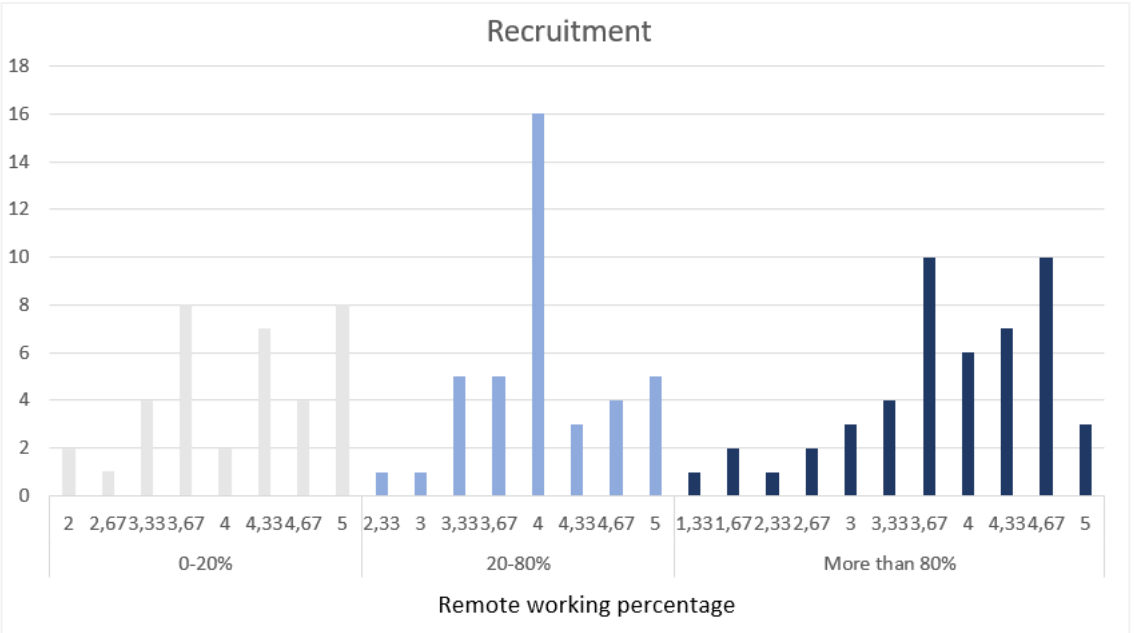

Figure 19: Recruitment distributions per RW

Regarding the impact that remote work had on the recruitment phase, the model indicated that this was not significant. If we look at Figure 19 we can see that the distributions for each group have an atypical pattern. In all three cases, there is a wide dispersion of the respondents' answers, in fact the values vary from about 2 to 5, although each group has a different mode. The mean confirms a similar overall positive experience of recruiting phase: 4.06 for in-person new hires, 4.03 for hybrid workers, and 3.82 for purely remote workers. This result does not support the hypothesis that remote work negatively impacted the new hire's recruitment experience.

Hp1, *that stated that remote onboarding has a negative impact on the recruitment experience, is therefore rejected.*
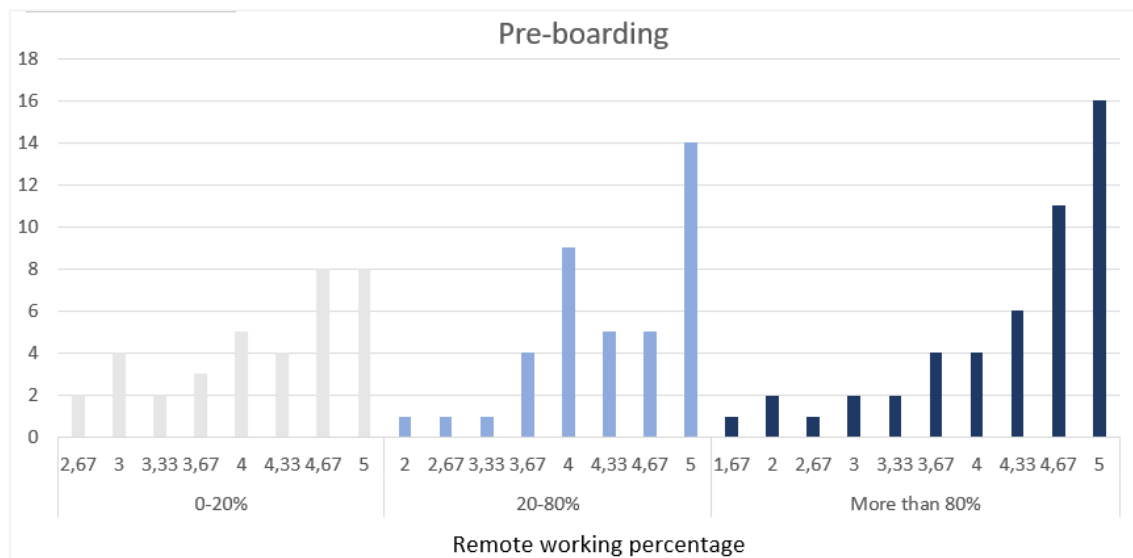

