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Exploring The Connection Between Telecommuting And Productivity Using Structural Equation Modelling

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Abstract:

The study aims to investigate the relationship between telecommuting and productivity while examining the moderating role of multiple business constructs like industrial psychology, leadership etc. This research was conducted in India with a sample population from Kolkata, Bengaluru, and Mumbai metro cities where 60% were male respondents and 40% females from the IT Sector and fell in the age group of 30 years -50 years . The structural equation model predicts which variables will enable or inhibit employee productivity in telecommuting. The results supported the hypothesis and examined the moderating effects of many business factors like Leadership style, Organizational change, Communication, Socioeconomic status, Industrial psychology, Training, Employee engagement, Employer branding, Employer liability, and Personality. The study has important implications for academia, future researchers, governments, and entrepreneurs aiming at improving their employee's quality of life, health, and well-being, a key sustainable development goal, and the goal of a sustainable future.

Keywords: Teleworking, work from home, flexible working programs, productivity

1. Introduction

Telecommuting also called work from home or e-commuting which is a work arrangement where an employee works from a remote location outside the office like a cafe or home (including coffee shops, libraries, and various other venues). Rather than travelling for work, the employee coordinates through "telecommunication" and its aids like distance conferencing and more. Telecommuting has its roots in the industry much before than 1990's however started being actively implemented from 1990's when there was an increasing pressure on companies to cut costs heavily and increase productivity. Companies are now challenged to initiate more flexible thinking for the new "corporate office." In addition the quick flourishing of the internet-based or web-based industry has created a much more flexible base for telecommuting to expand its horizon over the years. The convergence of voice, data

and video over a common IP framework has made telecommuting a viable option for both organizations and employees. The advantages include a good work-life balance ,reduced travel costs ,zero travelling congestion , higher employee satisfaction and improved productivity. The factors influencing the adoption of telecommuting are Leadership style, Organizational change, Communication, Socioeconomic status, Industrial psychology, Training, Employee engagement, Employer branding, Employer liability, Personality. However, telecommuting hasn't been explored yet regarding its relationships with other business constructs . The results of this study are critical to management in the 21st Century as organisations decide whether to embrace telecommuting.

2. Theoretical Background and hypothesis development

2.1 Taxonomy of Telecommuting and Productivity

The definition of working from home covers a wide scope of external working policies. It incorporates both standard remote workers and workers who spend a couple of hours per night telecommuting from home (Hartman, Stoner & Arora, 1992). A great many people characterise working from home as moving the work to labourers rather than employees going to work (Hassan 2001).Past studies have demonstrated that people work from home for different amounts of time, which range from once a month to once a week (Mokhtarian et al., 2002).

Figure 1 depicts the categorisation of the various types of telecommuting discussed in existing research papers and articles. Corporate telecommuters appreciate the advantages of having two means of working; they are ready to work at home and yet prefer to have a nearby central workplace to allow for collaboration with colleagues. This is ideal for those who dislike the seclusion of working at home and yet prefer not to be stuck in a corporate environment. In this means of working from home, the business has all the control. This sort of remote working permits telecommuters to work at home just some days of the week. Most corporate businesses offer strategic scheduling choices and stipulate that a worker wishing to work from home must still utilise suitable child-care during working hours. The

benefits of this method of working from home are that the business pays for each course of action required for telecommuting to be implemented.

Independent contractors are preferable for employers in today's business environment because this choice offers them the most control. In terms of legal grounds, the employer of a teleworking independent contractor cannot stipulate working conditions. The employer can only insist on the condition of the end product and the deadlines. Teleworkers in this category can, and usually do, have more than one employer. Independent contractors can earn more by utilising this category of telecommuting. However, their income tends to fluctuate as it is not fixed. There are normally no additional benefits available and the telecommuter must handle their own personal costs relating to the work, maintain their own equipment and deal with different issues that are normally resolved by an employer.

The self-employed remote worker model involves the most elevated risks. That said, it can also result in tremendous wealth and life opportunities. A self-employed remote worker effectively has their own business and continually obtains clients whilst working by telephone, fax or the internet. This implies that all decision-making starts and ends with the telecommuter. There are no additional benefits, unless the telecommuter's organisation pays for them, no direction from a business, no colleagues and no office to depend on for help. However, there are still many opportunities for those who follow this path. Telecommuters who choose this course can demand a certain price for their work, choose who they wish to work with and develop as fast or as gradually as their ability and results allow.

Flexible working programmes (FWPs) and unusual or long-hour telecommuting are classified as temporary arrangements of telecommuting as they are not predetermined or are determined according to business requirements. An employee can choose to be on a temporary flexible working programme during their sabbatical. Supervisory approval is required at each stage of this type of telecommuting and an additional grievance procedure exists for situations where working from home requests are rejected by supervisors.

