Professional MBA
Entrepreneurship & Innovation

Measuring the Factors of Teleworking Productivity and Engagement in a New Reality of COVID-19: The Case of Austria, Germany and Russia

A Master's Thesis submitted for the degree of
"Master of Business Administration"

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Affidavit

I, **AISLINN COGHLAN**, hereby declare

1. that I am the sole author of the pages 4-14 to 18-28, 40-55, to 67-78, and 82-83 to 90-95 of the present Master's Thesis, "MEASURING THE FACTORS OF TELEWORKING PRODUCTIVITY AND ENGAGEMENT IN A NEW REALITY OF COVID-19: THE CASE OF AUSTRIA, GERMANY AND RUSSIA", 95 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 05 July 2020

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I, **VLADIMIR KIM** , hereby declare

1. that I am the sole author of the pages 1, 15-17, to 29-39, 56-66, to 79-81 and 84 to 89 of the present Master's Thesis, "MEASURING THE FACTORS OF TELEWORKING PRODUCTIVITY AND ENGAGEMENT IN A NEW REALITY OF COVID-19: THE CASE OF AUSTRIA, GERMANY AND RUSSIA", 95 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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Abstract

This study examines the factors and developments of perceived *engagement* and *productivity* during global COVID-19 crisis in organizations across Germany, Austria and Russia. In particular, we examine the impact of such variables (and management practices) as *supervisor support*, *team interaction* and *competence development* during this unique situation, when virtually all employees across all industries and types of organizations in a short period of time have moved to work from home (WHM) format. Given this unprecedent shift of WHM, it was important to understand not only which factors were most critical to engagement and productivity and how (direct and indirect effects), but also, if previous experience in WHM or management level is a critical differentiator in these relationships.

Our study is based on a market research survey and the application of structural equations modelling SEM to define the system of causal paths. We have confirmed that *engagement* is positively and significantly linked to *productivity*. *Isolation* was found to be having a negative impact on *productivity* and no impact on engagement. Interestingly, in our study, and unlike in most studies, focusing on remote work practices, *supervisor support* was not playing any significant role to alleviate *isolation* or improve *engagement* or *productivity*. Yet, team interaction was found to have strong direct effect on *productivity*, an indirect via *engagement* and *isolation*. *Competence development* of employees is an important driver of engagement but has no immediate effect on productivity. We have not confirmed any hypothesis on differentiation between employees with significant previous experience in WHM and employee management level.

Our study suggests that during such global shifts in work format, it is critical to ensure engagement level and to reduce the effects of isolation. To do so, the most effective tools to leverage are improving team interaction and competence development. Further studies would be recommended to understand why *competence development* was found to be an important contributor to engagement, its interaction with *job security* and understand work-life balances issues for employees with families.

Contents

1. Introduction

In this chapter, the problem statement is introduced, and the importance of the research topic is explained. The research methodology and structure are also introduced.

1.1 Problem Statement

In March 2020, the world faced an unprecedented situation where due to the SARS-COVID-19 virus pandemic, governments across the world issued mandated social distancing measures to protect their at-risk citizens from death and to stop the rapid spread of the virus overwhelming healthcare services. Almost overnight, businesses closed their offices and entire workforces were sent to work from home for a prolonged period. With the situation unavoidable, and the economy under serious threat, companies are not only forced to adopt the home office but to ensure that their outputs and productivity of employees was not only maintained but increased was universal. In many cases, the survival of the company depended on it. Those companies who already had home office policies were better prepared, as company infrastructure was already in place to support remote working.

Even if the appropriate information and communication technology was available for home office, the ways of working needed to properly utilize these tools and maintain productivity require experience and training. Under normal circumstances, remote meetings, or teleconferences were not viewed as being effective as face to face interactions and important decision making meetings still involved stakeholders from around the world travelling lengthy journeys to interpret discrete body language, absorb inherent information through regular interaction and utilize all advantages such as physical disarming techniques (e.g. standing up to prove emphasis a point, placing a subtle hand on the shoulder of someone derailing your meeting and using physical queues to engage with the speaker/moderator). These ways of working involve experience and trial and error, none of which was allowed for in the short time window before “lockdown”. Working remotely also brings unique challenges such as lack of support, less frequent, lower quality team interactions and a feeling of social and

professional isolation. All of these factors can be linked to negative effects on engagement and productivity.

1.2 Objectives

Although extensive research has been completed in the area of engagement (Kahn, 1990, Saks, 2006, Boell et al., 2016), productivity (Bosch-Sijtsema et al., 2009, Ramirez and Nembhard, 2004, Patterson et al., 2004) and remote working (Neufeld and Fang, 2005, Grant Christine et al., 2013, Staples et al., 1999) , the current situation is unprecedented as the move to remote working was sudden, unplanned, and worldwide. This research aims to uncover the unique antecedents of productivity specific to this situation, in order to better understand what management practices managers and companies can apply to promote productivity in this situation and which management practices can have the strongest effects. It will also provide an understanding from the employee's perspective of their perceived productivity in home office. The following questions are in focus:

How has the COVID-19 home office migration affected perceived employee productivity?

What influences employee perceived productivity during the COVID-19 home office migration?

What management practices have an impact on perceived employee productivity in the COVID-19 home office migration?

These key questions are extremely important for research as this situation has not occurred in modern history and companies are under severe pressure to keep producing results with continuously limited resources due to the economic downturn the pandemic has induced. The conclusions from this study will further research in the area of remote working and provide real time evidence-based recommendations for the majority of companies struggling to survive in a situation that leaves very little control and an uncertain economic future. As the situation also provides unique research conditions, the implications are also valid to all organisations beyond the COVID-19 crisis, as home office becomes an aspect of the "new normal" and employees increasingly demand extra flexibility.

1.3 Research Structure

A review of current research is used to form hypotheses on the factors that contribute to productivity in a home office, or remote, professional setting. In the next chapter, the definition, history and development status quo of remote working is explored. The following chapter explores the research regarding the possible antecedents of productivity in home office and supports the development of distinct hypotheses and the creation of a specific research model. The management practices of supervisor support, team interaction, recognition, competence development and goal management are expected to impact engagement and isolation, and therefore overall productivity. These hypotheses are then formed into a survey which is deployed over multiple geographies and diverse professional settings. Once collected, structural equation modelling using SmartPLS is used to determine the significant constructs and build a valid construct model. The results of the SEM analysis are then used to generate insights into what management practices are most important to stimulate productivity in home office.

2 Exploration of Existing Research

In this section, the existing literature on remote working is explored. Research on engagement and productivity in a traditional work setting is also explored, and links are made to form research hypotheses that will be the focus of this work.

2.1 Existing Research on Remote Working

Remote working, home office or teleworking are all terms to describe the action of performing one's core profession activities away from the company core professional location. These terms are used interchangeably throughout research and through this paper.

Teleworking is defined in many ways in academic literature. **Table 1**, adapted from Allen gives an overview of the different definitions and terms used to describe telework (Allen et al., 2015):

Term	Defined As	Source
Distributed work	Employees work over geographical boundaries and to some extent work with computer-mediated communication in order to achieve a common goal	Bosch-Sijtsema, P. M., & Sivunen, A. (2013)
Flexible work arrangements	Alternative work options that allow work to be accomplished outside of the traditional temporal and/or spatial boundaries of a standard workday	Shockley, K. M., & Allen, T. D. (2007)
Remote work	A work arrangement in which the employee resides and works at a location beyond the local commuting area of the employing organization's worksite; generally includes full-time telework and may result in a change in duty location to the alternative worksite	U.S. Office of Personnel Management. (2013)

Telecommuting	The use of telecommunications technology to partially or completely replace the commute to and from work	Mokhtarian, P. L. (1991a)
	Working some portion of time away from the conventional workplace, often from home, and communicating by way of computer-based technology	Golden, T. D. (2006b)
	Work conducted from home that is often supported by telecommunications technology	Kossek, E. E., Lautsch, B. A., & Eaton, S. C. (2006)
	Work arrangement in which employees perform their regular work at a site other than the ordinary workplace, supported by technological connections	Pinsonneault, A., & Boisvert, M. (2001)
	The use of information and communication technologies to replace or substitute for work environments that require individuals to commute to a traditional office	Bélanger, F., Watson-Manheim, M. B., & Swan, B. R. (2013)
	Systems that enable employees to perform regular, officially assigned duties at home or at alternative work sites geographically convenient to their residences	Pearce, J. (2009)
Telework Work	performed by (a) those whose remote work is from the home or a	Morganson, V. J., Major, D. A.,

	satellite office, (b) those whose telework is primarily in the field, and (c) those whose work is “networked” in such a way that they regularly work in a combination of home, work, and field contexts	Oborn, K. L., Verive, J. M., & Heelan, M. P. (2010)
	A form of work organization in which the work is partially or completely done outside the conventional company workplace with the aid of information and telecommunication services	Konradt, U., Schmook, R., & Malecke, M. (2000)
	Work that relies on technology-mediated communication and sophisticated information-processing capabilities instead of colocation for the production and delivery of work outputs	Garrett, R. K., & Danziger, J. N. (2007)
	A work arrangement in which employees perform their regular work at a site other than the ordinary workplace, supported by technological connections	Fonner, K. L., & Roloff, M. E. (2010)
Virtual teams	Spatially or geographically dispersed work arrangements that are generally characterized by a relatively short life span, technology-enhanced communications, and a dearth of face-to-face interaction	Tworoger, L. C., Ruppel, C. P., Gong, B., & Pohlman, R. A. (2013)

Table 1: Definitions of remote working, adapted from (Allen et al., 2015)

Table 1 shows the vast breadth of how working remotely is defined, and the terms used to describe it. He definitions all have one thing in common – the physical location of the employee. However, other definitions include the use of technology to mediate

communication and define the length of time one spends away from the main office. These definitions are important as they introduce different elements to the research, which may or may not be representative of the current situation. In this research, the terms “telework”, “telecommuting”, “remote work” and “home office” are used interchangeably. However, the actual research is carried out on a test group that has largely been forced into the situation by the pandemic and are working fulltime in a remote setting.

Telework is nothing new. Companies have been engaging in telework since before the internet and its presence has grown with the greater power and availability of information and communication technology (ICT). In 2020, many companies offer flexible working, including several days per week in home office as a perk. The technology to support this, even foundationally, exists in almost every company. As many have learned from the recent social distancing restrictions implemented by the government, there are also many tools available for free. The fact that the modern working world spans across the globe means that most employees are already part of remote teams, even when based in several central offices across the world.

Telework, in a normal context, can offer a number of benefits for employees, which can be directly related to the factors of engagement (Morganson et al., 2010, Grant Christine et al., 2013). Telework can contribute to increased flexibility and autonomy for workers. Employees have more freedom to structure their day as it suits them best. This allows them to decide what to do, when and where. This could create boost productivity as the employee can work around their own natural productivity cycles and times. This can also link to greater job satisfaction. Linking with the Kahn’s engagement theory, telework should allow employees to work when they have more psychological availability and therefore increase engagement (Kahn, 1990). The flexibility of telework may improve worker’s ability to juggle work and non-work commitments.

This flexibility and increase in autonomy can also improve work morale and contribute to a positive corporate image, which has also been linked to engagement. Teleworkers may also use their time more effectively for the company, for example using the time spent on their hourly commute to instead drive value for the company. They may also experience less interruptions caused by a busy office environment (Boell et al., 2016).

From the employer's perspective, telework requires a high level of trust in employees, as telework can be more difficult to monitor and control. Telework may hinder teamwork and collaboration as co-worker lack the opportunity to bond and build social and emotional connections with their teammates usually built implicitly through physical co-location. Especially in cases where members of the team are remote and others are co-located, this can have adverse consequences on productivity for the remote team members. Missing out on these social interactions may contribute to feelings of social isolations and a negatively impact the sense of belonging within the company (Boell et al., 2016). As previously discussed, organisational citizenship behaviour is a leading indicator of engagement and productivity (Rich et al., 2010).

It has also been argued that, depending on the individual circumstances, teleworking may actually be a source of more distractions and increase work-life conflict as the barriers between the two become blurred, contributing to workaholism (Boell et al., 2016, Hilbrecht et al., 2008).

Boell *et al* describe the importance of the nature of work in how telework, or remote working, impacts employees and their organisations (Boell et al., 2016). This is split into three dimensions:

1. Complexity of work and individual experiences
2. Diversity of work activities
3. The role of Information and Communication Technology (ICT)

In this study, the complexity of work had an influence on individual experience with telework. Telework was seen as a major benefit when engaging with work that complex activities that require creativity, contemplation, and intellect. Personal preference is also a factor in how best to engage with less complex activities. There was a split of opinion amongst preferences for clerical work, with some preferring an office environment whereas other prefer the refuge of home.

The diversity of work activities requires different settings and environments for concentration, working in teams or exchanging ideas. The optimum environment for these activities varies between individual needs to quiet, interruption free working

conditions or interactive face to face exchange between colleagues to promote productivity and creativity.

The effective use of ICT and quality of available collaboration and communications tools is vital to productive remote communications between team members and effective connection to company IT systems for work. It is argued however, that even the most advanced ICT systems do not surpass the effectiveness of face to face communication (Boell et al., 2016).

Telework has been cited as having both a positive and a negative impact on work/life balance (Grant Christine et al., 2013). As discussed in the previous section, this could have an impact on psychological availability, which in turn impacts engagement, which eventually impacts productivity and effectiveness in work.

Teleworking arrangements can aid in overcoming work-life balance issues related to family commitments, including childcare and elderly care (Grant Christine et al., 2013). As the average commute time is rising, with CNBC quoting it as over 30 minute each way for the average American, telework can also give back the employee time to engage in more activities outside work. However, some studies show that how this extra time is spent has a negative impact for Women. Remaining in many cases as the primary caregiver, the blurred lines between work and childcare roles actually resulted in women having less personal time for themselves (Hilbrecht et al., 2008). Gender also had an impact on the perceived advantages of teleworking differed by gender. Women saw the flexibility as a chance to get more chores associated with the household and childcare done whereas men viewed the primary advantage as spending quality time with family. Further studies indicate that it is not a direct effect of gender, but rather the management of one's working hours. Madsen (2003) found that the contrary was true in a study which compared teleworkers with traditional workers. In this study, male participants differed significantly from female participants in areas such as negative interference of work with family. Males were similarly negatively impacted by behaviour-based conflict, in that the persona and attitudes they use in work must be most drastically adjusted when working with family (Madsen, 2003). These may both be related to the availability segment of Kahn's second and third dimension of engagement – safety and psychological availability. This first being

a constraint of time availability and the latter being linked to the safety of being one's authentic self and the energy it requires to adapt inherent behaviours. In this frame, the results are framed to have a negative effect on family life rather than engagement in work.

Another caveat of teleworking is the phenomenon of being available 24/7. As working hours are flexible, so are employees as they work increasingly with partners from around the world and in different time zones. Once again, this comes down to how effective one is in managing one's working hours and the boundaries that are put in place by the individual. One study found that some teleworking groups prefer to integrate their working and family lives, whereas for others it was important to have a clear separation. There were also subsets that moved between both styles (Grant Christine et al., 2013). Madsen found this to be a universal topic – and not just relevant for teleworkers. In this study, there were no significant differences in perceived time based conflict between teleworkers and traditional office based workers (Madsen, 2003). Madsen did however find that teleworkers worked more hours than no teleworkers.

Significant contributors to time-based conflict in teleworkers when compared to non-teleworkers were number of children. In teleworkers, Madsen showed statistically significant relationships between an employee's number of children and interference with family, time-based family interference, strain-based family interference with work and behaviour-based work interference with family. There was no statistically significant relationship between number of children and any of these factors in the traditional working group (Madsen, 2003).

Madsen also investigates the effect of the age of children on teleworkers. There was a statistically significant relationship between having young children and time-based family interference with work. Whereas this relationship was not present in the traditional working group (Madsen, 2003). Contrarily, Neufeld and Feng found no statistically significant relationship between number of children and perceived productivity (Neufeld and Fang, 2005). However, this study was made up of 75% male participants. This is a particularly interesting subject in the current COVID-19 situation where most children are being temporarily home schooled, and parents are expected to support alongside maintaining their work-related commitments.

The impact of family and work life balance is also investigated by Neufeld and Fang (2005). In this study of a Canadian branch of a large multinational company, employees worked a minimum of 32 hrs per week from home but had in the past been in a traditional working environment. In this study, it was found that social interaction with family members was positively linked to a positive perception of remote working. In this case, the respondents quoted having more time for social interaction with family due to physical nearness and being able to work more flexibly around family schedules. This study also linked these interactions to increased productivity when those interactions were positive. Negative social interaction with family members decreased perceived productivity and was also linked to negative attitudes towards teleworking (Neufeld and Fang, 2005).

2.2 Measuring Productivity

Our study addresses the issues of engagement and productivity of knowledge workers, who are teleworking. Essentially, only knowledge workers can be directed to teleworking mode, as opposed to blue collar workers, who are involved in the production of physical units. Knowledge workers can be often referred to as white collar workers and include a representative from a variety of functional areas and industries. First, KWs are largely coming either from service-related industries in the economy, such as professional consulting, IT, finance, education, healthcare etc (one of the biggest and growing sectors of modern economies). Second, within the industries and companies, that can be referred to as companies, extracting resources, delivering raw materials, producing physical goods, there are functional units in the organization which can be defined as knowledge workers. These include such units as sales and marketing, R&D, IT, administrative and managerial functions and so on. The common distinction of KWs is that both consume knowledge as inputs and produce knowledge as output, and in between these two is the production that includes acquiring, searching, analysing, organizing, programming, distributing and deciding on information and knowledge (Ramirez and Nembhard, 2004).

Productivity is often referred is a distinct indicator defined as a ratio of outputs to inputs in a given period of time. Productivity is also most often connected with the concept of efficiency, a measure of quantity delivered over time, and effectiveness, a measure of compatibility with aspects, such as quality expectations, time and goal expectations (Bosch-Sijtsema et al., 2009). Despite that mere clarity, productivity definition and measurement for KWs is not as straightforward as for “blue collar” workers or in manufacturing industries and processes. Complexities arise due to the fact, that the nature of KW’s inputs, outputs, and production processes even within one worker can vary and be not easily or directly measurable. However, and despite that, a number of researchers addressed the measurement issue and investigated the factors defining and determining output, input, and process of KW production.

On the output side, such components as output quantity, quality of results and customer satisfaction can be met (Laihonen et al., 2012). Output can be measured using several methods. Laihonen et al. in their research overview report such methods as weighting output model, monetary output measurement, customer value and

completion rate of defined performance goals. Monetary output measurement can be most fit to sales and marketing professional roles, but also other roles that can be viewed as service providers to external customers and organizational units. Goal completion approach is based on measurement of completed task and goals relative to initially planned ones. This approach is identical to achievement method, reviewed also by Ramirez and Nembhard (2004).