Figure 20: Pre-boarding distributions per RW

Relative to the impact that working remotely had on pre-boarding, again the model indicated that this was not significantly relevant. If we look at the distributions, we can see that they are right skewed for all the three groups, as if to that most respondents had a positive experience in the pre-boarding phase. The means reflect the graphical impression since they assume for in-person, hybrid and remote workers, respectively, 4.16, 4.34 and 4.27. This result could result from the too much generality of the statements aimed to study the support received from the organization, which did not take into consideration the emotional status of the new hired.

Hp2, *that stated that remote onboarding has a negative impact on pre-boarding experience is therefore rejected.*
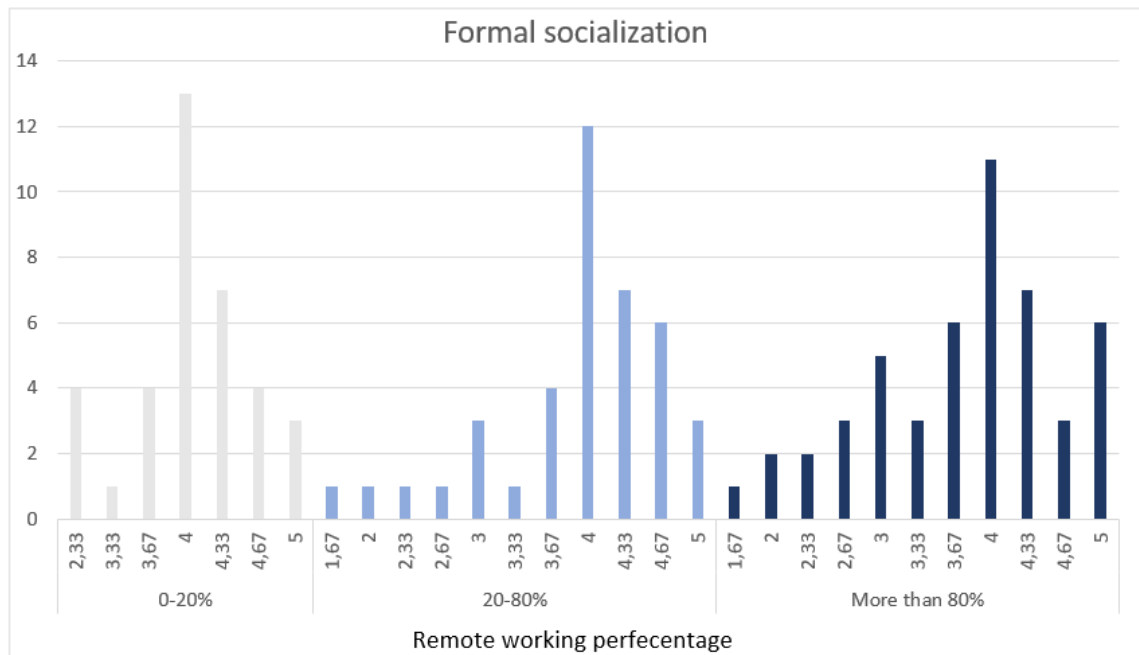
Figure 21: Formal socialization distributions per RW

Regarding the formal socialization process of the new hire, intended as the technical training and formal education, we have determined that this variable is not significantly impacted by the increase of remote work. From the distributions we see that in all 3 groups the mode resides in the value 4. In addition, for all groups the assumed values range from about 2 to 5. The mean value for in-person training is 3.99, that of onboarded new hires in hybrid is 3.92, and that of remote workers is 3.75.

Hp3, *stating that remote onboarding increase formal socialization for new hired is therefore rejected*.