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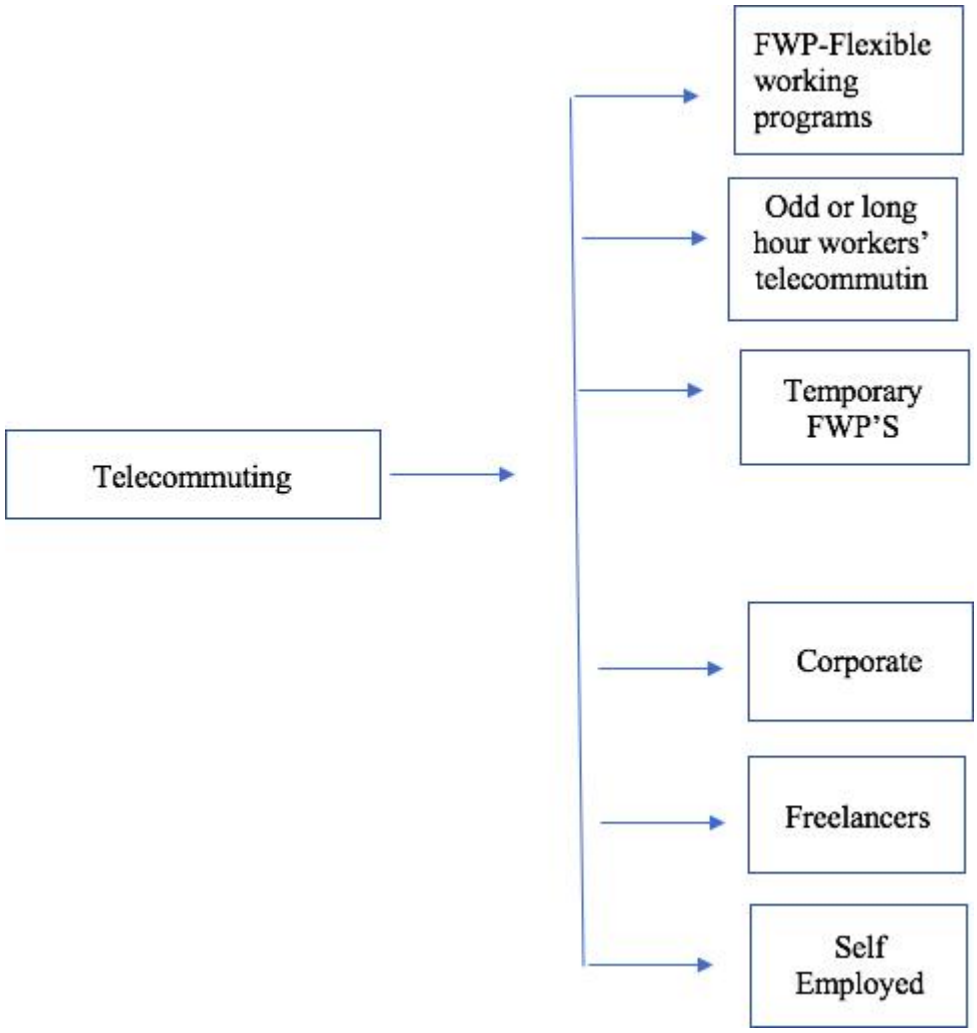

Figure 1: Taxonomy of Telecommuting

Figure 1 shows the categorisation of telecommuting models as defined by previous studies.

The ratio of input to output is a widely accepted definition of productivity. However, the definitions vary from individual to total productivity (Mirchandani, K. (1998).

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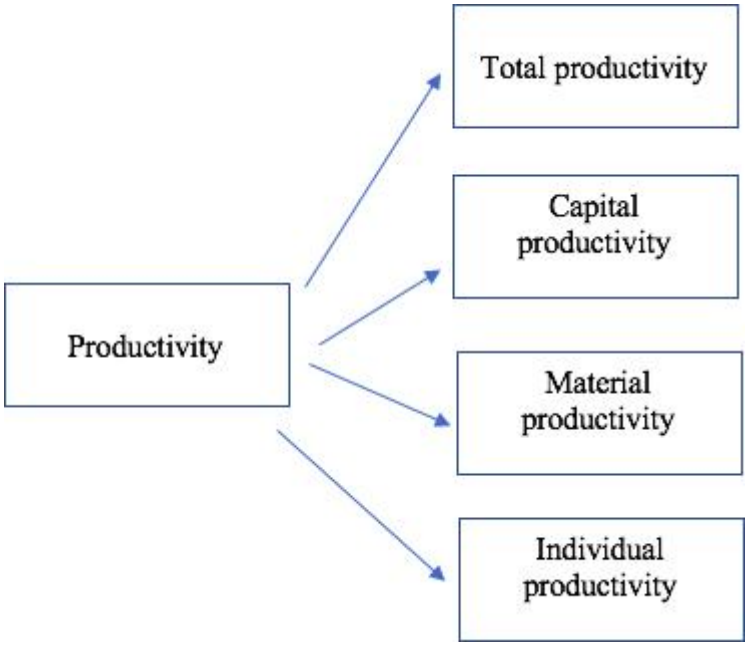

Figure 2: Taxonomy of Productivity

Total productivity is defined as the ratio of total output to all the inputs, which include the labour input factor, the capital input factor, the raw material and purchased parts input factor, other miscellaneous goods and the services input factor. A common measurement unit must be used to state the output as well as all the inputs of a firm. To ensure that measurements of productivity from different time periods can be compared, a base period value is used to adjust each index. This method is often called deflating and is done to account for prices typically rising each year (Jaakson, Krista & Kallaste, Epp. 2010).

The ratio of output to input of materials is known as material productivity. Directly or indirectly, the consumption of materials is a part of any product or service, which consequently forms the backbone of every production (Flachenecker, Florian 2017).

Capital has begun to play a role in national productivity analysis. The ratio of output (goods or services) to the input of physical capital is known as capital productivity. The amount of stakeholder's

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equity shown on balance sheets is generally called capital (Schoenmaker, Dirk & Schramade, Willem. 2023). Greater input of capital causes an increase in output.

Labour productivity is regarded as an effective indicator of the efficiency of industry activities (Le, Liu & Mills, 2016). It is defined as the ratio output per person and measures the efficiency of labour in terms of the production of goods or services of higher value.

This study considers labour productivity specifically because it is easy to understand and measure.