On the input side, Laihonen et al. indicate several productivity factors: innovativeness, employee satisfaction and motivation, knowledge management infrastructure, working environment, information technologies and tools, organizational culture, and structure. On the process side or productivity, Laihonen et al. list such factors as work organization, professional efficacy, quality of interaction, knowledge sharing, learning, goal management and knowledge acquisition among the few.

An interesting perspective on KW production processes is given by Ray and Sahu. They propose a multi-factor productivity measurement model for routine and non-routine operations, where productivity is dependent on organizational aspects, such as interaction with outside contributors, team work interaction and inter-organizational unit interaction (Ray and Sahu, 1989). According to Ray and Sahu (1989), in routine operations of “white-collar” workers, productivity is determined not just by operational time, but also by such factors as interdependence of task stages, group activities and multi-facility arrangements. While for non-routine operations productivity is determined, in addition, by job variability, interaction with outsider participants, co-ordination between different organizational units.

Based on research review, Bosch-Sijtsema et al., suggested a multi-layer framework of productivity factors for knowledge workers, productivity is defined from the perspective of efficiency and effectiveness. In this framework, productivity is influenced by four group of factors, such as (1) organizational context, (2) workplace, (3) team process and structure, (4) team task and mode of working (Bosch-Sijtsema et al., 2009). Organizational context is defined by structure, culture, strategy, policy, and rewards. Workplace is defined by physical location, virtual and social workplace. Team process is determined by interpersonal, planning and action process, while team structure by compatibility of skills and knowledge. Team task and mode of working

depends on whether it is individual task or team task, hence on the mode of collaboration.

Other KW productivity measurement approaches include achievement method and value added or professional time utilization (Ray and Sahu, 1989). In the achievement method, productivity can be measured by evaluating to what extent of what is planned was completed. Ray and Sahu suggest that this can be measured by a ratio of the total amount of tasks relative to the total amount of the set tasks. The drawback of this approach is that any quality dimension is omitted, which is important for all areas of KW, be that customers of internal/external consumers of knowledge within organization.

According to Ramirez and Nembhard, also Ray and Sahu, productivity can be also measured by a ratio of total time spent on useful or value-added tasks and total spent time on work. In other words, productivity is defined by his/her professional time utilization, a degree to which a KW spends his work time on professionally on value-added tasks and activities (Ramirez and Nembhard, 2004). Similarly, to achievement or goal achievement productivity measurement approach, value added, and professional time utilization approach avoids the aspects of output quality and time efficiency. High ratio of valued-added activities or utilization does not necessarily lead to high quality of service and is not necessarily associated with the proper speed of work process by KW.

Finally, subjective methods (such as interviews, surveys, or self-assessment survey forms) can be used to measure productivity. In this measurement approach productivity is referred to as perceived productivity and is based on self-assessment responses by employees or peer to peer performance assessment. Such an approach allows to measure the influence of different individual, team, and organisational factors on productivity, especially if the factors are qualitative and not directly measurable. Similarly, in many organizations and KW roles objective data on output is merely unavailable or difficult to extract from Information Systems. Another advantage of such an approach is that perceived productivity can be constructed in such a way, that it encapsulates different productivity measurement approaches (discussed above). In this way, perceived productivity can provide a universal and comparable productivity measure across different functional areas or even industry areas. Although some

biases with regards to positive statements over perceived productivity can be expected from respondents, researchers widely use and refer to this practice as a pragmatic method, that provides fairly consistent with reality results.

2.3 The Role of Engagement in Employee Productivity and Driving Results

Engagement theory forms the foundational pillar in this research model's by acting as a connecting factor between perceived productivity. Research on engagement is extensive and as discussed in this section, there are clear links between engagement and productivity.

Engagement has been defined in many ways by researchers and the definition has evolved over time. William Kahn is considered the founding father of employee engagement and may have been the first researcher to make a link with an employee's psychological state and the resulting work performance.

"…the harnessing of organization members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances" (Kahn, 1990)

Kahn (Kahn, 1990) identified three pivotal dimensions that were required to facilitate employee engagement – **Meaningfulness**, **Safety** and **Availability**. Meaningfulness of the task or job role is the employee's belief that the efforts exerted on said task are worthwhile. The next dimension, Safety, is the employee's belief that the work environment allows for them to be their authentic self without fear of negative consequences to themselves or their career. In this dimension, interpersonal relationships, management styles and organisational cultural norms play a significant role. Finally, availability is the employee's belief that they have the physical, emotional, and psychological resources to perform a task or role. Work-life balance, personal circumstances and individual distractions play a large role in this dimension.

Psychological **meaningfulness** varies in definition depending on a person's values may also be influenced by their generation (Imperatori, 2017). However, meaningfulness can be derived through the personal connection an employee makes with the task and role characteristics and work interactions. Kahn found that employees found psychological meaningfulness when their tasks were "challenging,

clearly delineated, varied, creative and somewhat autonomous"(Kahn, 1990). With regards to role characteristics, Kahn found that certain roles required the employee to take on a certain persona or identity that was expected of the role. The alignment or misalignment of this to the employee's true self and purpose is an indicator or their engagement and happiness in this particular role. Finally, the social and interpersonal interactions that took place as part of the task or role has an impact in the employee's belief of how meaningful their work is. When these interactions make the employee feel valued and valuable, by the presence of mutual appreciation, respect and positive feedback, their perception of the meaningfulness of the task increased.

Psychological safety is influenced by interpersonal relationships, groups and intergroup dynamics, management style / process and organisational norms (Kahn, 1990, Carmeli et al., 2010). Interpersonal relationships that are perceived as trusting and supportive allow a safe space for employees to explore ideas and be themselves without negative consequences. If differences in position and power are used in a threatening manner, the employee must exert more energy into presenting an image that protected them from retribution. Group and intergroup dynamics relate to the expectations a group develops on how each member should behave. Within a group each role has more or less safety, such being branded the "bad son" or "golden child". The employees that find themselves in each of these roles will have different levels of confidence when performing their work. Intergroup dynamics also play a factor as firms can often see subgroups form which create safe space within their individual groups, but a barrier to entry for others (Carmeli et al., 2010). An example of this given by Kahn is an organisation where the older and younger employees identify better within their peer groups (Kahn, 1990).

Management style and process is also a factor in an employee's perceived safety as manager reactions and the process in which management is carried out can either foster an environment of openness and trust or of fear (Carmeli et al., 2010). In a more open environment, the employees do not feel they have to hide their true selves. This also spreads into the category of organisational norms. People feel safe when operating within the companies cultural and organisational boundaries.

The final dimension in Kahn's study was psychological availability. Psychological availability means having the emotional, physical, or psychological resources to

undertake a task or role. Within this dimension, physical energy, emotional energy, insecurity, and outside life are key influencers of engagement. Kahn proposed that physical energy was required to physically execute a role. If an employee was physically exerted, then their capacity for that role decreased especially in more physically demanding tasks. As a highly engaged employee also needs to be emotionally engaged. Personally, engaging with the task takes more emotional resources then withdrawing emotionally from it. If these emotional resources deplete or are not there initially, the person withdraws as they cannot meet the demand of the personal engagement.

Insecurity is an antecedent of engagement as it can create psychological distractions to engagement. In order for a person to be their true selves at in a work environment or other social situation, they must feel relatively secure about themselves and their personalities (Gustafson and Cooper, 1978). Employees withdrawn from roles they would have liked or from taking on tasks as they did not have the self-confidence or belief that they would perform the task well, or they feared consequences from others. A second attribute of insecurity was a heightened self-consciousness. Employees with heightened self-consciousness overanalysed how they perceived other judged or interacted with them. Constantly processing the social cues of others is a distraction that takes away from engaging in the task or role. Finally, an employee may feel insecure if there is uncertainty of how they fit into an organisation's goals or mission. This takes up psychological energy to process, taking away from engagement.

The last attribute of **psychological availability** is an employee's life outside of the workplace. External factors that can take up resources otherwise allocated to high work engagement. (Kahn, 1990), some factors that have been studied in this regard are sex and race (Łaba and Geldenhuys, 2016), parenthood (Danner-Vlaardingerbroek et al., 2013) and work-family conflict.

Kahn's research has been elaborated on since and many other papers have created similar definitions of engagement, for example Rothbard in 2001:

"*it involves two critical components: attention and absorption. Attention refers to cognitive availability and the amount of time one spends thinking about a role while*

absorption means being engrossed in a role and refers to the intensity of one's focus on a role"(Rothbard, 2001)

And Saks in 2006:

"the extent to which an individual is psychologically present in a particular organizational role. The two most dominant roles for most organizational members are their work role and their role as a member of an organization" (Saks Alan, 2006)

In these papers, engagement is viewed as a behaviour highly dependent on external actors. Imperatori explores the ideas of how best to categorize engagement and explores if engagement is an attitude, personality trait, behaviour, or a state. The conclusion presented based on existing research evidence indicates that engagement may be interpreted as a state as it has noticeable physical, emotional and cognitive attributes however it is unique, original and profound (Imperatori, 2017). Another school of thought cited in Saks 2006 is viewing engagement as the opposite of burnout. Engaged employees are energized, involved and effective, the antonyms of the three burnout dimensions: exhaustion, cynicism and inefficacy (Saks Alan, 2006).

2.3.1 Antecedents of Engagement

Understanding the drivers of engagement is crucial to this research model. Saks investigated the following essential drivers: (1) job characteristics, (2) perceived organizational and supervisor support and (3) rewards and recognition. Job characteristics, including task characteristics, from engagement perspective is associated with job meaningfulness or the extent to which job is significant, challenging, and meaningful for an employee. Employees feel that they do tasks that are important and develop them, and eventually feel the need for reciprocation. According to Saks survey-based study, job characteristics is positively correlated with engagement.

Organizational and supervisor support plays crucial rule for employee engagement. From the perspective of social exchange theory, the more organization and direct manager provides infrastructure, operational and personal support along her mission, an employee feels the need for reciprocation, responding with a higher level of engagement. Saks, also finds that organizational and supervisor support is positively

correlated with engagement and productivity (Saks, 2006). Several researches confirm in the case of teleworking experience, supervisor support is important element of teleworking control management (Kurland and Cooper, 2002), and supervisor support positively impacts eventually productivity (Ramstad, 2014).

Recognition and reward, especially connected to meaningful work and achievements is also positively correlated with employee engagement (Saks, 2006). According to Kahn (as cited in Saks), the connection of recognition and rewarding with engagement is explained by a feeling of return on investment. An employee directs more efforts to a job, where he expects higher expected returns. Similarly, social exchange theory suggests that employee exerts respective efforts in reciprocation to rewarding from the company. And on the opposite, lack of recognition and rewarding leads to employee burnout and disengagement (Maslach, 2006, as cited by Saks).

2.3.2 Consequences of Engagement

Why should companies care about employee engagement? The benefits for the employee are clear – engaged employees are happier, have lower levels of anxiety and stress and high levels of mental resilience (Imperatori, 2017). These higher levels of engagement have also been correlated with company performance:

"companies with an engaged workforce of 60 percent or higher product an average Total Shareholder Return (TSR) greater than 25 percent. In contrast, companies in which engagement lays between 40 and 60 percent report a mere 9 percent average TSR. Those with engagement scores below 40 percent show a decline in average TSR of 3.4%" (Baumruk, 2004)

Baumruk also claims that engagement is strongly positively correlated to other tangible outcomes such as return on assets, market-to-book ration, customer retention and operating performance (Baumruk, 2004). Rich et al (Rich et al., 2010) attempted to statistically prove the link between engagement and job performance. Building on Kahn's originally theories, several hypotheses were tested in a group of 245 firefighters. In this study, job engagement was significantly ($p<0.05$) positively correlated to subjective job performance and organisational citizenship behaviour. The study also determined that engagement had a mediating role in relationships between

value congruence, organisational support(perceived), and core self-evaluations and perceived job performance and organisational citizenship behaviour (Rich et al., 2010).

Engaged employees are also less likely to be physically absent in their roles and stay in their position for longer, have fewer accident and score higher on performance KPIs such as customer satisfaction scores (Imperatori, 2017). Saks also explores the correlation between employee engagement, in both a job and organisational context and likelihood of quitting. In this study, higher job and organisational engagement were significantly positively related to job satisfaction, organisational commitment, organisational citizenship behaviour, and negatively related to an employee's tendency or intention to leave their positions.

Complementary to the positive impacts, engagement also prevents negative impacts. Disengaged employees are likely to "spin" - spend their efforts on tasks that do not have an impact on the organisation, "settle" – resolve themselves to a half committed relationship without ever leaving the company, or "split" – leave the company because they have no faith that changes will ever occur. Disengaged employees also are more likely to do the opposite of promoting their company to customers and potential future talent. This has a direct impact on the financial and business success of the company. Meere, as cited in Kompaso and Sridevi, found that companies with low engagement saw both operating margin and net profit margins reduce over a three-year period. In companies with high engagement levels, these measures increased (Kompaso and Sridevi, 2010).

Other tangible financial consequences include absenteeism, as disengaged employees miss 3.5 more days per year. This is estimated to have cost the US economy up to $355 billion in 2010 (Kompaso and Sridevi, 2010). Gallop business journal survey Singaporean employees each year for their perception about their workplace and their overall lives. The number of engaged employees was just 9%; and actively unengaged employees were also 9% in 2004. This gap, where most of the workforce was simply "disengaged" is estimated to have cost the Singaporean economy $9 Billion in lost productivity (Gopal, 2006):

Therefore, engagement appears to be a win-win situation for both the employee and the organisation. However, further research suggests that in this case too much of a good thing can be harmful.

Engaged employees may also experience negative outcomes such as over-engagement leading to burnout and work life imbalance. Although one definition of engagement states it is “the opposite of burnout”, overly high level of engagement can cause employees to work themselves over hard for extended periods of time without sufficient time to recharge ((Macey and Schneider, 2008) a cited in (Imperatori, 2017). Working long hours also increase the risk of having adverse mental and physical health effects. As engaged employees find a high level of meaning in their work, they may also be more severely affected by work failure or adverse events such as layoffs. The line between the definition of engaged working and workaholism can be defined by the drivers behind it. Workaholics are driven by a strong need to prove themselves, whereas engaged employees work hard because they enjoy what they do (Imperatori, 2017).

Highly engaged employees may also suffer from a depleted personal life. As their high engagement in the work setting requires psychological resources, engaged employees may have less energy for their families and friends. Therefore, HRM practices that focus on work-life balance could be a strategic driver in engaging employees (Lockwood, 2007 as cited in Imperatori, 2017).

The literary review covered a large area of research on engagement in a more general sense. This is important as there have been several studies and evidence-based theories that suggest that engagement is a vital antecedent to productivity, both in normal ways of working and when working remotely. The three pillars of engagement can also be seen as a recurring theme throughout the research on all topics. Therefore, it is seen as a crucial factor in influencing productivity and is placed in the centre of the research model for the purposes of this study

Hypothesis: Engagement is positively correlated to productivity in home office

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2.4 The Role of Self efficacy in Engagement and Productivity in Home Office

While the antecedents of engagement focus on largely external factors that are considered to influence employee engagement, self-efficacy theory is particularly relevant in the COVID-19 situation as the external environment has induced stress in multiple areas of a professional person's life. Self-efficacy has been defined as:

"a judgment of one's ability to execute a particular behaviour pattern"(Bandura, 1977)

The theory explains that a person's own perceived self-efficacy determines how much effort will be put into overcoming an obstacle or aversive experience and how long the person will sustain their work on this task. It can also be linked to whether the person will take on the task at all – and whether fight or flight behaviour is initiated. Bandura proposes that efficacy expectations influence a person's behaviour, their reaction to an event. This then also influences their own expectations of the outcome, which influences the outcome itself. It this way, self-efficacy can be a key factor in employee performance and productivity. If a person believes they are capable of producing a desired outcome, they will strive to realise this belief. Conversely, if a person believes they are not equipped to handle the situation, they will not even try (Bandura, 1977).

The first layer of this mechanism is efficacy expectation. This is the amount of effort a person will expend and how long they will persist when faced with obstacles. The stronger the self-efficacy, the more likely it is that the person will persist to overcome the obstacle. A person perceived efficacy expectation is rooted in 4 key sources: Performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal.

Performance accomplishments are the cumulation of personal historical experiences. In the case of previous success in similar or aversive situations, expectations of mastering the situation increase. Conversely, if in the past the experience was not overcome, this lowers expectations of mastering the current situations and stimulate a long-term fear response. The timing and frequency of failure play a key role in this aspect. A negative response to failure can be significantly reduced if it is experienced only on occasion, and eventually overcome. Historical failures that were overcome by

sustained effort also reinforce an expectation that in the similar situations, persistent and sustained effort will result in success. The other end of this perception is total avoidance behaviour, in which even if the obstacle could be easily overcome, historical experience has conditioned the individual into believing that it is not possible.

This influence is not only accumulating through personal experience but also through vicarious experience. Seeing others fail or succeed repeatedly when faced with similar obstacles reinforced the belief that it is, or is not, possible for one's self to overcome it. Although an influence, as they are not from direct personal experience the impact is likely to be lower. This influence is strengthened when the third party being observed bares similar characteristics to the individual observing. It is also strengthened when the outcome is repeatedly achieved (positive or negative).

Verbal persuasion is the verbal reinforcement that an individual can or cannot achieve the task or overcome the obstacle. It is extremely common as it is available to all and easy to use, however studies have shown it has limitations in its power. This is thought to be due to the lack of authenticity in verbal persuasion from others in comparison to actual personal experience. When people are convinced through social persuasion that they already possess the needed capabilities to overcome an adverse experience and then given aids to assist them, studies have shown that they exert greater effort than those who only receive the aids. However, when conditions are not altered to help the individual succeed, social persuasion is likely to result in the persuader being discredited and the individual's self-efficacy being further undermined.

The final factor is emotional arousal. A high state of emotional arousal, which may manifest itself as feeling stressed or anxious, is viewed as counterproductive to ability and performance. When this highly aroused emotional state is felt by an individual, their perceived self-efficacy decreases. These emotional states can also generate further fear reactions and result in elevated levels of anxiety that far exceed the fear experienced during the actual experience. Those individuals who believe they are less susceptible to heightened emotional states or less vulnerable in challenging situations are less prone to conjure these fear reactions in times of challenge. These beliefs can then be altered by having experiences that either reinforce this belief or discredit it (Bandura, 1977, Raghuram et al., 2003, Staples et al., 1999).

Staples *et al.* apply this methodology specifically to working in home office (Staples et al., 1999). In this study, the main principles of Bandura's Self efficacy were confirmed. Respondents had higher perceived self-efficacy had experience and training in how to work remotely and IT training and experience, corresponding with Bandura's performance experience antecedent. Modelling of effective remote working behaviour from a manager also had a positive impact on self-efficacy, corresponding to Bandura's vicarious experience antecedent. Emotional arousal, the last of Badura's antecedents was also tested in the frame of perceived computer anxiety and was found to have a negative effect on remote working self-efficacy. The study also found that higher self-efficacy was related to increased performance, increased ability to cope and reduced level of stress.