Hence, the formal socialization phase of new hires is not significantly and positively affected by the increased percentage of remote work.
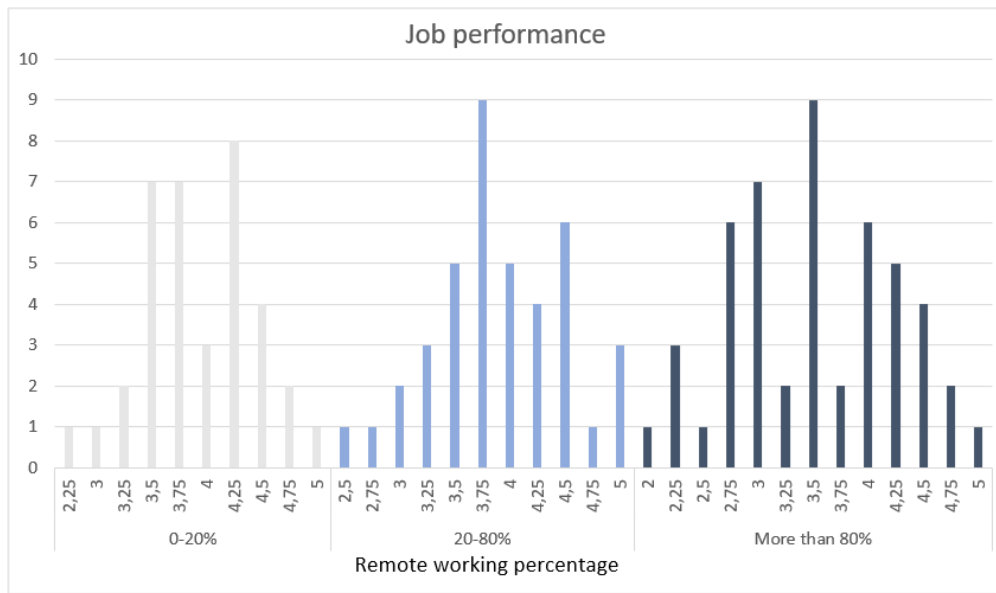
Figure 22: Job performance distributions per RW

The regression model confirmed a significant negative impact of the increase in remote work on the new hire's challenges in performing the job. From the distributions, we can see that the mode resides in the value 4.25 for the onboarded in-presence, 3.75 for the hybrid and 3.5 for the remote. Comparing the averages, that of the hybrid group and the in-presence group both take on a value of 3.91, while that of the remote group 3.51. Therefore, even this analysis suggests that remote work negatively impacted the new hire's job performance.

Hp4, *stating that remote onboarding negatively impact job performance is therefore accepted.*

Through this additional analysis, however, it was possible to note the negative impact of remote work is limited to percentages of work above 80%, while for new hires in the hybrid mode, the experience of performing work is similar to that of in-person onboarded.
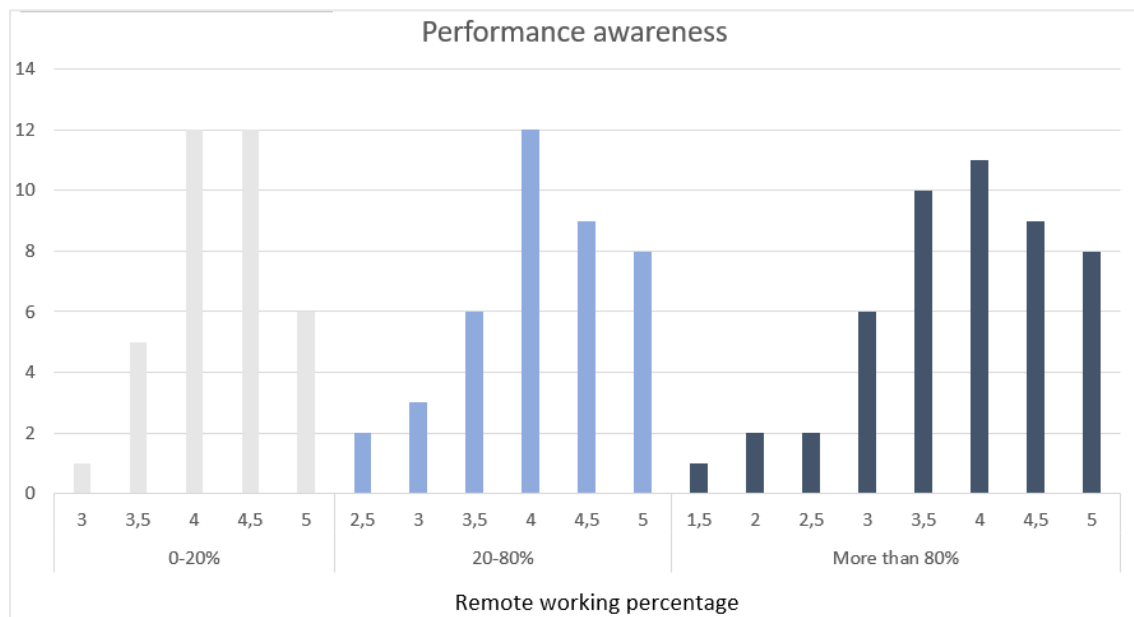
Figure 23: Performance awareness distributions per RW