Proposed Hypothesis:

Research Question	Research Objective	Hypothesis
1. Does industrial psychology significantly impact productivity in telecommuting?	To understand the impact of industrial psychology on productivity in telecommuting.	Industrial psychology has a highly significant impact on productivity in telecommuting.
2. Does leadership style significantly impact productivity in telecommuting>	To understand the impact of leadership style on productivity in telecommuting.	Leadership style has a highly significant impact on productivity in telecommuting.
3. Does communication significantly impact productivity in telecommuting?	To understand the impact of communication on productivity in telecommuting.	Communication has a highly significant impact on productivity in telecommuting.
4. Does employee engagement significantly impact productivity in telecommuting?	To understand the impact of employee engagement on productivity in telecommuting.	Employee engagement has a highly significant impact on productivity in telecommuting.
5. Does personality significantly impact		

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productivity in telecommuting?	To understand the impact of personality on productivity in telecommuting.	Personality has a highly significant impact on productivity in telecommuting.
6. Does employer liability significantly impact productivity in telecommuting?	To understand the impact of employer liability on productivity in telecommuting.	Employer liability has a highly significant impact on productivity in telecommuting.
7. Does socio-economic status significantly impact productivity in telecommuting?	To understand the impact of socio-economic status on productivity in telecommuting	Socio-economic status has a highly significant impact on productivity in telecommuting.
8. Does organisational change significantly impact productivity in telecommuting?	To understand the impact of organisational change on productivity in telecommuting.	Organisational change has a highly significant impact on productivity in telecommuting.
9. Does training significantly impact productivity in telecommuting? 10. Does Employer branding significantly impact productivity in telecommuting?	To understand the impact of training on productivity in telecommuting. To understand the impact of employer branding on productivity in telecommuting.	Training has a highly significant impact on productivity in telecommuting. Employer branding has a highly significant impact on productivity in telecommuting.

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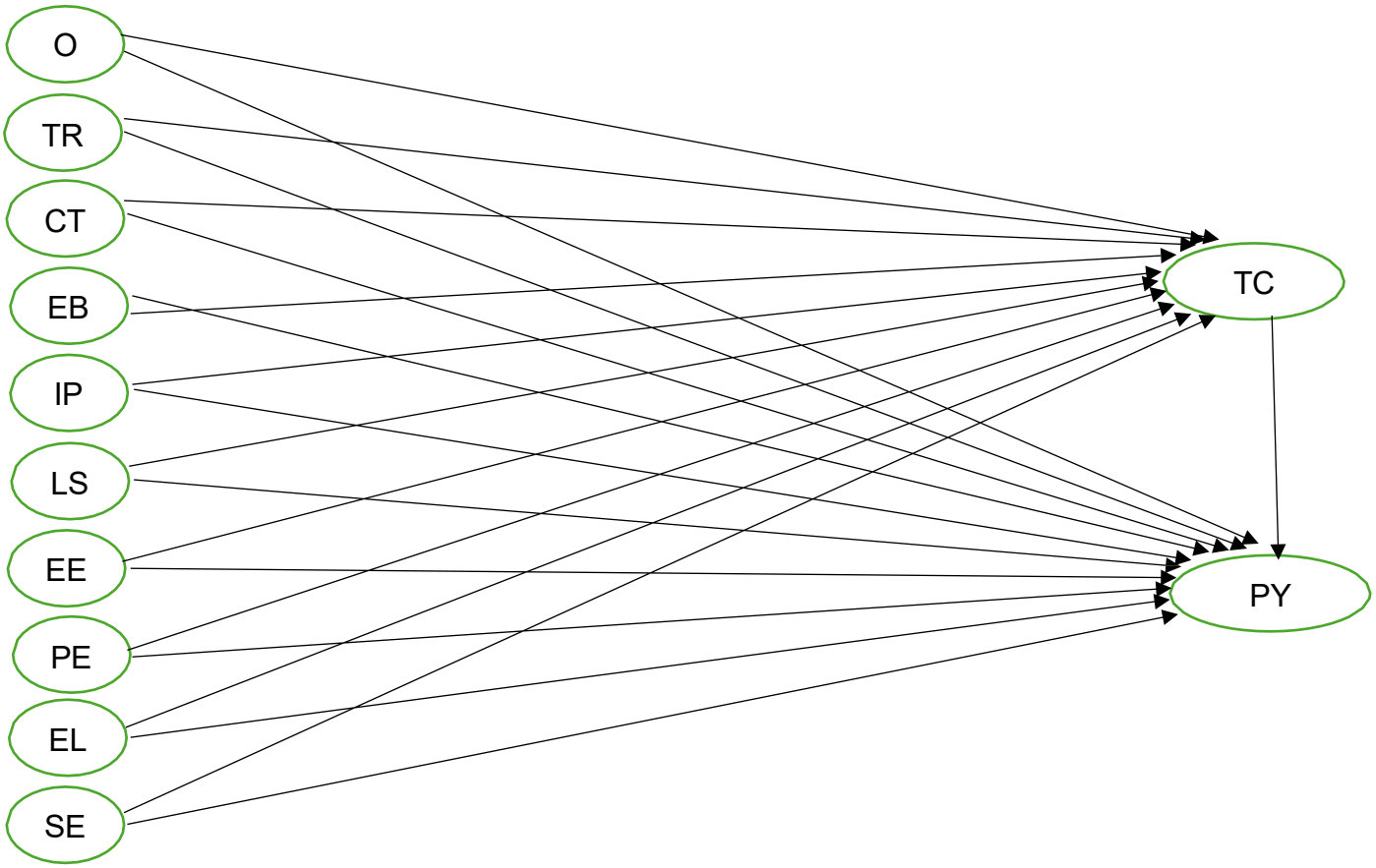
Research Framework



3. Literature review

Studies conducted in Japan showed how teleworking increases productivity but also it reduces the productivity if the hours are extended (Kazekami, Sachiko 2020). There have been various factors both internal and external related to the productivity of employees in previous literature while they telework. Telecommuting effects traveling and which in turn has positive effects on productivity plus morale amongst U.S Citizens (Mokhtarian, Patricia L 1991). Teleworking boosts economic productivity with less travel of future workers (Cette, Gilbert 2020).Worker productivity is also related to productivity of knowledge and implementation of the same for sustainable development of both the employee and the organization (Kazekami, Sachiko 2020). The characteristic of teleworking is more

of time flexibility than work period or work hours (Steward, Barbara 2000).Teleworking initiates a better productive time management and work life balance along with better official communications and personnel adaptability (Tolentino et al 2021).Some researchers have opposed views of telecommuting where they state that telework pushes employees to take work home and depletes family time (Glass et al 2016).The major reason for decline in productivity while working from home was communication disruption. However it may improve employee health and mental wellbeing (Kitagawa 2021).While work from home or telecommuting is characterised by decreased expenses , increased family time , better time management and improved health effects, it also has the flip side of lack of official or management environment, communication or more technological issues , technical glitches etc. (Seva et al 2021).While telecommuting increases productivity , it is also referred to as a bio break by researchers (Wrestler 2020).Working from home or teleworking also effects academic productivity (Fedorowicz 2022)Working on issues like infrastructure will drop health hazards like spine problems and other mental solo working issues. This will result in increased teleworker productivity and satisfaction while reducing costs (Moretti et al.2020).