Staples et al also made the hypothesis that the number of days spent working remotely had an impact on the relationship between self-efficacy and the ability of an employee o structure their work for productivity. Workers who telecommute only a couple of days a week still likely have fixed workplace and maintain regular physical contact with their colleagues and organisation. Being able to inherently pick up these organisational cues means that those who telecommute less require less self-organisation in order to effectively meet organisational demands and balance the distractions of nonwork responsibilities (Staples et al., 1999)

Raghuram *et al*. applied Bandura's self-efficacy principles to remote working but in the context of how well an employee adjusted to working from home and how well they were able to restructure their work to, which in turn could be linked to higher performance (Raghuram et al., 2003). It was also found that these effects were also stronger among workers who telecommuted more regularly, in line with Bandura's theory of performance experience. Raghuram found that self-efficacy was critical in aiding individuals to cope with the more challenging commuting arrangements, which is particularly relevant in the current situation with COVID-19 social restrictions.

Previous experience can help to eliminate anxiety, as described in self-efficacy theory (Bandura, 1977). This theory explains how employees who have previous experience in a task believe that they are capable of successfully completing this task. The hypothesis is that this also applies to working remotely in a home office setting. The situation surrounding the mass migration to home office could be considered by many

as a stress inducing situation. External factors such as fear for the health of oneself and loved ones was amplified/validated by government actions to protect their populations. Alongside the external sources of stress, those who had never worked in home office before may feel unprepared to fulfil their professional commitments without the structure and support network that comes with colocation with colleagues. When teams are inexperienced in how to work with each other and achieve their goals remotely, this could also be a cause of stress within the team.

On the contrary, teams and individuals who are experienced working remotely did not have to navigate a totally new way of working and communication. Even if the individual does not have experience themselves, self-efficacy theory dictates that when surrounded with individuals who are experienced or in a company that is experienced in working remotely, then these vicarious experiences could also help to reduce anxiety, although not as effectively.

As more experienced workers are already moulded by their own experiences, and Self efficacy theory dictates that these experiences are much stronger that vicarious experiences, it is expected that the actions of an individual's team members and management have a greater effect on those with less experience.

The hypothesis is that this also applies to remote working and the COVID-19 migration in home office. Therefore, not only are experienced employees expected to be more effective in a home office setting, but the external influences are expected to have less of an influence.

Hypothesis: Stronger experience in remote working mediates the extent of isolation on productivity. Higher management level is associated with higher engagement and productivity.

2.5 The effect of Social and Professional Isolation on Engagement as an Antecedent of Productivity

A key factor of engagement, and therefore productivity, is team and group dynamics (psychological safety). During the COVID-19 social distancing regime, the social

aspects of meeting physically in a common place to carry out professional tasks are no longer possible. Teleworking is by default assumes physical distance, and, hence can impact, the degree to which teleworkers interact with each other and share information. The feeling of isolation can be referred to as a state of mind, when a person, perceives that she is receiving limited or insufficient information, work inputs, feedback and learning for her direct work, and receiving insufficient or limited formal (discussions) and informal interaction (social interaction) with her colleagues along her work. There can be several directions of impact of the feeling of isolation on productivity: (1) medium term and long term impact of accessibility to formal and informal learning on productivity and performance, (3) and counter-balancing impact of the nature of politics in the organization on productivity.

Social and professional isolation can be directly and negatively associated with the negative the psychological standing and morale of employees via social isolation and professional isolation. A lot of important social interaction and exchange happens in a physical office environment, while teleworking provides limited access to the same level and quality of interaction. In other words, social isolation negatively influences informal and formal learning, professional development of teleworkers. Kurland notes that teleworking creates challenges to informal interactive learning, social networking, which normally occurs in physical office space (Kurland, 1999).

Teleworkers perceive that professional isolation can negatively impact their career development. Professional isolation refers to a situation, when teleworkers perceive that they are not able to receive a fair evaluation of their work and receive rewards and promotion (they deserved) due to complexity of performance evaluation while teleworking (Kurland, 1999). This, especially, refers to workers, who are evaluated based on end results. Thus, the feeling of professional isolation can indirectly impact productivity, via teleworker morale, motivation, and job satisfaction.

Although social and professional isolation may be linked with lower job satisfaction and productivity, teleworking is also associated with lower perceived organizational politics and lower level of stress from meetings and interruptions. The presence in physical space, not only stimulates positive social and professional exchange and interaction, but also encourages organizational politics. Informal political networks, politicized environment may lead to job dissatisfaction. Fonner and Roloff

organizational politics as twofold: (1) general politics and (2) going along to get ahead politics (Fonner and Roloff, 2010). Fonner and Roloff in their study define *general politics* by several elements, including the prevalence of power abuse and favouritism, and *going along to get ahead* with elements that display the extent to which promotion is defined by politics. In general, Fonner and Roloff study shows that teleworking is associated with lesser *general politics* and *going along to get ahead,* while the latter are both negatively correlated with job satisfaction of teleworkers. In the same study, Fonner and Roloff also examine the relationship between stress from meetings and interruptions and job satisfaction in teleworking. They find that teleworking is negatively correlated with stress from meetings and interruptions, while, in turn, they are negatively correlated with job satisfaction.

As opposed to Kurland findings, these findings may seem to be controversial, and indicate that less communication and social interaction in teleworking is beneficial (Kurland, 1999). However, it is not true, because the studies address different aspects of social interaction. On the one hand, teleworking naturally creates fewer interruptions and associated with it stress, and, in turn, allow for bigger slots of time for concentration on direct tasks. On the other hand, the nature of social interaction is important. Social interaction, that involves politics and political behaviour, is less prevalent in teleworking, and thus, drives higher job satisfaction. Meanwhile social interaction, that facilitates learning and skills development, positive professional networking, is also lacking during teleworking, yet this type of social interaction is crucial for professional development, and hence, productivity.

2.5.1 Trust Issues caused by Professional Isolation

Trust is in general an important aspect of working relations and management in all types of organizations. However, the issue of trust is even more important in virtual organizations, in teleworking, where team members do not enjoy direct physical presence of each other's. Trust is associated with common norms and believes, that define individual worker attitude towards his work, the quality of interactions with other team members and degree of commitment. One of key elements that defines trust is vulnerability to risk. Gallivan in his research overview outlines the definition of trust «as a relationship under condition, where one party (the trustor) willingly places herself

in the position of vulnerability to or risk from another party (the trustee) (Gallivan, 2001).

The impact of trust on productivity has following directions: (a) manager to worker level of trust and (b) worker trust and beliefs in other team members productivity. A high level of trust to a particular employee can have positive impact on her productivity, as it trusts creates an underlying assumption and believe in the good nature, intention, and commitment by that employee. Another direction is associated with beliefs and trust in other team worker productivity, where individual productivity and beliefs about team productivity are correlated.

The best way to understand the concept of trust in virtual organizations is to view it from the perspective of the opposite side of trust - control. There appears to be a general understanding that trust and trust building relationships are the other sides of the control mechanism for virtual organizations. On the one hand, a stronger trust from management on a remote worker or team is a positive sign, and can positively impact job satisfaction, hence, productivity. On the other, hand, lack of trust may lead to the feeling of micromanagement and distrust, hence, negatively impact job satisfaction and eventually productivity. However, more, or excessive trust without controls, may also lead to misuse of trust, and essentially may not only be connected with lower productivity, but with disruptive behaviour. In other words, lack of trust as well as excessive trust leads to negative outcomes and productivity disruptions. Essentially, trust and trust building relationships have to be working in interaction with a proper degree and frequency of controlling measures.

Gallivan summarized a conceptual framework of *Trust* and *Control*, where *Level of trust* depends on: (1) *Level of control,* which in turn, depends on *Control mechanisms;* (2) and simultaneously on *Trust building*. Both *Level of control* and *Level of Trust* impact *Confidence* (in partner cooperation). He found in his research overview of several case studies of Open Source Software projects that teams have relied explicitly more on Control mechanisms than on Trust (Gallivan, 2001).

Trust building is a process, along which a certain direction of the level of trust is evolving over time. Trust depends on the duration of relationship between two parties and the history or experience of relationships. Normally, one can expect a positive

correlation between the level of trust and time, as during this time a specific history of relationship outcomes was observed and reinforced.

Another element of trust is *Reciprocity*. Reciprocity (based on transactional theory), is a model of relationship between two or several parties, where they form an exchange of work efforts (in the case of labour relations) in both directions, and the quality of one individual effort will depend on the efforts of another party. In a virtual organisation, the degree of teleworker commitment depends on teleworker beliefs about commitments from her manager, other team members, or an organization are. In a case study of a UK Software group CompuCo, researchers have found reciprocal commitment in the work relationship was critical, in particular on personal level and divisional level (Crossman and Lee-Kelley, 2004).

To the extent that individual reciprocity is crucial, the *Beliefs* about team member productivity are crucial as well, even though a particular individual is not benefiting from a direct exchange with another team member. In another laboratory experiment, measuring the teleworkers vs. none-teleworkers teams, a positive correlation between individual efforts (and productivity) and beliefs about the efforts (and productivity) of other team members was found in the teleworking team environments (Dutcher and Saral, 2012). In other words, individual efforts are stronger, if she believes that team members apply similar efforts. That is, individual beliefs about each other productivity can impact overall team productivity.

The feeling of Isolation is a phenomenon that automatically follows teleworkers, especially those, who have not previously encountered teleworking experience in their lives. COVID-19 crisis has created unique situation, where a predominant number of teleworkers have never worked in remote work mode and now have to face with the biggest challenge of remote work – isolation. Isolation can negatively impact both engagement and productivity (directly and indirectly via engagement). That is why, the way an individual and organization addresses isolation issue will largely define what will be the level of productivity, hence overall effectiveness and efficiency of the whole remote work organization.

In accordance with Kurland studies, our research construct covers two major dimensions of isolation: professional and social (Kurland and Cooper, 2002). Social

isolation can be a critical factor of overall comfort of employee in organization, given that we are social beings, demanding communication, and social interaction to this or that extent. Thus, social isolation can impact engagement. Professional isolation can impact productivity due reduction in face to face interaction with regards to daily job tasks, as well as in the longer term due to lesser informal learnings and knowledge sharing opportunities.

Hypothesis: Isolation is negatively correlated to engagement and productivity. Isolation is also intermediated via engagement to productivity.

2.6 Modern Management Practices that can positively Influence Engagement and Productivity

Besides traditional human resource management practices outlined in control theory, there are quite recent non-conventional practices referred to as high involvement innovation practices (HIIP). Unlike traditional HRM practices that are focused on HR processes, recruitment and management control, traditional rewarding schemes, HIIP focuses on such instruments and approaches of people management, like (a) decentralization and empowerment, (b) supervisor support, (c) competence development and (d) external and internal cooperation (Ramstad, 2014).

It may seem that decentralization and empowerment in teleworking is probably a phenomenon that comes with teleworking automatically and naturally, given the fact that workers are physical working independently, autonomously and in different locations. However, the basis of decentralization is the way decisions are done on individual and team level, that is a decentralized organization incorporates decentralized and autonomous individual and team decision making, but not a physical aspect of teleworking. Ramstad indicates in her works, that organizations, where people are empowered with tools, autonomy and responsibilities to participate in decision making process, problem solving and innovation are more committed and motivated (Ramstad, 2014). Decentralized decision making is not an instant solution to productivity and its adoption is a matter of process and persistent change

management. So, during Covid-19 crisis, organizations are unlikely to initiate this change, unless they already practice decentralized decision-making and maintain it.

Supervisor support as a part of HIIP suggests a different angle of people management compared to control theory. While control theory (where the key word is control) is focused on output control, process control and knowledge and competence development control (for effective job execution), supervisor support is affiliated with interpersonal relationships, empathy and manager's concern over a broader scope of life of an employee. Supervisor support covers the aspects of employee well-being in general, support of employee work-life balance issues, which in turn drive the feeling of safety and motivation. In an early research in this area, Hartman and Stoner found that telecommuter satisfaction is strongly correlated with supervisor emotional and technical support provided to a teleworker (Hartman and Stoner, 1991). In a more recent study by Ramstad, the presence of supervisor support is positively correlated with employee productivity and quality of working-life simultaneously (Ramstad, 2014).

Supervisor support is the first on the management practices to be investigated that could potentially be altered to influence the outcome of productivity. Supervisor support can be directly related to Kahn's 3 pillars of engagement. Management style is discussed as a key influence in psychological safety. A manager can create a safe space for employees by providing an employee with the support they need to complete their work and clearly communicating goals and expectations. As usual face to face interactions are no longer feasible, extra efforts may need to be made in home office to provide this safe environment. A manager can also support an employee's psychological availability during the COVID-19 crisis. As the boundaries of work and life get blurred, employees may struggle with the striking an effective work life balance. In this situation the usual concept of one's work life balance has also been affected as those with children are having to home school along with juggling full-time job.

Besides, personal support, associated with providing sense of security and encouragement (RC 4 a and d), we decided to set up a wider definition of supervisor support also from the standpoint of managerial support (RC b and c). These questions stem from control theory, but in some researches also refer to supervisor support in a wider sense (Ramstad, 2014, Hartman and Stoner, 1991). It is hypothesized that supervisor support in the form of regular interactions and check-ins with one's direct

manager has a positive correlation with engagement and a negative correlation with professional isolation.

Hypothesis: Supervisor support is positively related to engagement and negatively related to isolation, both of which act as mediators of productivity

Control theory addresses employee competence development from clan control perspective. According to clan control, an organization is responsible for training and development, and creation culture and shared values. Compared to HIIP, clan control is a top down approach, whereas competence development as a part of HIIP is seen from “win-win” perspective of an employee and organization. From an employee perspective, training and development, employee development and educational plans raise personal and professional value of an employee directly (both for this particular organization and for the market), which is in direct interests of an employee. Organization that is investing in employee training and development, thus value their employees and displays interest in employee long-term value (Patterson et al., 2004). From organizational perspective, the company, investing in competence development, in doing so perceives employee’s development as investment, and thus directly leveraging employee productivity and hence overall profitability.

Competence development is a key factor in self-efficacy theory, linked to the key pillars of performance accomplishments and emotional arousal. The first hypothesis is that if employees in home office are well trained and experienced in how to work and communicate remotely, then they will be more productive.

As described in the literature review, self-efficacy has been linked to better productivity in remote working scenarios (Staples et al., 1999). If someone is experienced in remote work, the fast and unexpected shift to home office could have triggered less of an emotional arousal as someone who has no experience in home office as they were already equipped with the skillset to work remotely.

Competence development can be also outside of teleworking context. Competence development as a part of High Involvement Innovation Practices (HIIP) or modern management practices. On the one hand, in HIIP competence development as employee skills development, is a direct lever of productivity (though probably having

a longer-term effect). On the other hand, competence development can be an indirect lever of productivity and direct lever of engagement, when it is seen as display of company interest in employee, her significance and meaningfulness (Patterson et al., 2004). According to social exchange theory, an employee is expected to react positively to competence development.

Hypothesis: Competence development is positively related to both engagement and productivity

Internal and external cooperation are seen in more micro and macro perspective. There can be cooperation within a workplace, and hence, more internal, teamwork, within department. Internal cooperation is essential in reaching organizational goals, teams and departments have to be strongly interacting to align on goals and execution. This becomes critical in teleworking due to the issue of isolation, that can counter-balanced by internal cooperation and team interaction. On a broader scale, cooperation can be viewed across departments, different teams, external partners, and customers. The purposes of such cooperation can be customer service and business performance, and organizational development and change and innovation. According to Ramstad, there is a positive relationship between both internal and external cooperation and simultaneous improvement of productivity and quality of working life (Ramstad, 2014).

Informal and formal team interaction can be linked to Kahn's psychological safety and psychological availability pillars. The structures an office environment provides can contribute to clear team goals and more fluid interactions and work collaboration. It is also easier to pick up on social queues when collaborating and there are informal social situations where people come together and may discuss a project's progress or bring up an impending deadline while in the team's kitchen or social area. This structure creates psychological safety as it is a weathered and well-practiced process, the cultural norms of the office are known to most employees. Home office removes these practiced structures and causes teams to create new remote structures for collaboration. The new structures need to be tested within the team and the entire team needs to get used to the new way of working. Some will adjust better than others and feel little impact to the communication within the team, others will struggle with the lack of social cues and the varying options of remote communication and planning

tools. Navigating these new tools and the rapid change in how a team can communicate eats into one's psychological availability required for productive work. Interpreting written and other remote communications could also negatively affect one's psychological capacity to be productive.

Team interaction can have both direct and indirect effect on productivity. The indirect effect is routed via isolation. During COVID-19, team interactions a key factor to remedy professional and social isolation, as more effort is required to actively seek out colleagues and communicate with them. It can also be more difficult to express oneself using remote tools, if this is not a usual way of working. The direct effect operates via internal and internal cooperation, which ensures that employee has sufficient inputs for his work to be done in time and proper quality. Social interaction has been found as an important positive factor to telecommuter productivity (Neufeld and Fang, 2005). Internal and external cooperation was also positively correlated simultaneously with productivity and quality of working life (Ramstad, 2014).With a focus on measuring indicators that can be changed and influenced by those experiencing it, the following questions were chosen for the survey. It is hypothesised that regular team interactions are positively correlated with engagement and negatively correlated with professional isolation.

We look at team interaction broader and include recognition as its essential element. It is hypothesised that employees who still receive regular recognition from their peers and superiors in while working from home have a higher sense of engagement. Pulling once again on Kahn's engagement theories and the further literature around the subject covered in the literature review, management practices and the perceived "fairness" of organisational and management practices are a key antecedent of engagement, and therefore it is expected that this indirectly influences productivity. It also pulls on Kahn's first pillar of engagement, meaningfulness. If an employee's actions are appreciated by the people around them, it is expected that they are more engaged in their work as their tasks are perceived as meaningful. In a home office or remote setting, the distribution of these rewards and the celebration of small successes require active initiation, whereas this could be informal communicated in an office setting. In remote work, there may also be less opportunity to meet as a team

and have informal exchanges in which appreciation can be show without active initiation, for example while waiting for participants of a meeting to arrive.

The hypothesis is that recognition is positively correlated with engagement and negatively correlated with professional isolation.

Hypothesis: Positive team interaction is positively related to engagement and negatively related to isolation, both of which act as mediators of productivity. Team interaction is positively and directly linked to productivity.

2.7 Overall Research Construct Model

The literary review uncovered a wide array of focus areas which may be of interest in the unprecedented and unexpected COVID-19 situation. With this research, it is intended to focus on the desired outcome of productivity. This is a very relevant outcome for both companies and employees, and due to the uncertainty of economic impact of COVID-19, it is a significant area of worry and attention. The research model is set up to focus on which management practices have a significant influence on productivity and providing clear and tangible recommendations for managers and employees.