Regarding the awareness of whether or not new hires are performing a good job, thus the professional growth of the new hire, tested as a function of the proper receipt of feedback and fluid communication with team members, we determined through the regression model, that this variable is not significantly impacted by working remotely by a little. The dispersion of the values used by the group of onboarded workers in remote is greater than those in presence, in fact it varies from the value of 1.5 to 5, while the other from 3 to 5. The mean tends to indicate a slight negative impact from remote work assuming 3.82 for fully remote workers, 4.08 for hybrid workers, and 4.24 for in-presence workers. The non-significance may be derived from a superficial study of this type of process, given the use of only two likert items to measure the complexity of this phenomenon.

Hp 5, stating that remote onboarding has negatively impacted performance awareness is therefore rejected.
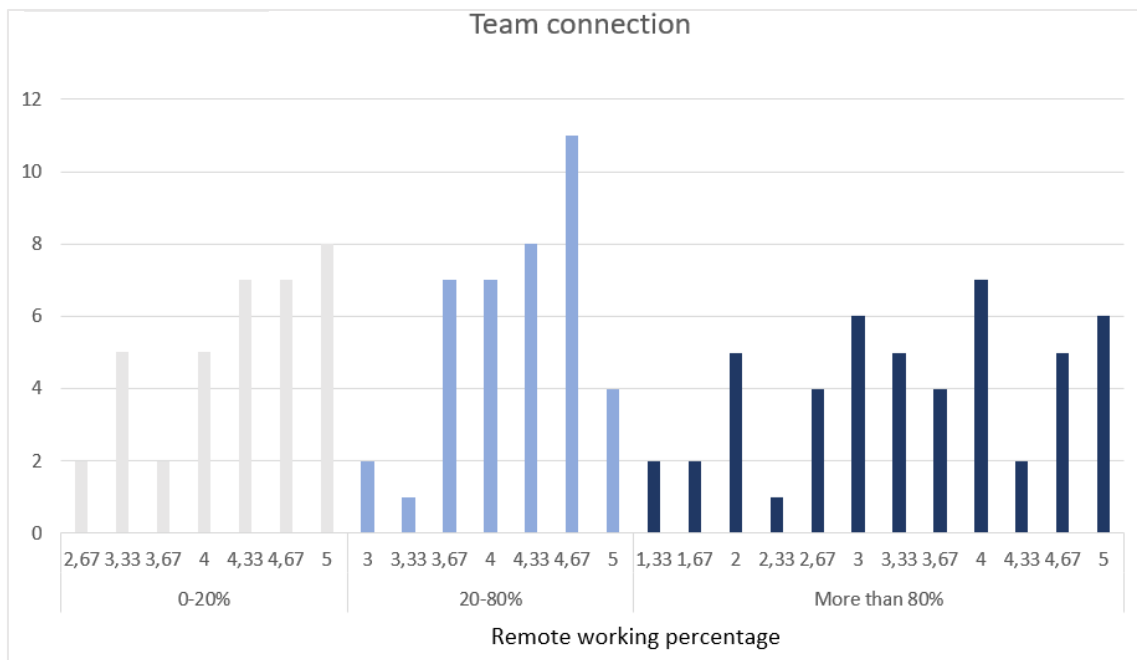
Figure 24: Team connection distributions per RW

The regression model confirmed a significant negative impact of increased remote work on developing a successful connection with the team for the new hired. From Figure 24 we see that many more respondents from the remote new hire group experienced greater difficulty in making a connection with the team, although for the hybrid group this difficulty is greatly mitigated. In fact, we note that, the mode for new hires in presence is 5, 4.67 for those in hybrid and 4 for those in full remote. In addition, for this last category some respondents used lower values, even lower than 2. This sphere was investigated by checking whether the new hire has established a good relationship with all members of the core team, to feeling part of the team and being aware of contributing to the work of the team. The mean confirms the intuition that by introducing a relevant portion of in-person work, hybrid work is similar to in-person work with respect to this area. In fact, the first two categories of onboarding have a value of 4.23 and 4.22 respectively, while 3.43 for the one related to full remote. Therefore, this analysis also shows that connection with the team is negatively impacted as remote work increases, although it adds insight that only beyond a certain threshold, which is that of more than 80%.