The varied views on telecommuters' productivity levels and the factors which influence them, it call for a deeper analysis. Hence, this study aims to organize and compile previous quantitative research on the influence of telecommuting on productivity. Further, it aims to narrow down the effect of telecommuting on productivity by basing them on chosen literature or research on samples which have been quantitatively analysed.

The rise of technology has facilitated a significant shift in work arrangements, with teleworking becoming increasingly common. This trend has sparked debate about the impact of teleworking on work productivity. This review examines the relationship between teleworking and work productivity, exploring relevant work psychology dimensions, management styles, and communication practices.

Teleworking and Work Productivity: A Mixed Picture

Research on the relationship between teleworking and work productivity presents a complex picture. Some studies suggest teleworking can enhance productivity. For instance, Bloom et al. (2015) found a

13% increase in performance among call center workers who switched to a teleworking arrangement. This positive effect is attributed to factors like reduced commuting time, increased autonomy, and improved work-life balance (Gunnarson & Martensson, 2004).

However, other studies report a decline in productivity with teleworking. Gibbs et al. (2021) found a 20% decrease in productivity among teleworkers during the COVID-19 pandemic. This may be due to increased distractions at home, challenges with collaboration and communication, and a lack of clear boundaries between work and personal life (Bailey & Kurland, 2003).

Work Psychology Dimensions: Mediating Factors

Several work psychology dimensions likely mediate the relationship between teleworking and work productivity. These include:

Self-regulation: Teleworkers require strong self-regulation skills to manage distractions, stay focused, and maintain a consistent work schedule (Van der Meijden et al., 2017).
Personality: Personalities suited to autonomy and self-directed work may benefit more from teleworking than those who thrive on structure and social interaction (de Jong & Bond, 2010).
Motivation: High intrinsic motivation may lead to increased productivity in a telework environment, as external motivators like supervision are less present (Eisenberger & Cummings, 1997).
Management Style and Communication

Management style and communication practices significantly influence the effectiveness of teleworking arrangements. A supportive and trusting management style that empowers teleworkers is essential (De Menezes & Cunha, 2017). Likewise, clear and regular communication channels are crucial for maintaining team cohesion, collaboration, and avoiding feelings of isolation among teleworkers (Lugrin & Bartolini, 2020).

The impact of teleworking on work productivity is not a simple binary. Work psychology dimensions, management style, and communication practices all play a role in mediating this relationship. Further research is needed to explore how organizations can design and implement teleworking arrangements that maximize productivity and employee well-being.

4. Data analysis

Conceptual model

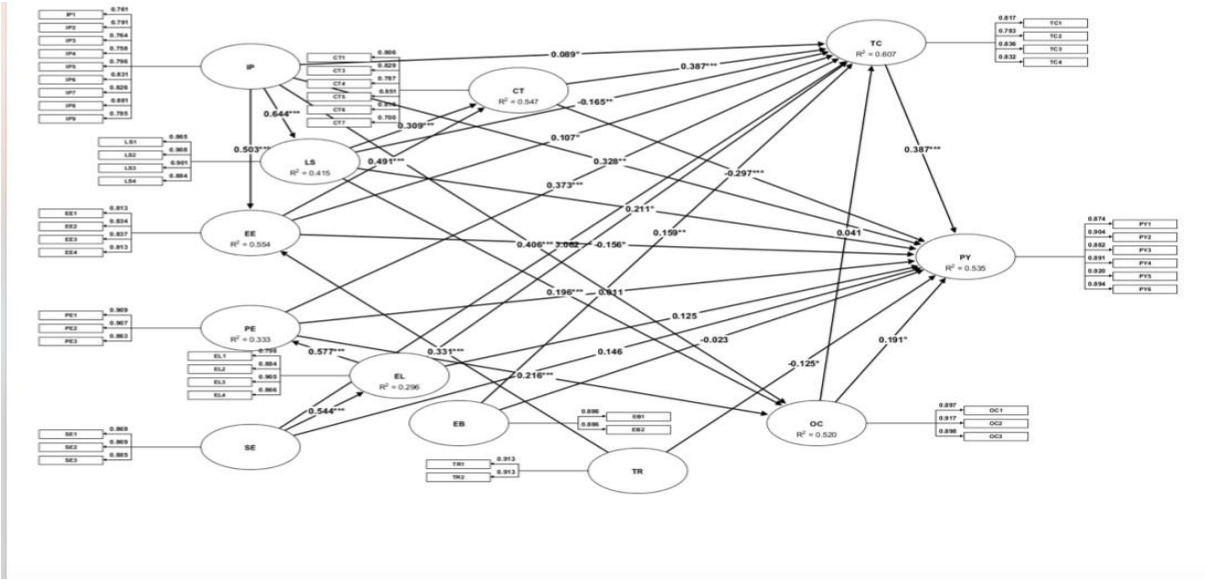


Figure 1 Conceptual structural equation model

Table 1--- Summary of results of hypothesis tested for research question 1				
Research question 1: Is productivity a significant construct in the telecommuting work environment?				
H1.1	Productivity is a significant construct in the telecommuting work environment.	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-