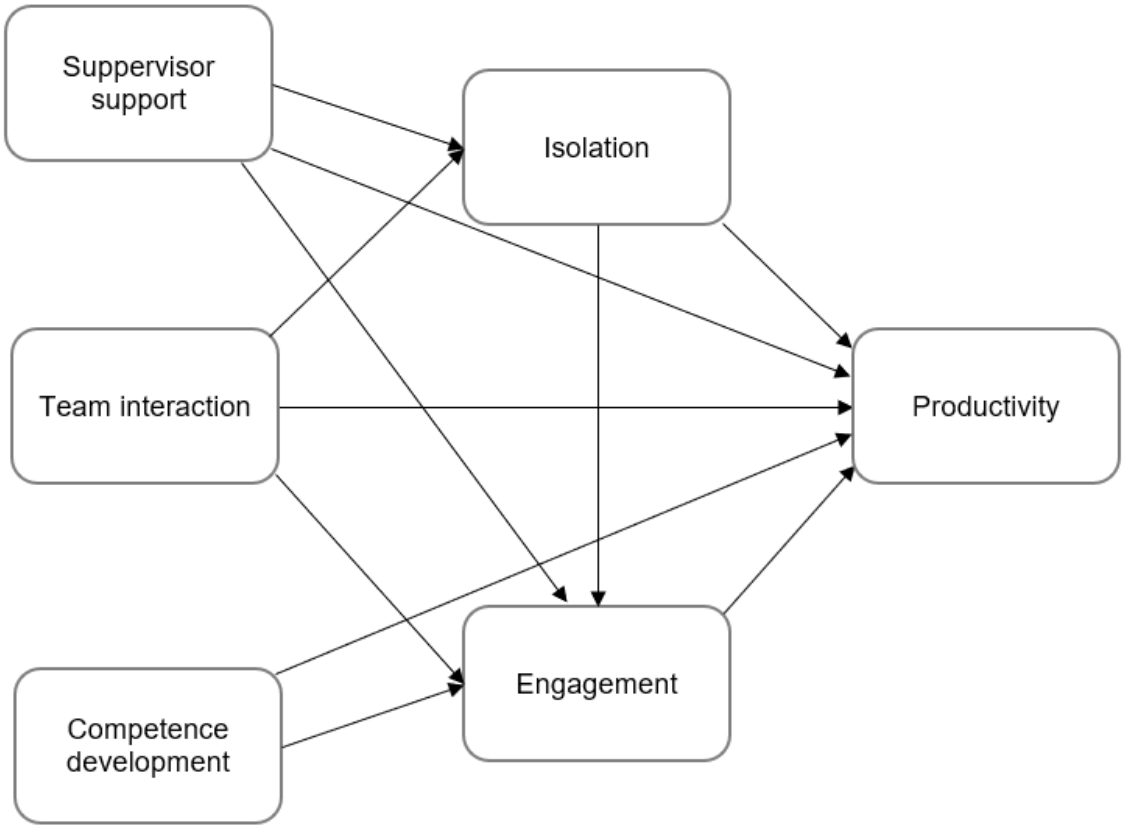


Figure 1: Research Construct Model

3 Measurement Method

This chapter covers the how these hypotheses were measured and analysed. In this chapter, an overview of the sample respondents, data gathering methods, data analysis methods and means of measurement are discussed and clarified.

3.1 Research Respondent Sample

The survey was answered by 274 respondents. Of these responses, 212 were deemed usable. Several responses were disqualified due to incomplete responses (more than 50% unanswered) or disqualified as they were not working in home office at the time of the survey. Several respondents also chose “neutral” for all questions in part 2 of the survey. These were also disqualified on suspicion of not being answered honestly and would have skewed the results.

As the maximum number of arrows pointing at a construct is 6, the recommended sample size is 217 at a 1% significance level and minimum R^2 of 0.1 as outlined in Cohen in (Hair et al., 2014). With 212 responses, the sample size is slightly off the recommended sample size for the construct of isolation. However, all other constructs have 5 or less arrows, and therefore exceed the recommended sample size of 205 with the same conditions.

3.2 Data Gathering

Data for this research was collected via online survey. The prepared survey was created on a paid third-party survey platform and circulated via social media channels (LinkedIn, Facebook) and through the personal networks of the researchers. The survey was created in both Russian and English to take advantage of the full networks available. The survey was directly promoted to networks in Austria, Germany, Ireland, the USA and Russia. It is noted that the networks used for survey collection were largely comprised of professionals with university level educations, which may have impacted results. The 274 responses were collected over a 3-week period in May 2020.

In order to appropriately group participants for analysis, several background information questions were asked.

The first question asked the participants to select their industry from a drop-down list. It is hypothesised that employees that work in industries that are considered more "high tech" or modern such as IT and programming have different, more flexible work cultures than those in traditional industries such as energy and manufacturing. Those employees in the more traditional industries may also have less experience working remotely as the nature of their work requires interactions with machines and process lines that are fixed in place. It is therefore hypothesised that these workers had a steeper learning curve and lower productivities working remotely.

The second question asks how long the participants has worked in their company. The hypothesis is that those who are with the company longer and more familiar and secure with the work that they do, needed less manager interaction which may have been missing in the short notice home office implementation. The length of time in the company may be an indicator of seniority – but is not necessarily so.

The next 3 questions are linked to experience in home office, which allows us to group participants into those who are experienced with remote working and those who are not. This also allows us to filter any participants who are not working in home office and who's responses bear no relevance for the survey so they can be removed from the final dataset.

The participants are then asked to state their gender. This ensures that the survey has a balanced dataset and although the topic of gender roles in home office is not directly investigated in this survey, the literature review indicates that this may be a factor that skews results.

The last question of the background section asks for the participants management level. This is directly linked to control theory and it is expected that higher level managers who have more direct responsibility for the company's performance have a different experience in home office than those who are individual contributors. It is also expected that the more senior the manager, the less interaction they will have with their superior about task and individual performance i.e. less micromanagement.

3.3 Data Analysis Methods

The data was analysed in SMART PLS using partial least squares structured equation modelling (PLS-SEM) to confirm or deny the hypotheses.

PLS-SEM is a 2nd generation technique of a multivariate method to test the hypothesis of existing theories and concepts or to develop a theory in an exploratory manner. This analysis focuses on the predictive ability of the model, which serves the purposes of this research. PLS-SEM can be used with a small data sample size, where data is non-normally distributed and the measurement scale if nominal, ordinal and interval. This matches the criteria of the data of this research and supports the analysis of the hypothesised research constructs.

3.4 Measuring individual research constructs

In order to collect data to support the analysis of the hypotheses, participants were asked to evaluate how strongly they relate to a number of statements using a 5-point Likert scale as shown in **table 2.**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Score	1	2	3	4	5

Table 2: Likert Scale used in Data Collection

This method was chosen as it is allowed for ordinal and interval data analysis. All questions used the same scale so that they were comparable (Bertram, 2013).

3.4.1 Research Construct: Productivity

The purpose of this study is to measure productivity in home office. The answers to these questions are used to indicate, if a person perceives themselves as productive or not in a remote working setting.

Research construct is composed of questions statements that will allow to self-rate productivity as objectively as possible. We have selected just one statement, on

overall productivity perception (RC1-a). The remaining statements are addressing particular components of productivity measurement (RC1 a-d). The latter address more "objective" aspects of productivity, such as quality of work, capacity and value-added time utilization and achievement of goal expectations. These dimensions of productivity are derived from general theory of productivity (effectiveness and efficiency theory) and other popular productivity measurement approaches, such as goal theory, capacity utilization theory.

#	Question	Theoretical background
RC1-a	I regularly reach a high level of productivity, when I work from home	Overall self-perception of productivity
RC1-b	I achieve satisfactory results with regards to agreed goals and deadlines, when I work from home	Goal theory/approach in measuring productivity
RC1-c	During an entire day working from home, I spend most of my time on useful work	Capacity utilization/Value added time utilization theory
RC1-d	The quality of my work results and output is high, when I work from home	Effectiveness & Efficiency in productivity

Table 3: Survey Statements to Measure Research Construct 1 - Perceived Productivity

3.4.2 Research Construct: Engagement

In this survey, engagement was evaluated by the respondents, and therefore there is a limitation that it is an individual's perceived engagement, rather than based on peer and managerial assessment. There are flaws in this measurement method, as outlined in the self-efficacy section of the literature review, a person's self-efficacy can alter their perception of their engagement and performance (Staples et al., 1999). These questions were also chosen as indicators of an engaged state, rather than measuring the theoretical influencers of engagement.

#	Question	Theoretical background
RC2-a	When I work from home, I am highly engaged in my job	Overall self-perception of engagement level
RC2-b	When I work from home, my job can be all-consuming, I am totally into it	Indirect perception of engagement level
RC2-c	When I work from home, sometimes I am so into my job that I lose track of time	Indirect perception of engagement level

Table 4: Survey Statements to Measure Research Construct 2 - Engagement

These questions are aligned with Saks and modified to apply them to the direct situation of COVID-19 home office by adding "When I work from home" at the start of the question (Saks, 2006).

3.4.3 Research Construct: Isolation

In order to measure the perceived isolation an individual participant is feeling, statements that covered both professional and social isolation were included in the survey. These statements cover the short term feeling that an individual feels, which can vary depending on which conditions the survey was completed, and also long-term beliefs on how the isolation will affect their future.

#	Question	Theoretical background
RC3-a	When I work from home, I feel discomfort due to lack of regular face to face contact with my colleagues and teammates, and it is harmful to my productivity	Professional isolation
RC3-b	I feel that lack of direct interaction is harmful for informal learning and experience sharing	Professional isolation
RC3-c	When I work from home, after some period of time I feel exhausted working without direct (face-to-face) interaction with my team	Social isolation
RC3-d	I feel that current level of face to face social and personal networking will be harmful to my career advancement	Professional isolation
RC3-e	When I work from home, I feel dissatisfied with the level of social interaction with my colleagues	Social isolation

Table 5: Survey Statements to Measure Research Construct 3 - Isolation

3.4.4 Research Construct: Supervisor Support

The first management practice to be measured in supervisor support. The statements in included in the survey covered the emotional support received from a manager and the structure the manager has put in place to support the work of their team. Both aspects are expected to positive influence engagement and productivity.

#	Question	Theoretical background
RC4-a	When I work from home, my manager encourages me to take initiative and develop new approaches and procedures	Supervisor support and encouragement
RC4-b	I have regular checkpoints on status of my tasks with my direct manager, when I work from home	Behaviour controls, managerial support
RC4-c	When I work from home, my direct manager is responsive and provides me with timely feedback and inputs for my work to be properly done	Behaviour controls, managerial support
RC4-d	When I work from home, my manager is open and supports me in juggling work and personal challenges	Supervisor support in work-life balance

Table 6: Survey Statements to Measure Research Construct 4 - Supervisor Support

3.4.5 *Research Construct: Team Interaction*

To ensure team interaction, the survey composed of statements that focused on internal and external cooperation, which is linked to engagement and productivity, and also goal and control theory.

#	Question	Theoretical background
RC5-a	When I work from home, my colleagues are responsive, provide timely feedback and input for my work to be done	Internal and external cooperation
RC5-b	When I work from home, I have daily team/department meetings to discuss who does what	Coordination, internal and external cooperation
RC5-c	When I work from home, I receive enough inputs and information from my colleagues in order to do all my tasks and job properly	Internal and external cooperation
RC5-d	When I work from home, we have weekly team meetings to align and discuss on medium term priorities	Coordination, Goal theory, control theory
RC6-a	When I work from home, my contribution and success is acknowledged and celebrated by colleagues	Peer to peer recognition
RC6-b	When I work from home, my teammates and colleagues congratulate me, whenever I demonstrate good results and achieve small successes	Peer to peer recognition
RC6-c	When I work from home, my manager regularly acknowledges my achievements	Manager to employee recognition

Table 7: Survey Statements to Measure Research Construct 5 - Team Interaction

Recognition is measured in the survey on two levels: Manager recognition and peer recognition. The statements were formulated and repeated in a rephrased way so as to minimize outcome bias by the survey participants.

3.4.6 Research Construct: Competence Development

The survey statements to support the testing of competence development focused on competency development regarding the technical and organisation aspects of working in home office and also professional competence development in a broader sense. The statements also elude to how the company has instructed/setup their organisation in remote working, and how the company controls their larger organisation.

#	Question	Theoretical background
RC7-a	I have completed training sessions on how to work remotely, including the usage of essential tools for working from home	Teleworking training
RC7-b	When I work from home, I continue taking regular trainings consistent with my professional and competence development plan	Competence development (HIIP), clan controls
RC7-c	When I work from home, my personal development plan is regularly discussed with the manager	Competence development (HIIP), clan controls
RC7-d	When I work from home, my manager/company offers me challenging tasks and projects	Competence development (HIIP)

Table 7: Survey Statements to Measure Research Construct 7 - Competence Development

4 Survey Results

This chapter gives an overview of the responses collected in the survey. The survey pre-amble questions are analysed to get a deeper understanding of how representative the respondent sample is of the working population and any anomalies are identified.

4.1 Descriptive Statistics

4.1.1 Length of time working for current company

Of the respondents, 72.3% had been working for their companies for over 1 year. The majority (47.9%) had been working with their companies for 1-5 years. Those with more experience accounted for 24.4%. Those with less experience accounted for only 4.7% of the sample. This data passed the test for normality; however, this is not required for SEM using Smart PLS software. The mean and median were at the midpoint of 1-5 years.

Factor	Mean	Min	Max	Standard Deviation
Length of Time at Current Company	3	1	5	1

Table 8: Statistical overview of Responses to question "How long have you worked for your current company?" where 1= Less than 3 months, 2 = 3-12 months, 3= 1-5 years, 4= 6-10 years, 5= More than 10 years

4.1.2 Industry Type

Respondents were asked which industry they worked in and these industries were then categorized into "traditional" or "modern". In this sample, 25% of respondents selected an industry that was categorized as traditional. The following industries were classified as "traditional": Construction, Building, Real Estate; Education; Logistics &Transportation; Manufacturing (Industrial and Consumer goods); Oil & Gas; Public sector, State services and agencies; Retail & Wholesale; Utilities (Electricity, Water).

As the survey was targeted at those who are working in home office due to COVID-19, this large majority in more modern industries could be explained by more traditional industries requiring a physical presence to complete the work. Therefore, these industries may not have been able to send employees into home office and this sample is representative of the actual situation.

4.1.3 Previous Remote Working Experience

Of our survey participants, 70% are classed as very inexperienced in home office with no experience in home office (34.8%) or less than 2 months experience working in home office full time or part time (38.4%). Our survey participants having little experience in home office is reflective of the actual work population, as many companies do not offer home office in the countries surveyed.

Factor	Mean	Min	Max	Standard Deviation
Previous Experience	2	0	6	2

Table 9: Statistical overview of Responses to question "how long have you worked from home?" where 1= Previously not, 2 = Less than 2 months, 3= 3-6 months, 4= 6-12 months, 5= 1-3 years

4.1.4 Gender

Although gender affects in home office are not in scope for this study, participants were asked to confirm their gender to compare the sample with that of the working population. In our study, 60% of the respondents were female. This is a mirrored picture of the actual situation in the countries of the respondents, which range from 45-48% female workers in the entire workforce (World Bank, March 1 2020).

A two-sample t test (Appendix 1) confirms that gender has no statistically significant effect on perceived productivity. Therefore, this discrepancy should not bias the overall model.

4.1.5 Management level

Survey respondents were 40% employees with no direct personnel management responsibility. On the other end of the spectrum, 11% of survey respondents considered themselves Top managers or executives.

Factor	Mean	Min	Max	Standard Deviation
Management Level	2	0	5	2

Table 10: Statistical overview of Responses to question "Which of the following best describes your management level? where 1= Employee, 2 = First level manager, 3= Team leader (managing 1st level managers), 4= Departmental Manager, 5= Top manager/Executive

4.1.6 Job Type

Most respondents (57%) worked in services position such as Finance, Accounting, HR and information technology. Therefore, the core of their work is done on computers and it is assumed these positions do not require site-based machinery.

Function	Percentage of Respondent Sample
Information Technologies, Programming	35%
Marketing	21%
Other	13%
Customer service	11%
Project management	4%
Procurement	4%
R&D	3%
Logistics	3%
Quality assurance	2%
Manufacturing	2%
Sales	2%
Administrative (Finance, Accounting, HR, other)	1%

Table 11: Job categories of survey respondents

4.2 Results from Research Construct Statements

4.2.1 Productivity

The aggregated responses for productivity showed that the majority of respondents felt that they were productive in home office. In the survey, 137 respondents (71%) selected “agree” or “strongly agree” to positive statements regarding their productivity.

Response to Productivity	Percentage Response					Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
(RC1-a) I regularly reach a high level of productivity when I work from home	2%	11%	23%	41%	23%	1
(RC1-b) I achieve satisfactory results with regards to agreed goals and deadlines, when I work from home	0%	2%	11%	60%	27%	1
(RC1-c) During an entire day working from home, I spend most of my time on useful work.	1%	17%	16%	54%	11%	1
(RC1-d) The quality of my work results and output is high when I work from home	2%	8%	22%	48%	21%	1
Aggregated Response	**1%**	**10%**	**18%**	**51%**	**20%**	**1**

Table 12: Responses to statements on Productivity

As shown in Table 12, out of the four statements included in the survey, results were consistent except for RC1-b "I achieve satisfactory results with regards to agreed goals and deadlines, when I work from home". Respondents answered this question more positively than the others with 87% of respondents answering "agree" or "strongly agree". This was the only statement that had reference to goals and deadlines, therefore this suggests our respondents are still meeting the performance expectations of their organisation in their own view.

4.2.2 Engagement

As shown in Table 13, the responses to positive statements indicating engagement were spread. The mean was roughly the midpoint "neutral", and the first quartile lying at "disagree" and the third quartile at "agree". This indicates that perceived engagement in home office was varied, and many respondents felt that the time dragged instead of passing quickly, which is a sign of engagement.

Response to Engagement	Percentage Response					1st Quartile	2nd Quartile	3rd Quartile
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree			
(RC2_a) When I work from home, I am highly engaged in my job	0%	17%	18%	46%	19%	3	4	4
(RC2_b) When I work from home, my job can be all-consuming; I'm totally into it	5%	23%	19%	41%	12%	2	4	4
(RC2_c) When I work from home, sometimes I am so into my job that I lose track of time	5%	17%	12%	46%	20%	3	4	4
Aggregated Response	**3%**	**19%**	**16%**	**44%**	**17%**	**3**	**4**	**4**

Table 13: Responses to statements on Engagement

As shown in Table 13, the responses to the individual statements were centred around the weaker responses of "disagree", "neutral" and "agree". However, it is interesting that there is a difference in the responses for RC2-b and RC2-c as the statements were very similar, asking about how fast time passes when working in home office. This could be explained by the phrasing of the statements, as RC2-b eludes to a positive feeling about work "I'm totally into it". This attitude towards work is based on an American survey by Saks, and culture attitudes may be playing a role here (Saks, 2006).