Hp 6, *stating that remote onboarding negatively affect team connection is therefore accepted.*
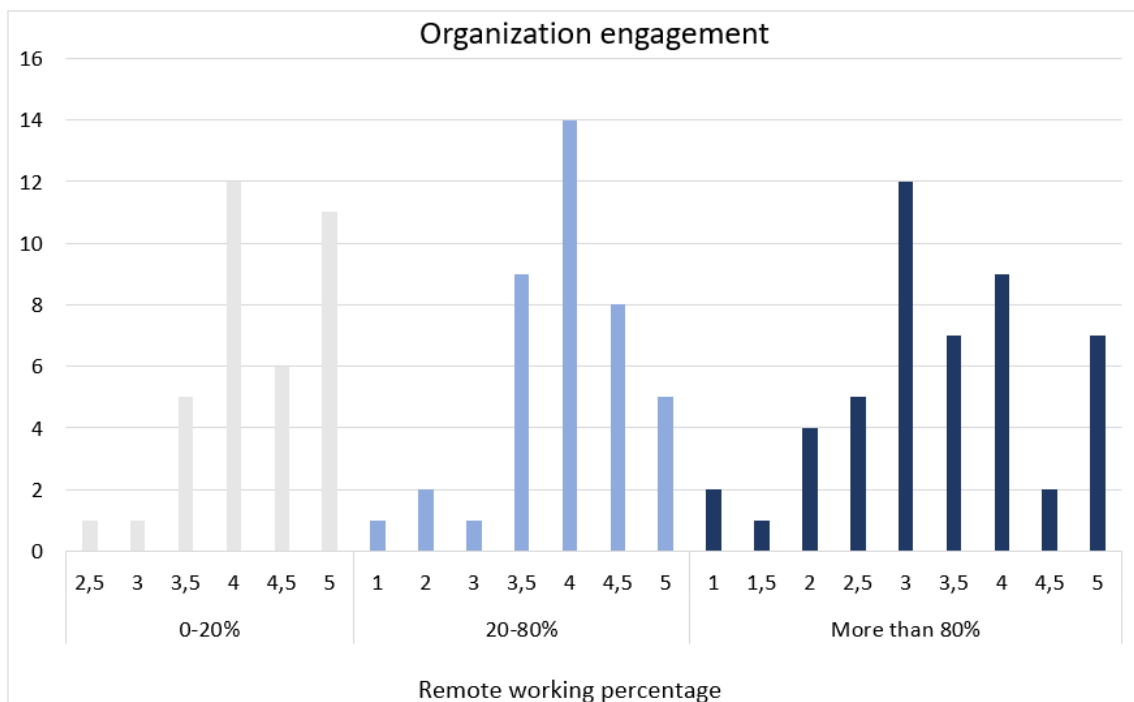

Figure 25: Organization engagement distributions per RW

The new hire's involvement with the organization was measured by investigating their understanding of the company's values and norms along with their feeling of being a part of it. The regression model indicated a significant impact of increasing remote work during onboarding on this variable. From the figure of distributions we can see that the mode is 4 for the first two categories and 3 for the one related to new hires in full remote. In addition, we can see that for the categories characterized by more remote work, values lower than 3 are assumed, especially for those in full remote. The averages for the three categories assume the value of 4.25 for new hires in presence, 3.91 for those in hybrid and 3.36 for those in remote, confirming the significance of this variable in the new hire's involvement in the organization.

Hp.7, *stating that remote onboarding negatively affects the new hire engagement in the organization is therefore accepted.*

From the overall model that considered the effects of all areas identified as relevant to the onboarding experience along with the remote work variable on the new hired engagement the following findings emerged:

- The impact of the pre-boarding experience, the formal socialization experience, and the performance awareness experience were not significant predictors on the new hire's overall engagement in the job.