	(Productivity is a multi-dimensional construct consisting of personal goals , employee relationship quality ,organizational goals, managerial prescriptions, relationship quality , organizational output.)			
H1.1a	Personal goals is a significant and distinct determinant of productivity.	0.874	Strong	53.4941
H1.1b	Employee relationship quality is a significant and distinct determinant of productivity	0.904	Strong	71.6846
H1.1c	Organizational goals is significant and distinct determinant of productivity	0.882	Strong	65.2223
H1.1d	Managerial prescriptions is significant and distinct determinant of productivity	0.891	Strong	93.0945
H1.1e	Relationship quality is a significant and distinct determinant of productivity	0.920	Strong	63.8626
H1.1f	Organizational output is a significant and distinct determinant of productivity.	0.894	Strong	53.4941
Table 2--- Summary of results of hypothesis tested for research question 2				
Research question 2: Does telecommuting impact productivity significantly?				
H2.1	Telecommuting has significant impact on productivity. (Telecommuting is a multi-dimensional construct consisting of permanent and	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-

	temporary arrangements, output , decision making authority and flexible working programmes)			
H2.1a	Permanent and temporary arrangements is a significant and distinct determinant of telecommuting	0.817	Strong	35.2930
H2.1b	Output is a significant and distinct determinant of telecommuting.	0.783	Moderate	41.6776
H2.1c	Decision making authority is significant and distinct determinant of telecommuting.	0.836	Strong	52.5350
H2.1d	Flexible working programmes is significant and distinct determinant of telecommuting.	0.832	Strong	41.0600

Table 3--- Summary of results of hypothesis tested for research question 3				
Research question 3: Does industrial psychology impact productivity significantly in the telecommuting work environment?				
H3.1	Industrial psychology has a significant impact on productivity in the telecommuting work environment. (Industrial psychology is a multi-dimensional construct consisting of designation ,willingness to accept or reject, age, citizenship behavior, attitudes towards job, managers inspiration, personality, organizational behavior, perception)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-

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H3.1a	Designation is a significant and distinct determinant of industrial psychology	0.761	Moderate	25.3997
H3.1b	Willingness to accept or reject something is a significant and distinct determinant of industrial psychology	0.791	Moderate	30.3871
H3.1c	Age is significant and distinct determinant of industrial psychology	0.764	Moderate	27.2589
H3.1d	Citizenship behavior is significant and distinct determinant of industrial psychology	0.758	Moderate	28.0329
H3.1e	Attitudes towards job is a significant and distinct determinant of industrial psychology	0.796	Moderate	26.7139
H3.1f	Managers inspiration is a significant and distinct determinant of industrial psychology	0.831	Strong	31.4097
H3.1g	Personality is a significant and distinct determinant of industrial psychology	0.826	Strong	36.7421
H3.1h	Organizational behaviour is a significant and distinct determinant of industrial psychology	0.881	Strong	54.0179
H3.1i	Perception is a significant and distinct determinant of industrial psychology	0.785	Moderate	30.6975

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Table 1--- Summary of results of hypothesis tested for research question 4				
Research question 4: Does leadership style significantly impact productivity in the telecommuting work environment?				
H4.1	Leadership style has a highly significant impact on productivity in the telecommuting work environment. (Leadership style is a multi-dimensional construct consisting of directing, facilitating, coaching and delegating)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T-values
H4.1a	Directing is a significant and distinct determinant of leadership style	0.865	Strong	48.7600
H4.1b	Coaching is a significant and distinct determinant of industrial psychology	0.908	Strong	73.0881
H4.1c	Facilitating is significant and distinct determinant of industrial psychology	0.884	Strong	59.3279
H4.1d	Delegating is significant and distinct determinant of industrial psychology	0.901	Strong	74.7781

Table 2--- Summary of results of hypothesis tested for research question 5
Research question 5: Does communication significantly impact productivity in the telecommuting work environment?

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H5.1	Communication has a highly significant impact on productivity in the telecommuting work environment. (Communication is a multi-dimensional construct consisting Interaction, coordination , avoidable circumstances ,social stimulation, connection ,employer perception)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-
H5.1a	Interaction is a significant and distinct determinant of Communication	0.806	Strong	41.0660
H5.1b	Coordination is a significant and distinct determinant of communication	0.829	Strong	49.0244
H5.1c	Avoidable circumstances are a significant and distinct determinant of communication	0.787	Strong	37.3653
H5.1d	Social stimulation is significant and distinct determinant of communication	0.851	Strong	69.8040
H5.1e	Connection is significant and distinct determinant of communication	0.818	Strong	41.1498
H5.1f	Employer perception is significant and distinct determinant of communication	0.700	Moderate	21.5378

Table 3--- Summary of results of hypothesis tested for research question 6
Research question 6: Does employee engagement significantly impact productivity in the telecommuting work environment?

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H6.1	Employee engagement has a highly significant impact on productivity in the telecommuting work environment. (Employee engagement is a multi-dimensional construct consisting of training and development, control systems, defined rules and goal progress)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-
H6.1a	Training and development is a significant and distinct determinant of employee engagement.	0.813	Strong	36.0561
H6.1b	Control systems are a significant and distinct determinant of employee engagement.	0.834	Strong	44.9476
H6.1c	Defined rules are a significant and distinct determinant of employee engagement.	0.837	Strong	42.9498
H6.1d	Goal progress is significant and distinct determinant of employee engagement.	0.813	Strong	34.2140

Table 4--- Summary of results of hypothesis tested for research question 7				
Research question 7: Does personality significantly impact productivity in the telecommuting work environment?				
H7.1	Personality has a significant impact on productivity in the telecommuting work environment. (Personality is a multi-dimensional construct consisting of extrinsic and intrinsic motivation, employee isolation , organizational behaviour)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value