4.2.3 Isolation

As shown in Table 14, the responses to the isolation statements indicated that there was an almost even split of respondents who did or did not feel isolated with 40% of respondents answering "agree" or "strongly agree" and 39% of respondents answering "disagree" or strongly disagree". This will be very useful in determining the effects of isolation on perceived productivity during the SEM analysis.

Response to Isolation	Percentage response					1st Quartile	2nd Quartile	3rd Quartile
	Strongly agree	Disagree	Neutral	Agree	Strongly agree			
(RC3-a) When I work from home, I feel discomfort due to the lack of regular face to face contact with my colleagues and teammates and it is harmful to my productivity	12%	31%	19%	31%	6%	2	3	4
(RC3-b) I feel that lack of direct interaction is harmful for informal learning and experience sharing	6%	24%	19%	40%	12%	2	4	4
(RC3-c) When I work from home, after some period of time I feel exhausted working without direct (face-to-face) interaction with my team	10%	31%	16%	28%	14%	2	3	4
(RC3-d) I feel that the current level of face to face social and personal networking will be harmful to my career advancement	13%	37%	29%	15%	7%	2	3	3
(RC3-e) When I work from home, I feel dissatisfied with the level of social interaction with my colleagues	6%	28%	20%	36%	10%	2	3	4
Aggregated Response	**9%**	**30%**	**21%**	**30%**	**10%**	**2**	**3**	**4**

Table 14: Responses to statements on Isolation

The responses to statements RC3-c and RC3-e were stronger than the others in that a larger number of respondents choose “agree” or strongly agree” (52% and 46% respectively). Both of these questions were related to interaction with colleagues.

RC3-d asked the respondents whether they felt isolation would negatively impact their career and the 50% of all responses were “disagree” or “strongly disagree”. This reflects the situation unique to the COVID-19 social restrictions as all employees were presented with the same circumstances.

5 Results and Analysis

5.1 Initial model

The initial model was evaluated with three endogenous latent variables (*productivity, engagement*, *isolation*) and three exogenous variables (*supervisor support, team interaction* and *competence development*). First of all, let's evaluate the internal consistency of indicators within latent variables. Cronbach's alpha and Rho-A is acceptable and above 0.7 for *productivity, engagement* and *isolation* (Table 2.1). Cronbach's alfa and Rho-A are not acceptable for *competence development* and *supervisor support,* indicating that there these research constructs and contents were inconsistent. However, because the indicators of Average Variance Extracted (AVE) and Composite Reliability Index (CRI) are both above required thresholds, we in general conclude, that altogether construct reliability tests provide us the reasons to further discuss the results and model changes.

Table 2.1.

Research constructs	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
Competence development	0,471	0,504	0,786	0,650
Engagement	0,789	0,820	0,874	0,699
Isolation	0,864	0,873	0,902	0,648
Productivity	0,809	0,827	0,875	0,638
Supervisor support	0,602	0,605	0,834	0,715
Team interaction	0,704	0,735	0,817	0,531

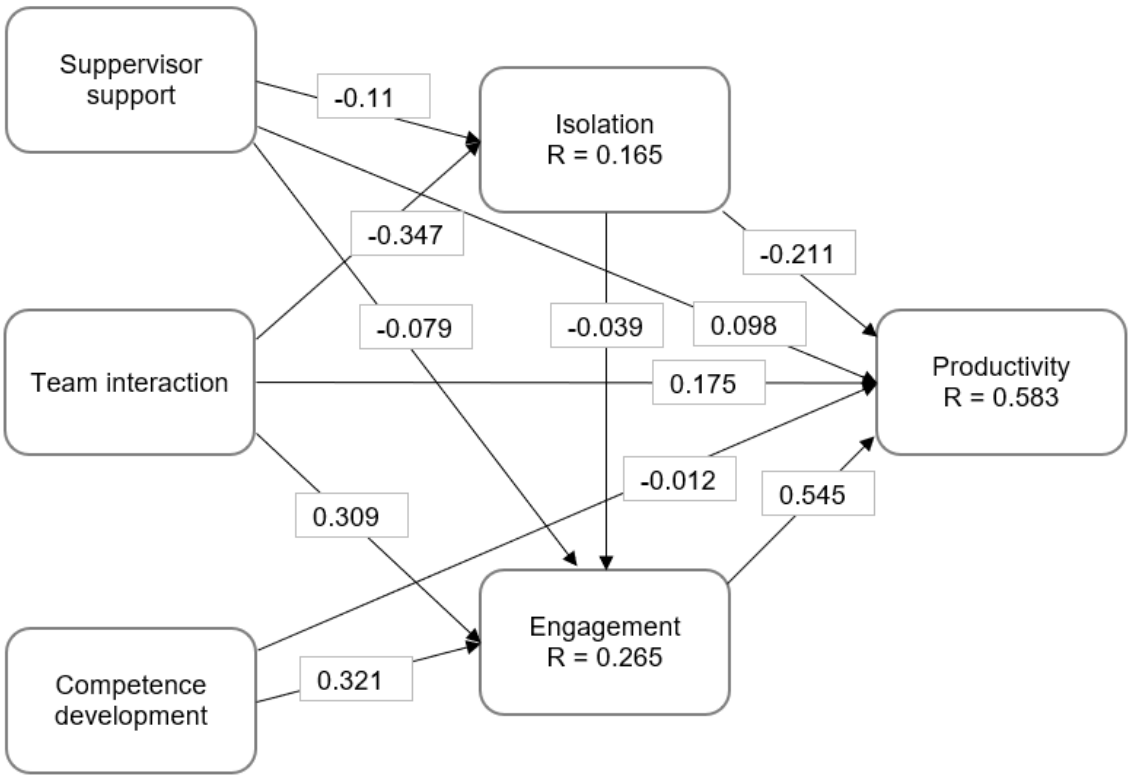
Second, looking into goodness of fit, we can state that *productivity* is fairly well explained. R-squared for *productivity* is fairly strongly explained, reaching 58% of explained variance (graph 2.1 and table 2.3.). *Engagement* and *isolation* with R-squared of 26% and 16% are considered to be weakly explained by exogenous variables. The overall goodness of fit, measured by SRMR, NFI and rms Theta indicators remain below acceptance levels. Looking at SRMR and NFI, we cannot conclude that the model is perfectly fit. SRMR is expected to be below 0,08, and in our model, SRMR is slightly above (0,084). NFI is recommended to be above 0,9, while in our estimation 0,689. The indicator of rms Theta is expected to be as close to zero as possible. Because SRMR is near 0,08, and goodness of fit can in general display the explanatory power and scope of research, we proceed with the analysis of coefficients, as they will display, if individual relationships are statistically significant or not.

Table 2.2. Model fit

Major criteria	Estimated Model
SRMR	0,083
Chi-Square	581,143
NFI	0,69
rms Theta	0,181

Before we continue with other variants of the model, let's review predicted beta path coefficients and their significance levels. In general, the signs of all coefficients are as expected (Figure 2.1). *Supervisor support* and team *interaction* negatively affect *isolation* have negative signs, -0,11 and -0,35. *Isolation* negatively impacts *productivity* with -0,21 coefficient. *Supervisor support, team interaction, engagement* are positively linked to *productivity*. We can note that engagement has a fairly powerful impact on productivity with a coefficient of 0,54, *team interaction* with a moderate level of 0,18. From a bird view, *supervisor support* is linked to *productivity* with 0.1 coefficient. Keeping in mind construct reliability tests, let's have a look at significance levels (2.3). It appears, that coefficients linking *supervisor support* with *isolation* and *productivity* are statistically insignificant and can be rejected at 5% p-vale level.

Figure 2.1. Initial model path model



Overall, given the construct reliability tests and t-statistics we were not able to confirm our hypotheses of *supervisor support* being an important predictor of neither isolation, nor engagement and productivity (Table 2.3 and Figure 2.2). However, in our opinion, this conclusion does not necessarily question the theory around supervisor support role in teleworking, but rather questions the display of this relationship during COVID-19. Also, one can potentially question the validity of this finding, challenging the construct quality due to a fairly low Cronbach's alfa (Table 2.1).

In the initial model, *competence development* has a statistically significant causal effect on engagement and indirectly on productivity. It is interesting, that the direct effect of *competence development* on *productivity* is statistically insignificant as well. Perhaps, a statistically insignificant link indicates on the differences of "short-term vs long-term" and "direct vs. indirect". Basically, in the short-term perspective, competence development impacts *engagement* and, thus, indirectly *productivity*, instead of improving productivity performance immediately.

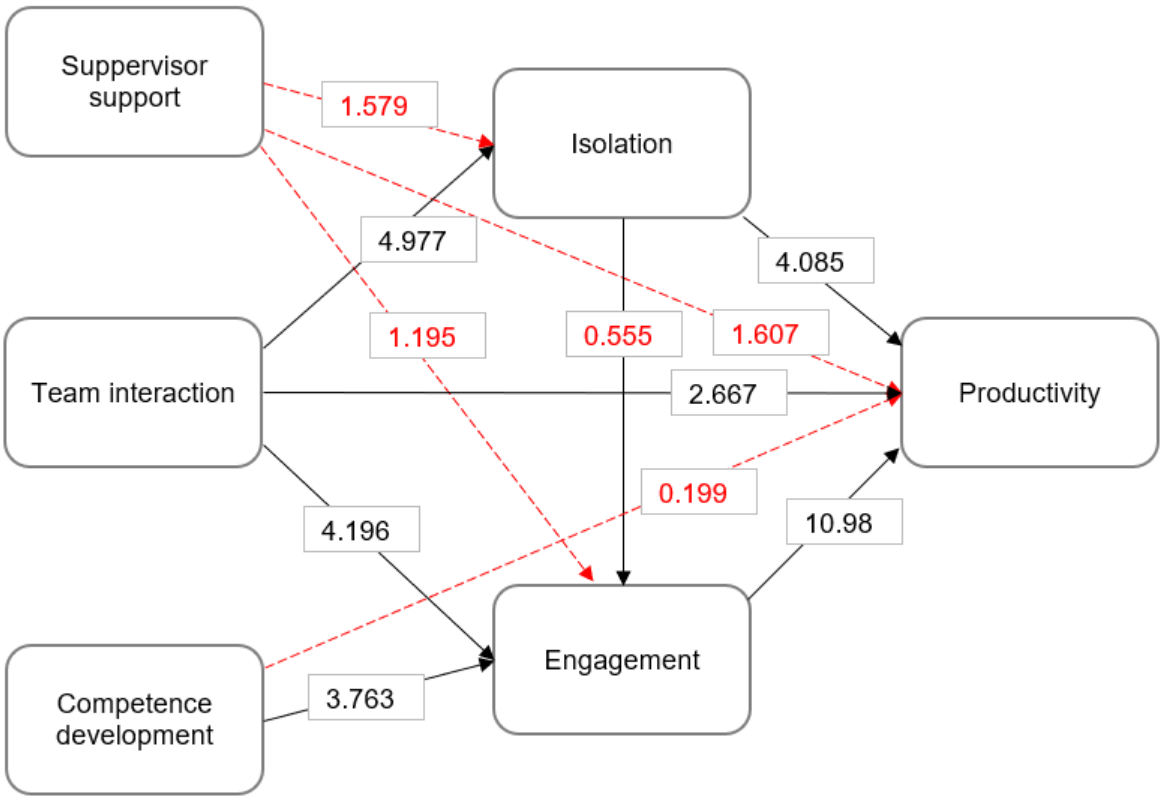
Given, the overall model fit quality and t-statistics of path coefficients, we will not proceed with further assessment tests of the initial model. Instead, we proceed with further analysis of a modified model without *supervisor support* variable and only statistically significant causal links.

Table 2.3. T-statistics of path coefficients in initial model

Path	Sample Mean	Standard Deviation	T Statistics	P Values
Competence development -> Engagement	0,320	0,085	3,763	0,000
Competence development -> Productivity	-0,011	0,062	0,199	0,842
Engagement -> Productivity	0,546	0,050	10,976	0,000
Isolation -> Engagement	-0,043	0,071	0,555	0,579
Isolation -> Productivity	-0,212	0,052	4,085	0,000
Supervisor support -> Engagement	-0,076	0,066	1,195	0,233
Supervisor support -> Isolation	-0,106	0,070	1,579	0,115

Supervisor support -> Productivity	0,091	0,061	1,607	0,109
Team interaction -> Engagement	0,308	0,074	4,196	0,000
Team interaction -> Isolation	-0,351	0,070	4,977	0,000
Team interaction -> Productivity	0,179	0,066	2,667	0,008

Figure 2.2. Path analysis and coefficients in initial model



5.2 Modified model

As it was discussed, we continued with a modified model, where *supervisor support* latent variable was taken out. In addition, we have deleted a statistically insignificant

link from *competence development* to *productivity*. Construct reliability tests show satisfactory results, as Compositive Reliability (CR) and Average Variance Extracted (AVE) are at acceptable levels. But questions still remain opened to the quality of *competence development* construct. Cronbach's alpha and Rho-A for competence development are 0,471 and 0,481 respectively, still not reaching satisfactory levels, suggesting that improvements in this construct can be made in future research (Table 2.4).

Table 2.4. Construct reliability tests in modified model

Research constructs	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Competence development	0,471	0,481	0,789	0,653
Engagement	0,789	0,817	0,874	0,699
Isolation	0,864	0,872	0,902	0,649
Productivity	0,809	0,829	0,874	0,637
Team interaction	0,704	0,736	0,817	0,531

The modified model is slightly better fit, compared to the initial model. Although SRMR is almost the same at 0,086, NFI has increased from 0,69 to 0,73 (Table 2.5). R-squared for endogenous variables have also marginal changes.

Table 2.5. Modified model fit

Key indicators	Estimated Model
SRMR	0,086
NFI	0,732
rms Theta	0,18

T-statistics, as it was expected, are satisfactory. All coefficients in the modified model are statistically significant and can be accepted at 1% confidence level (Table 2.6). The signs of coefficients appear to be logical and similar to the initial model. The

results of other model assessment statistics, including the tests in convergent and discriminant validity, structural model assessment is at satisfactory level (Appendix II).

Table 2.6. T-statistics of path coefficients in modified model

Path coefficients	Sample Mean	Standard Deviation	T Statistics	P Values
Competence development -> Engagement	0,292	0,082	3,519	0,000
Engagement -> Productivity	0,549	0,049	11,083	0,000
Isolation -> Productivity	-0,222	0,053	4,219	0,000
Team interaction -> Engagement	0,306	0,069	4,397	0,000
Team interaction -> Isolation	-0,396	0,059	6,642	0,000
Team interaction -> Productivity	0,209	0,059	3,495	0,001

5.3 Path analysis and intermediation of isolation and engagement

Our model suggests that *team interaction* has both direct and indirect effect on *productivity*. Team interaction positively and directly impacts productivity with a low impact coefficient of 0,2 (Figure 2.3). Direct effect is explained by the fact that *team interaction* is an essential element for a daily work to be done, including exchange of work inputs, feedback, and alignment. The indirect effect on productivity is intermediated via *isolation* (negatively) and via *engagement* (positively). The intensity of team interaction directly reduces the impact of isolation for teleworkers, as employees get more often connected and exchange with communications. Simultaneously, team interaction strengthens employee engagement, as employees see participation and contribution of the others and engage themselves respectively. The total impact of *team interaction* on *productivity* is evaluated to be at fairly high level, as it reaches 0,46 (Table 2.7).

In the same time, *competence development* has an intermediated impact on *productivity* via *engagement* with a total coefficient of 0,16. And we have seen that in the initial model, that direct link is statistically insignificant. It is interesting, to note that our study shows, that competence development appears to be more of an

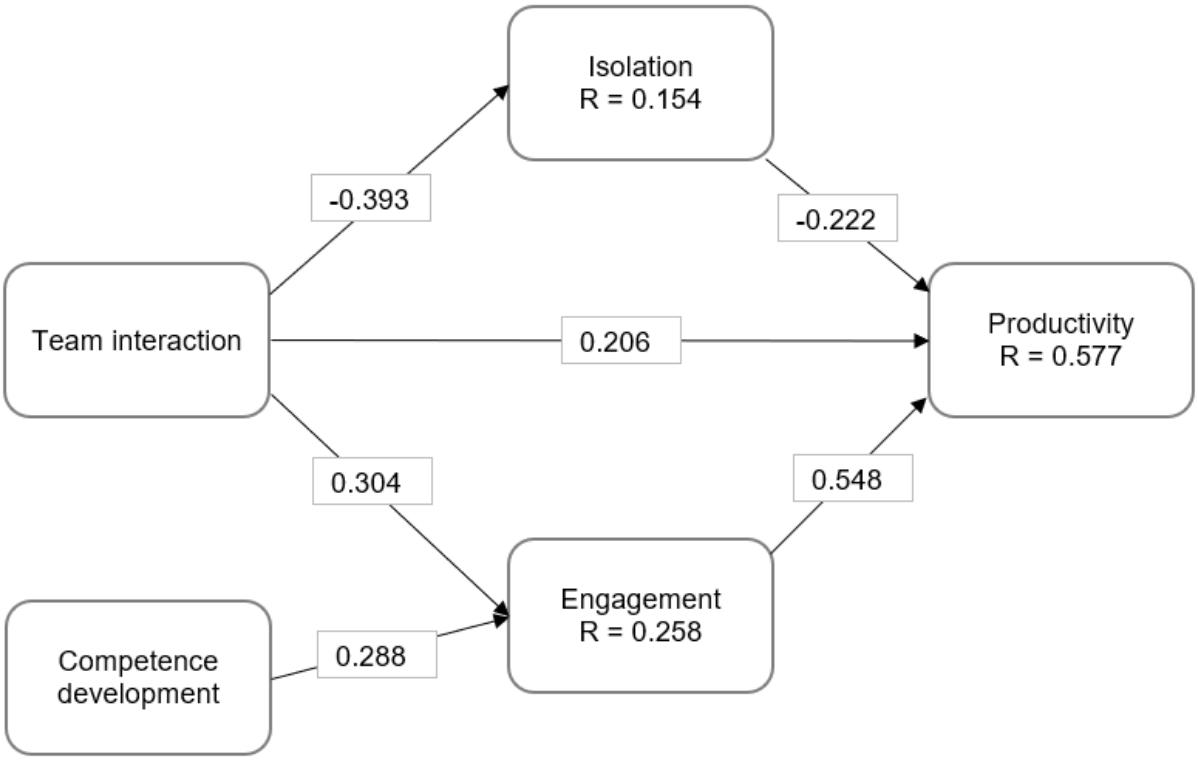
engagement lever than a direct lever of productivity improvement. As discussed earlier, this effect can be explained by short-term vs. long-term effect of *competence development* on *productivity*.

As it is predicted by general theory, engagement is one of most prominent drivers of productivity. Our study also confirms a fairly strong link from *engagement* to *productivity* with a 0,55 coefficient, suggesting that engagement is indeed a crucial intermediator and direct factor of productivity. Similarly, and in accordance with theory, a negative causal link from *isolation* to *productivity* was confirmed. A stronger professional and social isolation reduces productivity. Our study suggests that isolation reduces productivity by a factor of -0,22.