- A good experience in the recruitment phase is associated with higher values in new hired engagement in the job.

- A good experience in the performance of the job is associated with higher values in new hired engagement in the job.

- A good team connection is associated with higher values in new hired engagement in the job.

- A good engagement in the organization is associated with higher values in new hired engagement in the job.

- The increase in the percentage of remote working is associated with lower values in the new hired engagement in the job.
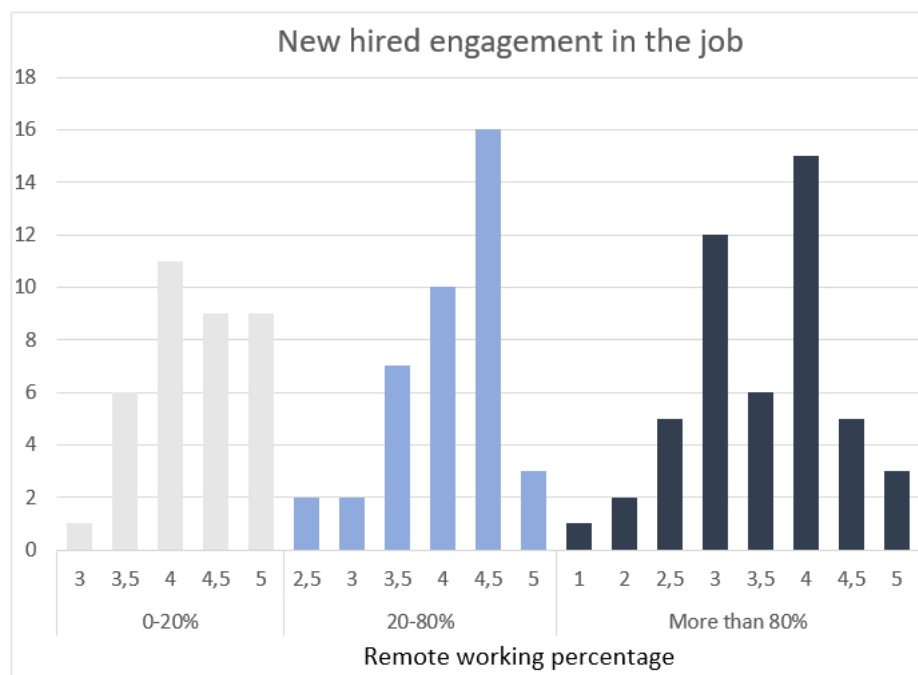

Figure 26: New hired engagement distributions per RW

From Figure 26, which represents the frequency distributions of the 3 groups identified, with respect to the variable representing the engagement of the new hire in the job, we can see that the distributions are significantly different. In fact, while for new hires in presence this variable varies between values 3 and 5, that of new hires in full remote varies from values 1 to 5, thus emphasizing that remote

work has negatively impacted the involvement of the new hire in the job. Hybrid work, presents an intermediate distribution between the 2, where we can see respondents who used lower values on the scale than in-person onboarded respondents but the mode residing in the 4.5 value. The values of the mean for each group tend to confirm this interpretation, for new hires in presence it assumes a value of 4.25, for those in hybrid of 3.91 and 3.35 in those in remote. So compared to what we discovered through the regression model, through this additional analysis we can see that for a remote work percentage of less than 80%, new hire engagement is less negatively impacted. For each group, in each case, the mean of newcomer involvement exceeds the intermediate value of 3.

Hp. 9, *stating that remote onboarding negatively affects the new hired engagement in the job is therefore accepted.*

Regarding the relevance of the use of the mentor figure, we noted from the overall model that this does not significantly impact the engagement of the new hire.

Hp 8, *which states that the new hire's engagement is positively impacted by the successful fruition of the mentor is therefore rejected.*

Despite this, we have still shown that for new hires for whom the mentor has fully played his role, the connection with the team, job performance and recruiting experience is positively impacted compared to those new hires for whom the mentor has not performed their role at all or poorly. These variables, in turn, positively and significantly impact the final engagement of the new hire in the job.

3.5. Research limitations

The research conducted of a preliminary and exploratory nature, showed how the increase in the use of remote work during the onboarding of new hires can negatively affect the overall engagement of new hires in the job, and specifically on the performance of the job, the connection with the team, and engagement with the organization.