H7.1a	Extrinsic and intrinsic motivation is a significant and distinct determinant of personality.	0.909	Strong	78.8865
H7.1b	Employee isolation are a significant and distinct determinant of personality	0.907	Strong	75.3362
H7.1c	Organizational behavior is a significant and distinct determinant of personality.	0.863	Strong	47.4112

Table 5--- Summary of results of hypothesis tested for research question 8				
Research question 8: Does employer liability significantly impact productivity in the telecommuting work environment?				
H8.1	Employer liability has a highly significant impact on productivity in the telecommuting work environment. (Employer liability is a multi-dimensional construct consisting of authority, regulatory risks , ergonomic controls , zoning laws)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value
H8.1a	Authority is a significant and distinct determinant of employer liability.	0.798	Moderate	35.6139
H8.1b	Regulatory risks is a significant and distinct determinant of employer liability.	0.884	Strong	68.4648
H8.1c	Ergonomic controls is a significant and distinct determinant of employer liability.	0.905	Strong	88.1810

H8.1d	Zoning laws is a significant and distinct determinant of employer liability.	0.866	Strong	52.5187

Table 6--- Summary of results of hypothesis tested for research question 9				
Research question 9: Does employer branding significantly impact productivity in the telecommuting work environment?				
H9.1	Employer branding has a highly significant impact on productivity in the telecommuting work environment. (Employer branding is a multi-dimensional construct consisting of non monetary benefits and millennial attitudes)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value
H9.1a	Non monetary benefits is a significant and distinct determinant of employer branding	0.886	Strong	73.9894
H9.1b	Millenial attitudes are a significant and distinct determinant of employer branding.	0.886	Strong	73.9894

Table 7--- Summary of results of hypothesis tested for research question 10				
Research question 10: Does socio economic status significantly impact productivity in the telecommuting work environment?				
H10.1	Socioeconomic status has a highly significant impact on productivity in the telecommuting work environment.	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value

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	(Socio economic status is a multi-dimensional construct consisting of compensation, social factors ,market competition)			
H10.1a	Compensation is a significant and distinct determinant of Socio economic status	0.869	Strong	49.8424
H10.1b	Social factors are a significant and distinct determinant of socio economic status	0.885	Strong	52.2131
H10.1c	Market competition is a significant and distinct determinant of socio economic status	0.885	Strong	63.3104

Table 8--- Summary of results of hypothesis tested for research question 11				
Research question 11: Does organizational change significantly impact productivity in the telecommuting work environment?				
H11.1	Organizational change has a highly significant impact on productivity in the telecommuting work environment. (Organizational change is a multi-dimensional construct consisting of psychological contract, organizational implementation and organizational behaviour.)	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value
H11.1a	Psychological contract benefits is a significant and distinct determinant of organizational change	0.897	Strong	70.0193

H11.1b	Organizational implementation are a significant and distinct determinant of organizational change.	0.917	Strong	89.2211
H11.1c	Organizational behavior is a significant and distinct determinant of organizational change.	0.898	Strong	69.2945

Table 9--- Summary of results of hypothesis tested for research question 12				
Research question 12: Does training significantly impact productivity in the telecommuting work environment?				
H12.1	Training has a highly significant impact on productivity in the telecommuting work environment. (training is a multi-dimensional construct consisting of short term and long term training	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-
H12.1a	Long term training is a significant and distinct determinant of training	0.913	Strong	85.4104
H12.1b	Short term training is a significant and distinct determinant of training	0.913	Strong	85.4104

Table 13--- Summary of results of hypothesis tested for research question 12				
Research question 12: Does training significantly impact productivity in the telecommuting work environment?				
H12.1	Training has a highly significant impact on productivity in the telecommuting work environment.	Loadings (Path coefficient)	Impact > 0.8 Strong, < 0.8 Moderate	T value-

	(training is a multi-dimensional construct consisting of short term and long term training			
H12.1a	Long term training is a significant and distinct determinant of training	0.913	Strong	85.4104
H12.1b	Short term training is a significant and distinct determinant of training	0.913	Strong	85.4104

4.Results and discussion

Through this study we observe that factors listed in the table answer our research questions and have a significant contribution in influencing productivity or output in the telecommuting work environment.

Research Questions	**Research Objectives**	**Hypothesis**
11. Does industrial psychology impact productivity significantly in the telecommuting work environment.	To understand the impact of industrial psychology on productivity in the telecommuting work environment.	Industrial psychology has a highly significant impact on productivity in the telecommuting work environment.
12. Does leadership style significantly impact productivity in the telecommuting work environment.	To understand the impact of leadership style on productivity in the telecommuting work environment	Leadership style has a highly significant impact on productivity in the telecommuting work environment.

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13. Does communication significantly impact productivity in the telecommuting work environment.	To understand the impact of communication on productivity in the telecommuting work environment	Communication has a highly significant impact on productivity in the telecommuting work environment.
14. Does employee engagement significantly impact productivity in the telecommuting work environment.	To understand the impact of employee engagement on productivity in the telecommuting work environment.	Employee engagement has a highly significant impact on productivity in the telecommuting work environment.
15. Does personality significantly impact productivity in the telecommuting work environment.	To understand the impact of personality on productivity in the telecommuting work environment	Personality has a highly significant impact on productivity in the telecommuting work environment.
16. Does employer liability significantly impact productivity in the telecommuting work environment?	To understand the impact of employer liability on productivity in the telecommuting work environment	Employer liability has a highly significant impact on productivity in the telecommuting work environment.
17. Does socio economic status significantly impact	To understand the impact of socio-economic status on	Socio economic status has a highly significant impact on

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productivity significantly in the telecommuting work environment.	productivity in the telecommuting work environment	productivity in the telecommuting work environment.
18. Does organizational change significantly impact productivity in the telecommuting work environment.	To understand the impact of organizational change on productivity in the telecommuting work environment	Organizational change has a highly significant impact on productivity in the telecommuting work environment.
19. Does training significantly impact productivity in the telecommuting work environment.	To understand the impact of training on productivity in the telecommuting work environment	Training has a highly significant impact on productivity in the telecommuting work environment.
20. Does Employer branding significantly impact productivity in the telecommuting work environment.	To understand the impact of employer branding on productivity in the telecommuting work environment	Employer branding has a highly significant impact on productivity in the telecommuting work environment.