Table 2.7. Total effects and path coefficients in modified model

Latent variables	Competence development	Engagement	Isolation	Productivity
Competence development		0,288		0,158
Engagement				0,548
Isolation				-0,222
Productivity				
Team interaction		0,304	-0,393	0,460

Figure 2.3. Modified model and path analysis



5.4 Moderator effects

In our initial hypotheses we indicated that previous experience in teleworking and management level can play a systemic and differentiating role in our *isolation*, *engagement* and *productivity* model. We hypothesized, that employees with longer previous experience in teleworking may have a different level of *isolation,* and eventually *productivity*. Similarly, we expected, that the higher the level of management an employee has, the more he/she is engaged and productive. We have tested the impact of such variables on the final model and included them as moderator variables (the nature of which is similar to dummy variables in the case of categorical data in regression models). We expected a positive causal link between our moderator variables of previous teleworking experience and management level and our end endogenous variables, *productivity, engagement and isolation.*

Unexpectedly, the introduction of previous teleworking experience has not produced meaningful results. Previous teleworking experience has positive causal link on *isolation* and is statistically significant at 5% confidence interval (Table 2.7). According to our model, the more experienced in teleworking an employee is, the stronger isolation impact, he/she experiences. Similarly, previous experience on productivity resulted in a negative sign on productivity. More experience in teleworking is associated with lower perceived productivity in our model. This relationship can be rejected at 5% confidence interval, but also can be accepted at 10%. Such results may indicate that both experienced and inexperienced teleworkers were subject to the same level and degree of isolation effects.

A second moderator effect was a management level, tested on *isolation*, *engagement* and *productivity*. Similar to the previous moderator effect, we were not able to confirm that management level has any statistically significant impact on any of the endogenous variables. In total, we may conclude that neither previous teleworking experience nor management level played any differential role in the way *engagement*, *isolation* and *productivity* evolved during COVID-19. COVID-19 had an unprecedent impact on all employees, who have been subject to the same situation and consequences of the COVID-19 crisis.

Table 2.7. T-statistics of moderator effects

Path	Sample Mean	Standard Deviation	T Statistics	P Values
Previous teleworking experience				
Previous experience on Isolation -> Productivity	0,059	0,037	2,031	0,043
Previous experience -> Productivity	-0,208	0,157	1,734	0,084
Management level				
Management level -> Productivity	-0,217	0,279	0,770	0,442
Management level on Engagement -> Productivity	0,037	0,037	0,929	0,353
Management level on Isolation -> Productivity	-0,001	0,034	0,049	0,961

6 Discussion

The model shows had the following outcomes for the research hypothesis statements:

Hypothesis	Description	Result
1	Engagement is positively correlated to productivity in home office.	Confirmed
2	Isolation is negatively correlated to engagement and productivity. Isolation is also intermediated via engagement to productivity.	Partially confirmed
3	Stronger experience in remote working mediates the extent of isolation on productivity. Higher management level is associated with higher engagement and productivity.	Not Confirmed
4	Supervisor support is positively related to engagement and negatively related to isolation, both of which act as mediators of productivity.	Not Confirmed
5	Positive team interaction is positively related to engagement and negatively related to isolation, both of which act as mediators of productivity. Team interaction is positively and directly linked to productivity.	Confirmed
6	Competence development is positively related to both engagement and productivity.	Engagement only

Table 15: Summary of Hypotheses Results

6.1.1 Results confirm that engagement is positively correlated to productivity in home office (Hypothesis 1)

As expected, this research confirms that there is a very strong relationship between engagement and productivity, also in a home office setting. This is not a remarkable result but is important as this assumption was an underlying principle for the entire model. In this particular study, engagement had the strongest influence on productivity, with a T value of 11,083.

6.1.2 Results confirm that Isolation is negatively correlated to productivity. However, there is no direct correlation between isolation and engagement (Hypothesis 2)

It was expected that isolation would negatively impact productivity, and the research confirmed this. However, it was unexpected that isolation did not have a significantly negative impact on engagement.

It was expected that isolation would negatively impact the psychological safety and availability pillars of Khan's engagement model. This effect was expected to be amplified during the COVID-19 lockdown period as the level of isolation for many people was extreme. Isolation was not just occurring at work by being in home office, but also in all other aspects of life. As discussed in the previous section, there was an almost equal split between participants who responded that they did or did not feel affected by isolation.

However, what was unexpected was the lack of correlation between these responses and engagement. One explanation could be that although employees may feel that isolation makes them less productive, they do not feel that their engagement has been impacted by isolation.

Engagement is a different construct to productivity as it describes the individual's feelings and beliefs towards work, rather than perceived productivity which describes outputs and results. COVID-19 was a unique situation that impacted almost the entire professional population. It could be reasoned that in the sphere of workers who answered the survey, the uncertainty and fear of the situation actually caused professionals to become more engaged in work. Many jobs were lost during this period, and the research survey did not apply to those who had lost their jobs.

Therefore, those who were in home office may have appreciated the flexibility to work from home and keep their jobs and livelihoods. In this case, being in home office may have positively contributed to psychological safety by removing the fear of losing one's job.

Another explanation of why there was no link between isolation and engagement found was that as everyone was in home office, the use of digital tools to communicate was universal. The entire work population was working remotely, therefore there was no sense of being "left out" due to not being co-located. All meetings and interactions, both professional and personal, were done via digital means. This may have increased the level of engagement as digital tools allow the inclusion of more of the workforce. For example, only a select few many be chosen to participate at a regional meeting that requires travel expenses, but digital meetings are accessible to all.

6.1.3 Results confirmed that previous remote working experience mediate the extent of isolation of productivity (Hypothesis 3)

The research found that previous experience did have a statistically significant impact on isolation at a 5% confidence level. However, it was expected that previous experience would reduce the impact on isolation on productivity. The model indicates that more experienced employees experienced greater isolation and this isolation had a greater impact on perceived productivity (at a 10% confidence level).

As seen in Table 16, the mean response for aggregated isolation did not differ significantly of each experience group. What is noticeable is that the third quartile is higher for those with more experience. This indicates that there were subgroups which felt more or less isolation during the period of home office due to COVID-19.

Experience level	RC3-a	RC3-b	RC3-c	RC3-d	RC3-e	Aggregated
No Experience	2.9	3.4	3.1	2.7	3.2	3.5
Less than 2 months	2.6	3.1	2.8	2.4	2.8	3.1
3-6 months	3.1	3.4	3.1	2.9	3.6	3.4
6-12 months	2.5	2.8	2.6	2.4	2.7	3
1-3 years	3	3.1	3.2	2.7	3.2	3.5

Table 16: Effect of Experience level on Isolation where 1 = "strongly disagree", 2= disagree", 3= "neutral", 4 = "agree", 5= "strongly agree"

Table 16 also shows that all groups follow the same trend for each question, with no unique trend apparent for increasing remote working experience.

This could be explained by the situation itself and the individual personal and professional circumstances of the individual. Fear, uncertainty and an increasingly uncertain environment has different effects. In this study, the respondents were not asked how they felt about the pandemic. It could be that those who felt a stronger sense of isolation were more concerned by the pandemic.

Another explanation for the lack of impact on isolation in more experienced groups could be that even though these respondents were used to working remotely, the style of working changed due to everyone now working remotely. The study did not ask whether the respondents worked exclusively with remote teams. It could be reasoned that the effect of less experienced employees also working remotely increased the isolation and frustration of those who had an established remote working routine.

It was quite a surprise to see the absence of a statistically significant and theoretically meaningful relationship between previous teleworking experience and isolation and productivity (to a lesser extent between management level and engagement and productivity). We conclude, that, on the one hand, such a relationship exists, but only when only when somewhat and well experienced teleworkers are subjects of the study. On the other hand, the absence, of any relationship, can be explained by the fact that COVID-19 in such a quick period of time initiated a very drastic shift to work from home with other supporting events such as global organizational uncertainty, job insecurity, younger family member presence, that neither previous teleworking experience, nor management level mattered. All employees of different levels of experience and management have found themselves in an equally challenging environment.

6.1.4 Results did not confirm that management level had a moderating impact on productivity in home office (Hypothesis 3)

It was expected that management level would influence perceived productivity in home office. It was expected that leaders of a higher management level are used to working

more independently and lead by example for their employees by striving for high levels of productivity. However, the results were not statistically significant.

The respondent sample consisted 60% first line managers or higher. This is not representative of the actual working population and may be an explanation of this finding.

6.1.5 Results did not confirm that supervisor support is positively related to engagement and negatively related to isolation, both of which act as mediators of productivity (Hypothesis 4)

The model showed that supervisor support had no statistically significant impact on engagement, isolation, or productivity. This was unexpected, as supervisor support was expected to be a contributor to psychological safety, a pillar of engagement. However, the results were on the contrary.

The statements used in the survey were focused mostly on managerial control on professional outcomes, with just one question relating to a managerial support in the sense of work life balance. It could be reasoned that the 4 questions related to managerial control were interpreted as micro-management techniques, which frustrates employees and have a negative impact on employee perceived productivity.

When looking into the responses for the statement on work life balance, there is a clear trend on employee perceived productivity with regards to how supported the employee feels in this regard, although this was not statistically significant in the model. Employees who feel their manager supports them in juggling their work-life conflicts responded with higher reported productivity. Further research with a focus on work-life balance support would be recommended to support this.

In terms of the *supervisor support-to-isolation* link, the absence of a statistically insignificant link to any variable can be potentially explained by an interaction of factors, such as *team interaction* variable and extreme scope of organizational transition to work from home. During COVID-19, perhaps, employees were not differentiating supervisors separately and considered them a part of team, hence *team interaction*. Another explanation could be, that *supervisor support* just have not played that much of a role during COVID-19, as the majority of “supervisors” were not ready

physically and professionally to play the role of the “supervisors”, as they have found themselves in a new reality of the need to supervise everyone. In other words, COVID-19 may have led to a very unique experience of teleworking, when many managers in supervisor roles have never had experience in running teleworking teams and were not prepared to run such a scale of teleworking. Employees, who have also never had any prior teleworking experience, were not able to realize the value of the supervisor role.

6.1.6 Results did not confirm that management level had a moderating impact on engagement, isolation and productivity in home office (Hypothesis 4)

It was expected that management level would have an effect on perceived productivity in home office. It was expected that leaders of a higher management level are used to working more independently and lead by example for their employees by striving for high levels of productivity. However, the results were not statistically significant.

The respondent sample consisted 60% first line managers or higher, this is not representative of the actual population and may be an explanation of this finding.

Running a one-Way ANOVA of the results for productivity also confirms that there are no significant differences between the groups of different management level (Appendix V). There are also no outliers that could be affecting the data outcomes. This suggests that there are no significant differences in productivity by management level.

The One-Way ANOVA was repeated for engagement and isolation (Appendix VI & VII). These tests also confirmed that there was no statistically significant difference between the means of each management level group. This suggests that there are no significant differences in engagement or isolation by management level.

6.1.7 Results confirm that positive team interaction is positively related to engagement and negatively related to isolation, both of which act as mediators of productivity. Team interaction is positively and directly linked to productivity (Hypothesis 5)

As expected, team interaction decreases isolation and is positively related to engagement, both directly and indirectly impacting productivity. It is hypothesized that a sense of professional community in the times of COVID-19 social restrictions eased feeling of isolation and mitigated feelings of isolation. This is evidence that as in a

traditional office setting, team interaction in home office is of great importance to engagement and productivity.

6.1.8 Results confirm that competence development is positively related to engagement, but not productivity (Hypothesis 6)

We also, have not confirmed a direct link from *competence development* to *productivity*, yet a moderate level of impact (and statistically significant) was confirmed on *engagement*. In the context of COVID-19, *competence development* appeared to be a direct driver of *engagement* and indirect driver of *productivity*, rather than a direct driver of productivity (the link between which is probably more of a long-term nature). Our suggestion would be that a direct link between *competence development* and *productivity* can be rather found in longitudinal studies. In addition, in the context of COVID-19 and future teleworking experience improvements, the interaction of *job security* (which was out of our scope) and *competence development* can be investigated. Employees, can interpret company's investment into their *competence development* as a job security proof, indicating a long-term working relationship. So, *competence development* and *job security* can be interrelated, and their role and influence on engagement and productivity was especially important during COVID-19.

7 Conclusion and Recommendations

The purpose of this research was to investigate the drivers of productivity in a home office setting during the COVID-19 social distancing regime. The situation provided a unique opportunity to research a group of professionals from varying industries, management level and remote working experience who were all put into a home office setting at very short notice. The research took common theories that exist in traditional settings related to productivity, test if they were relevant to a home office setting and also examine the drivers of productivity unique to the OCVID-19 situation. The goal of the research was to determine what management practices could be used to increase productivity in remote working and based upon these findings, make recommendations for companies who find themselves in position where remote working could become the “new normal”.

Current research on the topic of remote working was completed, exploring different definitions of remote working, and identifying existing theories regarding what makes remote employees’ productivity. Research on the positive and negative impact remote working can have on employees and businesses was also reviewed. Certain positive and negative antecedents to productivity such as work/life balance, diversity of work activities and effective use of ICT were identified.

Research was then reviewed on the topic of productivity, isolation, and engagement in a general setting in order to hypothesize what theories would also be applicable in a home office setting. The definition and antecedents of productivity were then explored, with a particular focus on hypothesizing how productivity could be measured for the purpose of the research. During this review, engagement was identified as a key driver of productivity. Many of the engagement theories, such as Kahn’s 3 pillars of engagement (Kahn, 1990) were seen as particularly relevant to the current situation, and it is reasonable to assume that these were directly affected by the effect of COVID-19 social distancing. The antecedents for engagement in a traditional working setting were also reviewed and incorporated into the research model. A wide range of research was also found that provided substantial evidence that engagement was a key antecedent of productivity. Self-efficacy theory was also explored as the experience and management level of the employees being surveyed were expected to have an impact on the results. As COVID-19 was an isolating experience for many

people, existing research on the effect of isolation on productivity was also reviewed in depth.

Finally, existing research regarding how management practices can influence these factors was explored. Out of this review, four management practices were selected to be the focus of the research model: Supervisor Support, Competence Development, Team Interaction/Recognition. Based on the research that was reviewed, the relationships between management practices, isolation, engagement and productivity were hypothesized and formed the basis of the research model. Certain aspects of the literature review were excluded from the research as they were seen as obvious or deemed outside of the scope of this research.

A survey was conducted, and 212 responses were collected with a high enough quality to be used in further analysis. The responses covered a variety of different industries and geographies and were overall deemed to be representative of the professional population in home office. Overall, respondents indicated that they perceived their productivity and engagement in home office to be high, and their isolation levels were also high.

The initial model was evaluated in SMART PLS using Structural Equation Modelling (SEM). During the initial analysis, supervisor support unexpectedly had no statistically significant impact on the outcomes and was subsequently removed from the model to improve statistical fit in further analysis.

The modified model found that engagement had the greatest positive effect on productivity with a T-statistic of 11.083 and a P-Value of 0. Isolation was also confirmed as having a significant negative impact on productivity. Out of the management practices, team interaction was found to have not only an indirect, but also a direct impact, on productivity. Competence development and team interaction had significant positive impact on engagement and team interaction also reduced isolation significantly. Moderator effects of remote working experience and management level were found to be insignificant and therefore no conclusion could be made.

7.1 Practical Recommendations

Resulting from this research, the importance of engagement and reduction of isolation in stimulating productivity has been highlighted. Particular attention should be given to facilitating high quality peer to peer and team interactions in the form of continuous feedback, a stimulating meeting culture and effective internal communication processes.

Competence development was found to be an important driver of engagement in home office. This could be interpreted by employees as a signal of job security, which during COVID-19 was a particularly relevant topic and a source of anxiety for many of those effected. The consistent development of professional competencies also drives engagement in aspects outside of job security, such as job satisfaction and enjoyment at work.

Supervisor support was not found to be significantly linked to isolation, engagement, or productivity. As discussed in the results section, this could be due to interpretation of the survey statements as micromanagement techniques. An individual survey statement regarding support of work life balance had a much higher more positive average response and the intricate relationship of supervisor and employee in such a situation could be a topic of investigation in further research.

Work life balance was not a topic of this research. With COVID-19, many schools were closed, and parents were forced to home school alongside professional commitments. The actual effects of this are unknown and could be investigated further.

No link to experience in home office as a moderating factor of performance in home office was found. This was unexpected and as the research statements covered in this research did not ask respondents specific questions regarding the effect their experience has on them in this situation, this would be interesting to research further.

There are many external factors caused by the COVID-19 social restrictions that could have influenced the results of this research and gone undetected. Conducting research during a large-scale pandemic creates a homogenous home office setting for professionals, but factors such as being separated from loved ones and fear of contracting the potentially fatal virus could have an impact on the results.

In conclusion, this research has been successful in identifying key management practices to drive productivity during the COVID-19 pandemic and these practices are also applicable to all future home office settings, also outside of the time of the pandemic.

7.2 Topics for Further Research

Several topics were uncovered during the literature review that were not selected as part of the path analysis in order to focus the research on tangible outcomes and recommendations for company leaders and managers.

Many of the topics discussed were seen as obvious antecedents of engagement, isolation and in turn productivity. This included the topic of how many children are present in the home. During OCVID-19 social restrictions, home-schooling came into effect. This saw many parents juggling the role of teacher and employee while in home office. Children are also an obvious distraction. This was not investigated further in this was not investigated further in the research but may be a topic of interest for future research.

Gender roles were also not deeply investigated. In the literature review, it was discovered that the gender roles of professional men and women play a role in job satisfaction and psychological availability while working remotely. Although the survey asked for the participants to reveal their gender, this topic was not investigated more deeply as to why this difference in productivity exists.

The effectiveness of the Information and Communication Technology (ICT) was also not directly investigated. It is hypothesised that companies with very poor ICT will find it much more difficult to remain in contact and collaborate in teams while in home office. However, this was not investigated as the upgrading of ICT is generally a very large and costly infrastructure and not an action that company leaders can make quickly and efficiently during a short notice emergency situation such as the COVID-19 social distancing restrictions.

All questions related to personal attitudes to home office were also excluded. In the literature review, it is stated that employee disengagement can lead to absenteeism, and absenteeism is a real fear for companies in a home office scenario, where an overview of employees attending the office is no longer available. However, this topic and others related to other unethical personal behaviour were omitted from the survey. These topics are extremely sensitive, especially during the COVID-19 social restrictions and were deemed unethical to ask during these times. This may have also resulted in distrust and a higher non-completion rate of the survey.

Finally, we decided not to focus on work-life balances, family related issues and their influences on engagement and productivity. There are several studies on teleworking with this research focus, where family status was a significant factor determining teleworker productivity. Although family status is an important productivity factor in teleworking, it is also a complicated factor for managerial control, especially during COVID-19. The crisis forced all employees, with or without family, to shift to home office. Organizations were not in the position to be selective in terms who they shift to. They were not able to be selective, and hence impact productivity on organizational level. In other words, our research scope, was more focused on more controllable management practices, as levers of engagement and productivity.