Although for these variables the research confirms the bibliographic evidence for the others, such as awareness of doing a good job, or the pre-boarding phase it

disagrees. In fact, it follows from the analysis that the impact of remote work on these variables is not significant and not even the impact of these variables on the overall new hired engagement in the job. However, there are significant limitations to the research. Certainly, the use of only closed-ended questions to intercept the challenges encountered by new hires is not sufficient to fully capture their impact. In addition, the use of ordinal regressions model caused by the non-normality of the distributions of the variables under study limited range of quantitative analyses on the data. Regarding the assumptions about prior work experience as a mitigating factor for the negative impact of remote work was not significant given the sample consisting of young individuals with no more than 48 months of experience and the limited number of experienced respondents. Moreover, the heterogeneity of the sample that was composed of respondents working in different sectors and in different organization in terms of size, was not considered. Ultimately, the distance from the onboarding experience that perhaps they performed it in early 2020 may have impacted the memory or feelings related to those early months. Nonetheless, these findings, aim to provide valuable insights into how new hires have experienced the adjustment in the organization during the pandemic and can serve as a starting point for future research.

CONCLUSION

The adoption of remote working practices is becoming a standard way of working for knowledge-intensive jobs. The ever-increasing complexity of products and services requires organizations to conduct development activities beyond company boundaries. Employees and organizations benefit from the introduction of such practices, both in terms of cost savings for the company and lifestyle balance. The spread of the Covid-19 pandemic in the 2020-2021 timeframe has further accelerated the spread of this work mode, forcing some companies to make significant investments to enable the use of this work mode, which will make it even more unlikely to take a step back from its diffusion. This is the context in which the research conducted in this thesis is positioned. Its objective was to investigate how the introduction of this practice in the context of product development has impacted the onboarding of new hires in the 2020-2021 biennium. Initially, we focused on the analysis of the bibliographic evidence that represented a guideline for the choice of relevant areas to investigate in the onboarding experience and in the formulation of hypotheses on the possible impact of remote work on that experience. Subsequently, through the administration of the dedicated questionnaire, the onboarding experience from the perspective of the new hire was investigated, specifically analyzing the responses of 125 respondents, finding a negative impact of remote work on some areas. In particular, through the use of single ordinal regression models, it was found that the increase in remote work negatively and significantly impacted job performance, team connectedness, and attachment to the organization. In contrast, the same type of analysis decreed that the increase in remote work did not have a significant impact on the recruiting phase, the preboarding phase, the formal socialization, and the performance awareness. Through a more general ordinal regression model, we then moved on to study the impact of each area identified as relevant to onboarding and remote work on overall new hire engagement at the end of the first six months of employment. Results showed that, as the percentage of remote work increased, lower values of new hires' engagement in the job, measured as a function of overall satisfaction and

perceived productivity, were found. Hence, a negative differential in the overall job engagement was found between new hires who did the work in the presence of the new hire and those who did the work in the presence of the new hire. With regard to the other independent variables, it was found that a successful recruiting phase, is a significant positive predictor of the overall job engagement of the new hire as well as it is the positive experience in the daily job performance. Regarding the degree of connection with the team and attachment to the organization, the increment in the success of these areas too emerged as positive predictors of the dependent variables. In contrast, no statistically significant impact of the variables related to pre-boarding experience, formal socialization, and performance awareness emerged. The difference in fruition in the mentor too did not result in a significant impact in the engagement of the new hire. However, it emerged, through the use of ordinal regression models on this single independent variable, that the support of the mentor who has fully carried out his role positively and significantly impacts the connection with the team, the performance of work and the recruiting phase. From the evidence it can be concluded that remote work can create more difficulties for new hires. It is therefore of the utmost importance for organizations to adapt their onboarding strategies to address the main challenges that may arise in remote onboarding which are mainly related to creating successful professional relationship with core team members and with other coworkers within the organization. However, research was conducted on a heterogenous sample, without taking into considerations the differences in the onboarding experience that may derive from working in a large organization or in specific industries of product development. In addition, the use of an ordinal regression model limits the value of the results. In any case, this research has provided valuable insights into how new hires have experienced the adjustment in the organization during the pandemic and can serve as a starting point for future research. For example, it might be interesting to investigate in a more in depth and limited manner only some of the factors considered. Another research could be aimed at analyze whether what emerged from this research was also detected from the point of view of the organizations.

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ANNEX

Annex 1

Onboarding
experience survey.pdf

Annex 2

Data_Master.xlsx