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Table 1 : Construct Reliability Table

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	Cronbach's alpha (α)
TC	1.0000	0.8893	0.8338
PY	1.0000	0.9601	0.9500
IP	1.0000	0.9411	0.9293
CT	1.0000	0.9140	0.8864
SE	1.0000	0.9065	0.8453
LS	1.0000	0.9383	0.9122
EE	1.0000	0.8946	0.8429
EB	1.0000	0.8796	0.7264
PE	1.0000	0.9220	0.8729
EL	1.0000	0.9217	0.8860
OC	1.0000	0.9307	0.8883
TR	1.0000	0.9089	0.7995

Thus, the study has been conducted on the basis that the reliability value construct for each item was higher than 0.7 as per Dijkstra-Henseler's rho. Dijkstra and Henseler (2015) indicate that any score higher than 0.8 is good. Joreskog et al. (2006) stated that any score above 0.9 is excellent. Most of the scores for the Cronbach alpha are excellent as they are higher than 0.8 (Cronbach, 1951).

Table 2:Convergent Validity Table

Construct	Average variance extracted (AVE)
TC	0.6678
PY	0.8003
IP	0.6402
CT	0.6400
SE	0.7638
LS	0.7917
EE	0.6798
EB	0.7852
PE	0.7977

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EL	0.7467
OC	0.8174
TR	0.8330

Indicator	TC	PY	IP	CT	SE	LS	EE	EB	PE	EL	TR	OC
TC1	0.8170											
TC2	0.7826											
TC3	0.8359											
TC4	0.8322											
PY1		0.8740										
PY2		0.9045										
PY3		0.8824										
PY4		0.8915										
PY5		0.9201										
PY6		0.8945										
IP1			0.7607									
IP2			0.7910									
IP3			0.7643									
IP4			0.7575									
IP5			0.7962									
IP6			0.8310									
IP7			0.8261									
IP8			0.8812									
IP9			0.7848									
CT1				0.8063								
CT3				0.8291								
CT4				0.7869								
CT5				0.8514								
CT6				0.8177								
CT7				0.7000								
SE1					0.8685							
SE2					0.8686							
SE3					0.8846							
LS1						0.8650						
LS2						0.9079						
LS3						0.9011						
LS4						0.8845						
EE1							0.8130					

EE2							0.8345					
EE3							0.8367					
EE4							0.8134					
EB1								0.8861				
EB2								0.8861				
PE1									0.9094			
PE2									0.9067			
PE3									0.8626			
EL1										0.7982		
EL2										0.8840		
EL3										0.9047		
EL4										0.8659		
TR1											0.9127	
TR2											0.9127	
OC1												0.8973
OC2												0.9171
OC3												0.8978

Table 3: Loadings

Convergent validity is measured in two forms: AVE and loadings. All the loading values, as noted in Table 5, are above 0.7, hence the convergent validity of all constructs is very high.

Construct	TC	PY	IP	CT	SE	LS	EE	EB	PE	EL	OC	TR
TC	0.6678											
PY	0.2904	0.8003										
IP	0.3085	0.3853	0.6402									
CT	0.4476	0.1198	0.3417	0.6400								
SE	0.2673	0.2716	0.4595	0.4020	0.7638							
LS	0.2541	0.2650	0.4152	0.4215	0.5090	0.7917						
EE	0.3734	0.2073	0.4815	0.4972	0.4597	0.4805	0.6798					
EB	0.3949	0.1912	0.2641	0.3499	0.3090	0.3798	0.3601	0.7852				
PE	0.4740	0.2876	0.4205	0.3442	0.4144	0.4105	0.4256	0.5533	0.7977			
EL	0.1979	0.1945	0.3381	0.2384	0.2957	0.2399	0.3713	0.2523	0.3334	0.7467		
OC	0.2343	0.3263	0.4519	0.2134	0.3507	0.3550	0.3879	0.2584	0.3656	0.2836	0.8174	
TR	0.2311	0.1534	0.3345	0.3139	0.4072	0.3551	0.3863	0.2476	0.3924	0.4777	0.2911	0.8330

Squared correlations; AVE in the diagonal.

Table 4 : Squared correlations : AVE Diagonal

Thus, this research study adopts a standardised factor loading of greater than 0.50, a Cronbach's alpha values of greater than 0.7 and an AVE value of greater an 0.05 as

acceptable levels of convergent validity. The discriminant validity is examined by the correlations between latent constructs of less than 0.80 as suggested by Cunningham (2012), the pattern and structure coefficients as suggested by Thompson (1997) and an AVE greater than the variance shared between the two respective
constructs (square multiple correlations between two constructs) as suggested by Fornell and Larcker (1981).