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9 Appendices

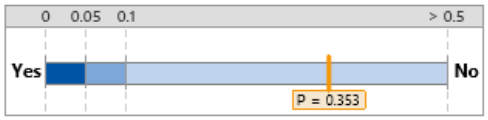
Appendix I: ***Effect of Gender on Average Perceived Productivity***

2-Sample t Test for Average Perceived Productivity by Gender

Summary Report

Mean Test

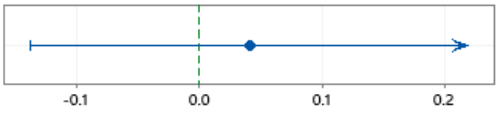
Is Female greater than Male?



The mean of Female is not significantly greater than the mean of Male ($p > 0.05$).

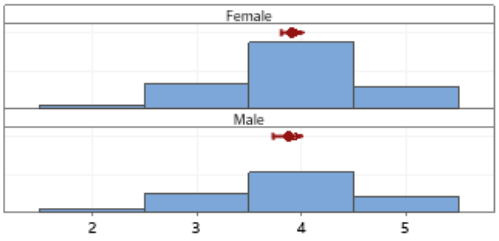
95% Lower Bound for the Difference

Is the entire interval above zero?



Distribution of Data

Compare the data and means of the samples.



Individual Samples

Statistics	Female	Male
Sample size	126	86
Mean	3.9127	3.8721
95% Lower bound	3.805	3.7297
Standard deviation	0.72685	0.79404

Difference Between Samples

Statistics	*Difference
Difference	0.040605
95% Lower bound	-0.13693

*Difference = Female - Male

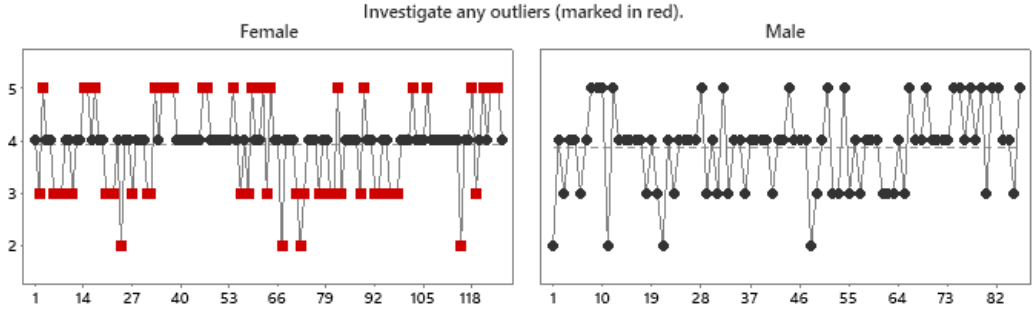
Comments

- Test: There is not enough evidence to conclude that the mean of Female is greater than Male at the 0.05 level of significance.
- CI: Quantifies the uncertainty associated with estimating the difference in means from sample data. You can be 95% confident that the true difference is greater than -0.13693.
- Distribution of Data: Compare the location and means of samples. Look for unusual data before interpreting the results of the test.

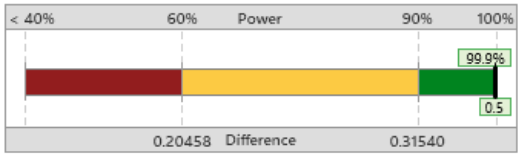
2-Sample t Test for Average Perceived Productivity by Gender

Diagnostic Report

Data in Worksheet Order
Investigate any outliers (marked in red).



What is the chance of detecting a difference of 0.5?



For α = 0.05 and sample sizes = 126, 86:
If the true mean of Female were 0.5 greater than Male, you would have a 99.9% chance of detecting the difference.

What sample sizes are required to detect a difference of 0.5?

Each Sample	Power
18	60%
23	70%
30	80%
41	90%

Your Samples	
126, 86	99.9

Observed difference = 0.040605

Power is a function of the sample sizes and the standard deviations. If the power is not satisfactory, consider increasing the sample sizes.

Appendix II: ***Model assessment***

Table. 2.8. Outer factor loadings

	Competence development	Engagement	Isolation	Productivity	Team interaction
RC1-a				0,849	
RC1-b				0,667	
RC1-c				0,802	
RC1-d				0,861	
RC2-a		0,853			
RC2-b		0,875			
RC2-c		0,778			
RC3-a			0,867		
RC3-b			0,788		
RC3-c			0,808		
RC3-d			0,713		
RC3-e			0,843		
RC5-a					0,673
RC5-c					0,835
RC5-d					0,636
RC6-a					0,753
RC7-c	0,767				
RC7-d	0,846				

Table 2.9. Fornell-Larcker Criterion

	Competence development	Engagement	Isolation	Productivity	Team interaction
Competence development	0,808				
Engagement	0,432	0,836			
Isolation	-0,207	-0,205	0,805		
Productivity	0,396	0,684	-0,415	0,798	
Team interaction	0,473	0,440	-0,393	0,534	0,728

Table 2.10. Cross-loadings

	Competence development	Engagement	Isolation	Productivity	Team interaction
RC1-a	0,297	0,600	-0,347	0,849	0,393
RC1-b	0,320	0,345	-0,310	0,667	0,368
RC1-c	0,346	0,624	-0,294	0,802	0,449
RC1-d	0,314	0,569	-0,380	0,861	0,490
RC2-a	0,375	0,853	-0,324	0,700	0,463
RC2-b	0,360	0,875	-0,099	0,516	0,338
RC2-c	0,346	0,778	-0,032	0,453	0,266
RC3-a	-0,200	-0,198	0,867	-0,397	-0,363
RC3-b	-0,184	-0,202	0,788	-0,297	-0,285
RC3-c	-0,023	-0,087	0,808	-0,302	-0,239
RC3-d	-0,231	-0,179	0,713	-0,323	-0,330
RC3-e	-0,169	-0,147	0,843	-0,334	-0,342
RC5-a	0,259	0,214	-0,344	0,352	0,673
RC5-c	0,416	0,392	-0,386	0,506	0,835
RC5-d	0,289	0,353	-0,150	0,331	0,636
RC6-a	0,398	0,310	-0,225	0,331	0,753
RC7-c	0,767	0,315	-0,144	0,236	0,413
RC7-d	0,846	0,379	-0,188	0,392	0,359

Table 2.11. Latent variable correlations and square root of AVE

	Competence development	Engagement	Isolation	Productivity	Team interaction	Square root of AVE
Competence development	1,000	0,432	-0,207	0,396	0,473	0,808
Engagement	0,432	1,000	-0,205	0,684	0,440	0,836
Isolation	-0,207	-0,205	1,000	-0,415	-0,393	0,805
Productivity	0,396	0,684	-0,415	1,000	0,534	0,798
Team interaction	0,473	0,440	-0,393	0,534	1,000	0,728

Table 2.12. Heterotrait-Monotrait Ratio (HTMT)

	Competence development	Engagement	Isolation	Productivity
Competence development				
Engagement	0,701			
Isolation	0,312	0,242		
Productivity	0,634	0,814	0,495	
Team interaction	0,821	0,565	0,482	0,691

Table 2.12. Outer VIF values

	VIF
RC1-a	1,967
RC1-b	1,404
RC1-c	1,669
RC1-d	2,050
RC2-a	1,562
RC2-b	2,133
RC2-c	1,690
RC3-a	2,493
RC3-b	1,839
RC3-c	2,085
RC3-d	1,439
RC3-e	2,279
RC5-a	1,335
RC5-c	1,546
RC5-d	1,347
RC6-a	1,550
RC7-c	1,105
RC7-d	1,105

Table 2.13. Inner VIF values

	Competence development	Engagement	Isolation	Productivity
Competence development		1,288		
Engagement				1,242
Isolation				1,184
Productivity				
Team interaction		1,288	1,000	1,407

Table 2.14. Effect size f^2

	Competence development	Engagement	Isolation	Productivity
Competence development		0,087		
Engagement				0,572
Isolation				0,098
Productivity				
Team interaction		0,097	0,183	0,071

Table 2.15. Predictive relevance Q^2

	SSO	SSE	Q^2 (=1-SSE/SSO)
Competence development	426,000	426,000	
Engagement	639,000	532,266	0,167
Isolation	1065,000	963,822	0,095
Productivity	852,000	548,310	0,356
Team interaction	852,000	852,000	

Appendix III: ***Moderator effects***

Figure 2.4. Moderator effect of previous experience in teleworking

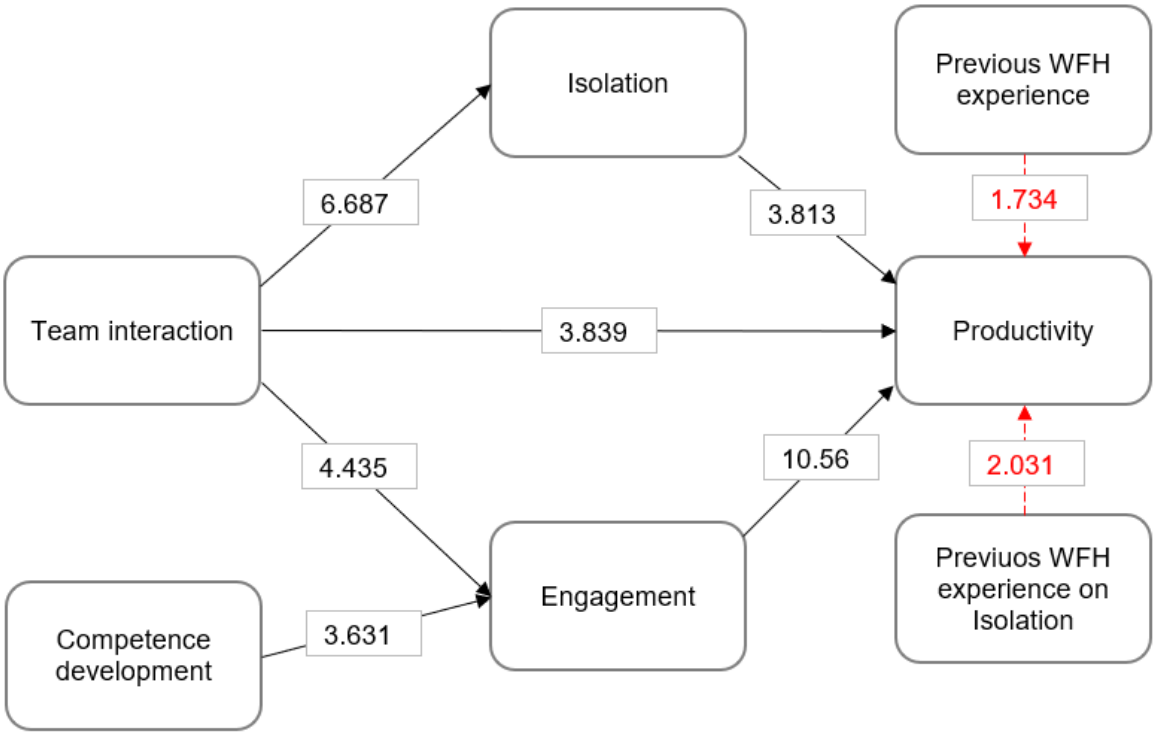
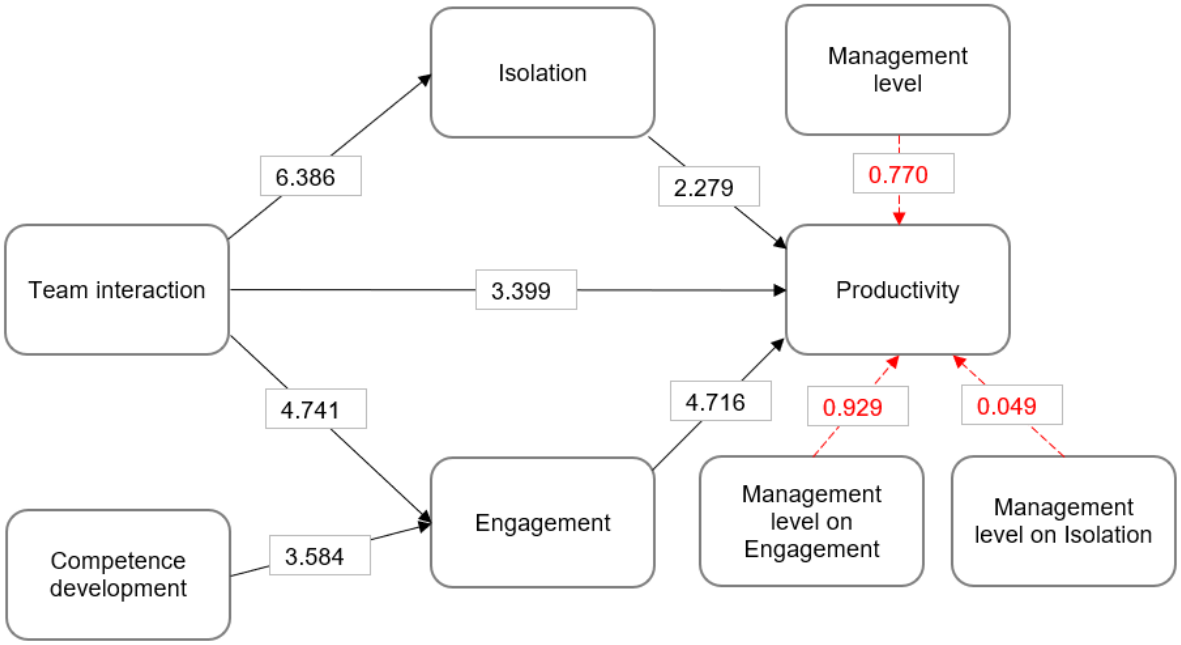
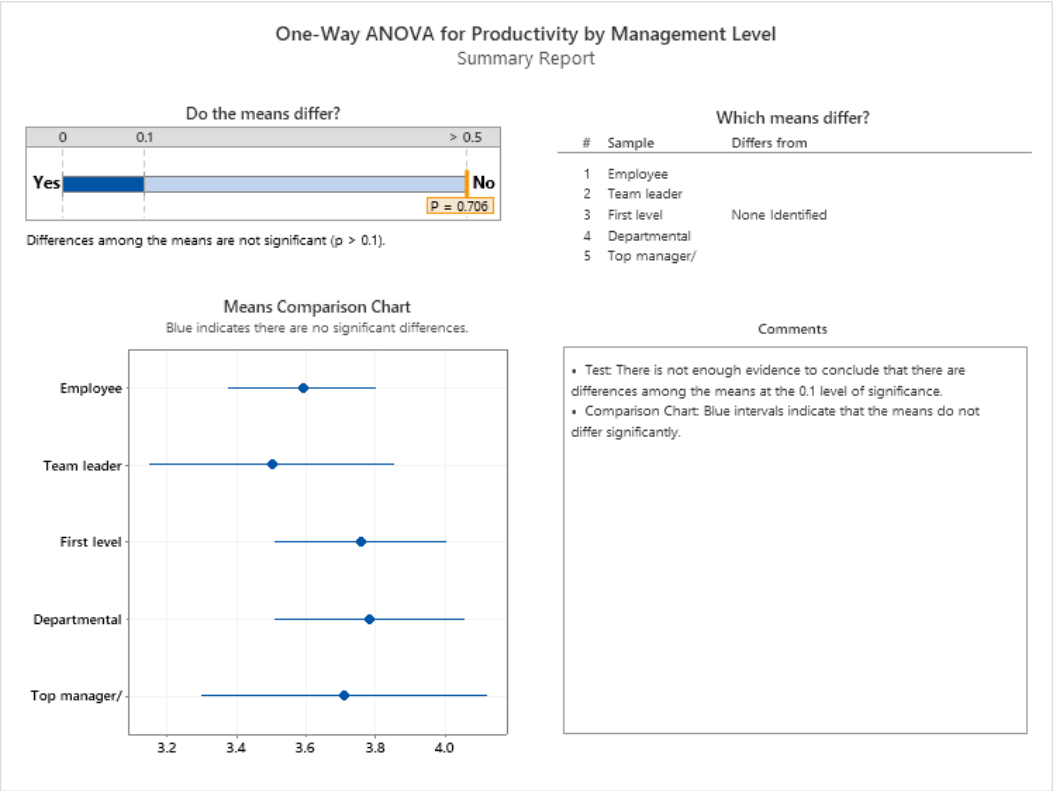
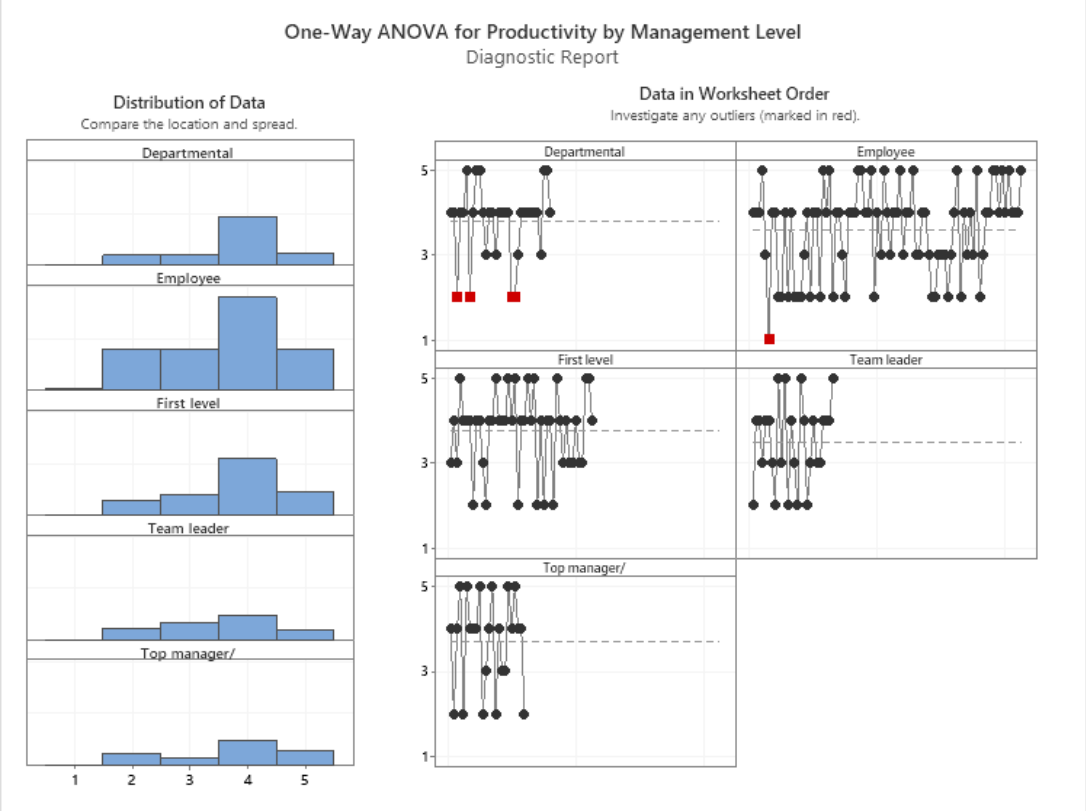


Figure 2.5. Moderator effect of previous experience in teleworking



Appendix IV: Results of One-Way ANOVA for Productivity by Management Level

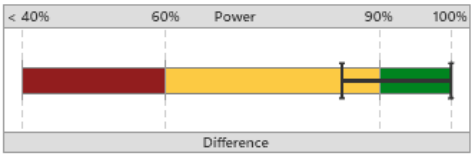




One-Way ANOVA for Productivity by Management Level

Power Report

What is the chance of detecting a difference of 1?



Based on your samples and α level (0.1), the chance of detecting a difference of 1 ranges from 84.67% to 99.92%.

What sample sizes are required to detect a difference of 1?

All Samples	Power
16	62.8 - 76.2%
19	70.7 - 83.6%
24	81.0 - 91.8%
31	90.4 - 97.2%

Power is a function of the sample sizes and the standard deviations. If the power is not satisfactory, consider increasing the sample sizes.

Statistics

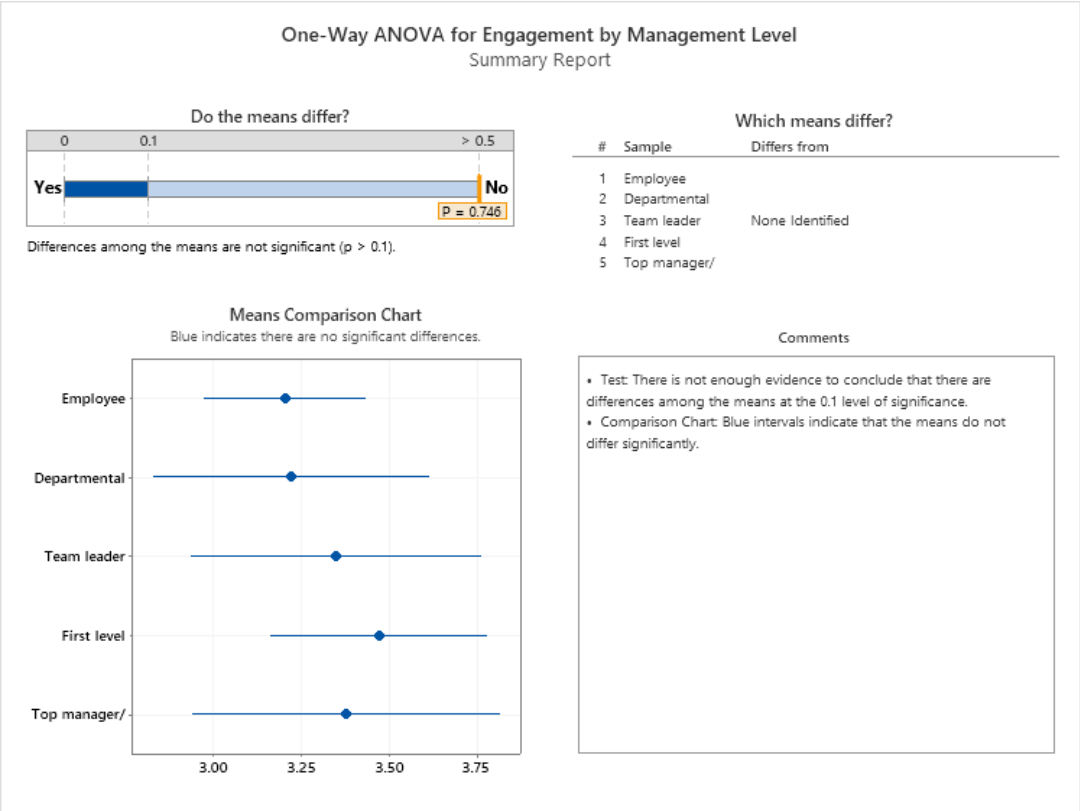
Which of the	Sample Size	Mean	Standard Deviation	Individual 90% CI for Mean
Departmental	32	3.7813	0.87009	(3.5205, 4.0420)
Employee	85	3.5882	1.0385	(3.4009, 3.7756)
First level	45	3.7556	0.93312	(3.5218, 3.9893)
Team leader	26	3.5	0.98995	(3.1684, 3.8316)
Top manager/	24	3.7083	1.0826	(3.3296, 4.0871)

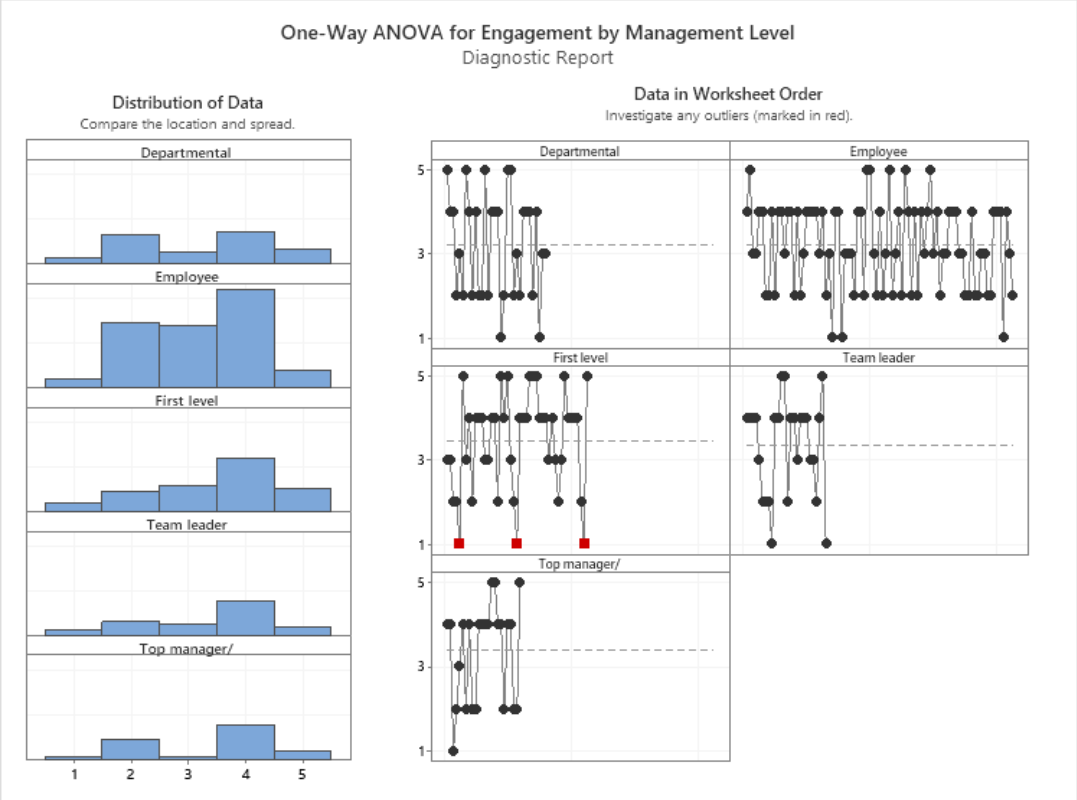
One-Way ANOVA for Productivity by Management Level

Report Card

Check	Status	Description
Unusual Data	⚠	Some of the data points are unusual compared to the others in the same sample. Because unusual data can have a strong influence on the results, you should try to identify the cause of their unusual nature. These points are marked in red on the Diagnostic Report. You can hover over a point or use Minitab's brushing feature to identify the worksheet row. Correct any data entry or measurement errors. Consider removing data that are associated with special causes and repeating the analysis.
Sample Size	⚠	Based on your sample sizes and α, the chance of detecting a difference of 1 ranges from 84.7% to 99.9%. To have at least a 90% chance of detecting a difference of 1 between any two means, you need to increase your sample sizes to 31. Some practitioners feel that an 80% chance of detection is sufficient. If this is your case, you can conclude that it is unlikely that there are any differences of 1 or larger.
Normality	✓	Because all your sample sizes are at least 15, normality is not an issue. The test is accurate with nonnormal data when the sample sizes are large enough.
Equal Variance	ℹ	Minitab's Assistant uses Welch's method, which does not assume or require that the samples have equal variances. Research shows that the test performs well with unequal variances, even when the sample sizes are not equal.

Appendix V: Results of One-Way ANOVA for Engagement by Management Level

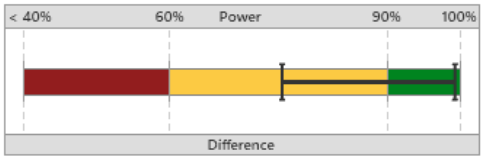




One-Way ANOVA for Engagement by Management Level

Power Report

What is the chance of detecting a difference of 1?



Based on your samples and α level (0.1), the chance of detecting a difference of 1 ranges from 75.48% to 99.21%.

What sample sizes are required to detect a difference of 1?

All Samples	Power
20	62.1 - 70.4%
24	70.5 - 78.6%
30	80.3 - 87.4%
40	90.7 - 95.3%

Power is a function of the sample sizes and the standard deviations. If the power is not satisfactory, consider increasing the sample sizes.

Statistics

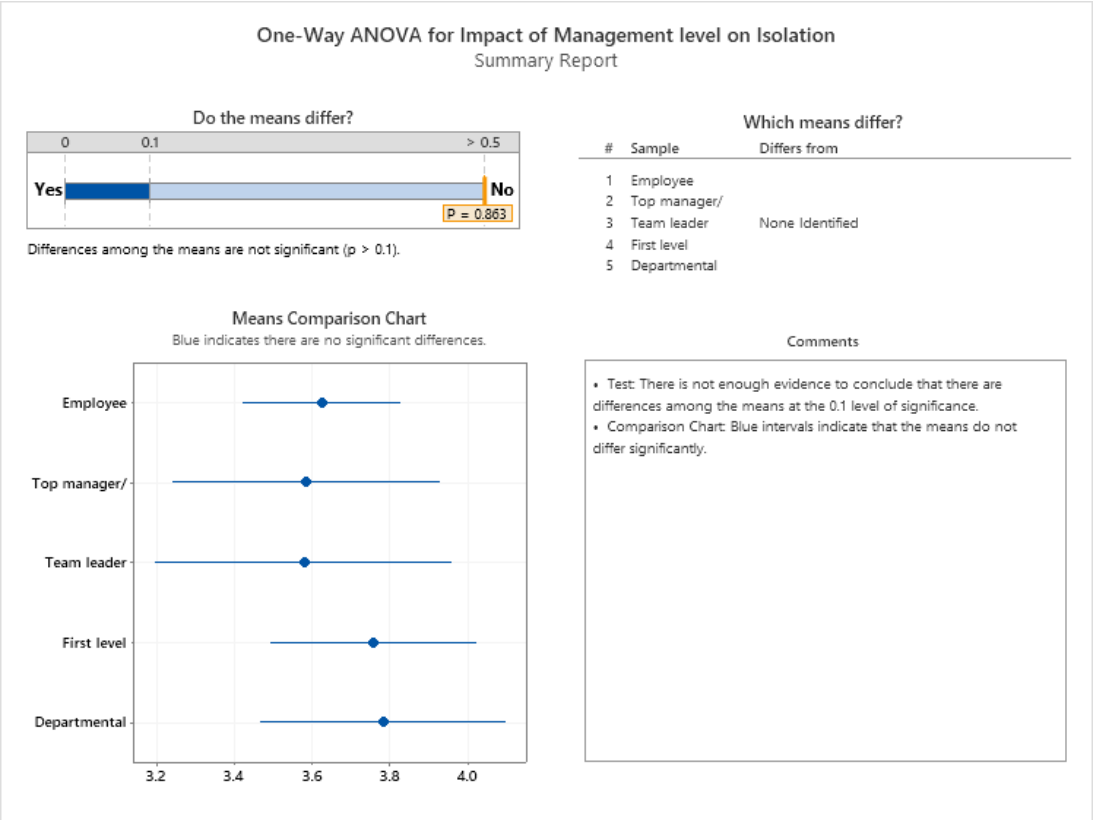
Which of the	Sample Size	Mean	Standard Deviation	Individual 90% CI for Mean
Departmental	32	3.2188	1.2374	(2.8479, 3.5896)
Employee	85	3.2	1.0212	(3.0158, 3.3842)
First level	45	3.4667	1.1599	(3.1761, 3.7572)
Team leader	26	3.3462	1.1642	(2.9562, 3.7362)
Top manager/	24	3.375	1.1726	(2.9648, 3.7852)

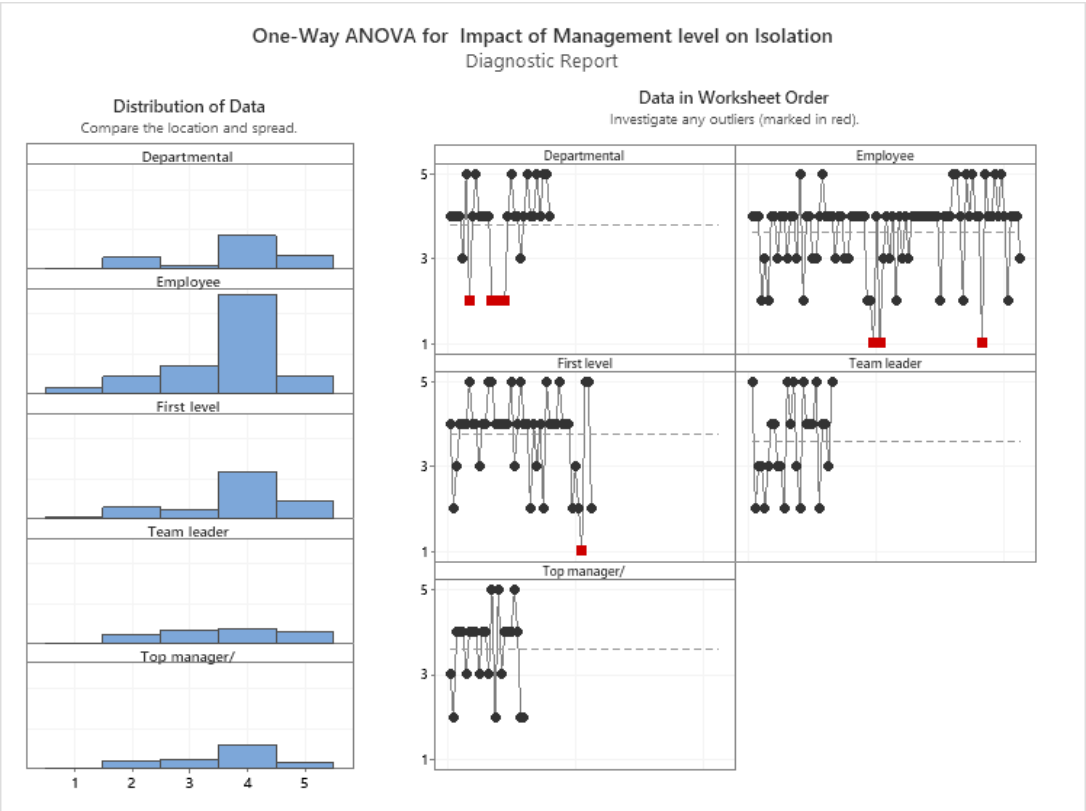
One-Way ANOVA for Engagement by Management Level

Report Card

Check	Status	Description
Unusual Data	⚠	Some of the data points are unusual compared to the others in the same sample. Because unusual data can have a strong influence on the results, you should try to identify the cause of their unusual nature. These points are marked in red on the Diagnostic Report. You can hover over a point or use Minitab's brushing feature to identify the worksheet row. Correct any data entry or measurement errors. Consider removing data that are associated with special causes and repeating the analysis.
Sample Size	⚠	Based on your sample sizes and α, the chance of detecting a difference of 1 ranges from only 75.5% to 99.2%. To have at least a 90% chance of detecting a difference of 1 between any two means, you need to increase your sample sizes to 40. Some practitioners feel that an 80% chance of detection is sufficient. To have at least an 80% chance, you need sample sizes of 30.
Normality	✓	Because all your sample sizes are at least 15, normality is not an issue. The test is accurate with nonnormal data when the sample sizes are large enough.
Equal Variance	ℹ	Minitab's Assistant uses Welch's method, which does not assume or require that the samples have equal variances. Research shows that the test performs well with unequal variances, even when the sample sizes are not equal.

Appendix VI: Results of One-Way ANOVA for Isolation by Management Level

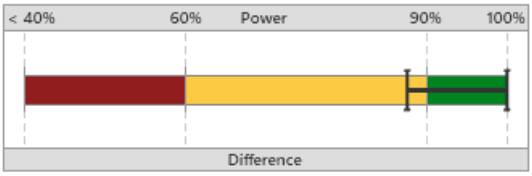




One-Way ANOVA for Impact of Management level on Isolation

Power Report

What is the chance of detecting a difference of 1?



Based on your samples and α level (0.1), the chance of detecting a difference of 1 ranges from 87.53% to 99.91%.

What sample sizes are required to detect a difference of 1?

All Samples	Power
15	61.7 - 70.4%
18	70.1 - 78.7%
23	81.0 - 88.4%
30	90.7 - 95.6%

Power is a function of the sample sizes and the standard deviations. If the power is not satisfactory, consider increasing the sample sizes.

Statistics

Which of the	Sample Size	Mean	Standard Deviation	Individual 90% CI for Mean
Departmental	32	3.7813	1.0075	(3.4793, 4.0832)
Employee	85	3.6235	0.93829	(3.4543, 3.7928)
First level	45	3.7556	1.0035	(3.5042, 4.0069)
Team leader	26	3.5769	1.0648	(3.2202, 3.9336)
Top manager/	24	3.5833	0.92861	(3.2585, 3.9082)

One-Way ANOVA for Impact of Management level on Isolation

Report Card

Check	Status	Description
Unusual Data	⚠	Some of the data points are unusual compared to the others in the same sample. Because unusual data can have a strong influence on the results, you should try to identify the cause of their unusual nature. These points are marked in red on the Diagnostic Report. You can hover over a point or use Minitab's brushing feature to identify the worksheet row. Correct any data entry or measurement errors. Consider removing data that are associated with special causes and repeating the analysis.
Sample Size	⚠	Based on your sample sizes and α, the chance of detecting a difference of 1 ranges from 87.5% to 99.9%. To have at least a 90% chance of detecting a difference of 1 between any two means, you need to increase your sample sizes to 30. Some practitioners feel that an 80% chance of detection is sufficient. If this is your case, you can conclude that it is unlikely that there are any differences of 1 or larger.
Normality	✓	Because all your sample sizes are at least 15, normality is not an issue. The test is accurate with nonnormal data when the sample sizes are large enough.
Equal Variance	ℹ	Minitab's Assistant uses Welch's method, which does not assume or require that the samples have equal variances. Research shows that the test performs well with unequal variances, even when the sample sizes are not equal.