The estimated correlations between constructs are demonstrated in an inter-construct correlation matrix. Table 8 shows only the lower triangle of the inter-construct correlation matrix due to the presence of symmetrical relations. The inter-construct correlations can differ from the correlations between construct scores. This occurs when one or more construct has a weighting scheme or if one or more composite measurement model is assumed to have a random measurement error. In this thesis, the reliability was manually set to a value different from 1, which can be seen in Table 8. Predictive validity is defined as the ability of a measuring instrument to estimate some criterion behaviour that is external to the measuring instrument itself and is shown by the correlation between the instrument and the criterion variable (Nunnally, 1994). Furthermore, predictive validity, which is also known as external validity or criterion-related validity, is 'concerned with the degree to which a measuring instrument is related to an independent measure of the relevant criterion' (Badri et al., 1995). To assess the predictive validity of the scale, a measure of productivity was employed as the criterion variable for the 10 constructs. The 10 constructs have high criterion-related validity when they are highly positively correlated with productivity in telecommuting. The predictive validity of the combined set of the 10 constructs was estimated by examining the Pearson's correlation coefficients (r) for the 10 constructs and productivity as a measure. Correlation analysis revealed that productivity correlated positively with the 10 constructs: telecommuting (TE), industrial psychology (IP), communication (CT), socio-economic status (SE), leadership style (LS), employee engagement (EE), employer branding (EB), personality (PE), employer liability (EL), organisational change (OC) and training (TR). Having observed the high correlation among constructs, we also concluded that multiple predictive models could be developed through several regression models. Consequently, we can confirm that the instrument used for collecting data has high validity and high reliability. The measurement model is, therefore, valid.

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Construct	TC	PY	IP	CT	SE	LS	EE	EB	PE	EL		
TC	1.0000											
PY	0.5389	1.0000										
IP	0.5554	0.6208	1.0000									
CT	0.6690	0.3461	0.5846	1.0000								
SE	0.5170	0.5211	0.6778	0.6340	1.0000							
LS	0.5041	0.5148	0.6443	0.6492	0.7135	1.0000						
EE	0.6111	0.4553	0.6939	0.7051	0.6780	0.6932	1.0000					
EB	0.6284	0.4372	0.5139	0.5915	0.5559	0.6162	0.6001	1.0000				
PE	0.6885	0.5363	0.6485	0.5867	0.6437	0.6407	0.6524	0.7439	1.0000			
EL	0.4448	0.4410	0.5815	0.4882	0.5438	0.4898	0.6094	0.5023	0.5774	1.0000		
OC	0.4840	0.5712	0.6723	0.4620	0.5922	0.5958	0.6228	0.5083	0.6047	0.5326	1.0000	
TR	0.4807	0.3916	0.5784	0.5603	0.6382	0.5959	0.6215	0.4976	0.6264	0.6912	0.5396	1.0000

Table 5:Inter Construct Correlations

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles				Status of significance
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%	(Yes/No)
TC -> PY	0.3873	0.3854	0.0557	6.9592	0.0000	0.0000	0.2306	0.2782	0.4962	0.5291	Yes
IP -> TC	0.0887	0.0960	0.0525	1.6906	0.0912	0.0456	-0.0226	0.0005	0.2070	0.2472	Yes
IP -> PY	0.3282	0.3261	0.1027	3.1969	0.0014	0.0007	-0.0232	0.1089	0.5008	0.5332	Yes
IP -> LS	0.6443	0.6429	0.0506	12.7275	0.0000	0.0000	0.4796	0.5370	0.7318	0.7497	Yes
IP -> EE	0.5026	0.5019	0.0594	8.4587	0.0000	0.0000	0.3397	0.3843	0.6139	0.6436	Yes
IP -> OC	0.4061	0.4088	0.0635	6.3924	0.0000	0.0000	0.2616	0.2895	0.5395	0.5753	Yes
CT -> TC	0.3869	0.3881	0.0528	7.3246	0.0000	0.0000	0.2434	0.2752	0.4884	0.5158	Yes
CT -> PY	-0.2965	-0.2873	0.0545	-5.4449	0.0000	0.0000	-0.4383	-0.3915	-0.1730	-0.1337	No
SE -> TC	-0.0617	-0.0606	0.0499	-1.2371	0.2163	0.1082	-0.1976	-0.1561	0.0381	0.0721	No
SE -> PY	0.1461	0.1387	0.1246	1.1724	0.2413	0.1207	-0.2393	-0.1298	0.3487	0.4120	No
SE -> EL	0.5438	0.5437	0.0529	10.2785	0.0000	0.0000	0.3869	0.4381	0.6414	0.6705	Yes
LS -> TC	-0.1648	-0.1660	0.0501	-3.2909	0.0010	0.0005	-0.2976	-0.2695	-0.0676	-0.0448	No
LS -> PY	0.2112	0.2067	0.1095	1.9297	0.0539	0.0270	-0.1515	-0.0385	0.4011	0.4435	Yes
LS -> CT	0.3089	0.3131	0.0645	4.7868	0.0000	0.0000	0.1579	0.1933	0.4402	0.4842	Yes
LS -> OC	0.1958	0.1921	0.0536	3.6501	0.0003	0.0001	0.0599	0.0883	0.2924	0.3198	Yes
EE -> TC	0.1073	0.1032	0.0557	1.9249	0.0545	0.0273	-0.0399	-0.0003	0.2208	0.2520	Yes
EE -> PY	-0.1563	-0.1450	0.0692	-2.2580	0.0242	0.0121	-0.3361	-0.2827	0.0003	0.0303	No
EE -> CT	0.4910	0.4857	0.0595	8.2551	0.0000	0.0000	0.3115	0.3638	0.5903	0.6152	Yes
EB -> TC	0.1593	0.1582	0.0508	3.1370	0.0018	0.0009	0.0162	0.0525	0.2543	0.2802	Yes
EB -> PY	-0.0227	-0.0211	0.0618	-0.3683	0.7127	0.3564	-0.1754	-0.1444	0.0977	0.1541	No
PE -> TC	0.3729	0.3704	0.0693	5.3822	0.0000	0.0000	0.1960	0.2277	0.4984	0.5278	Yes
PE -> PY	0.0110	0.0154	0.0725	0.1523	0.8789	0.4395	-0.1850	-0.1327	0.1579	0.1859	No
PE -> OC	0.2159	0.2166	0.0619	3.4878	0.0005	0.0003	0.0449	0.0921	0.3415	0.3846	Yes

EL -> TC	-0.0640	-0.0645	0.0457	-1.4004	0.1617	0.0809	-0.1887	-0.1573	0.0231	0.0488	No
EL -> PY	0.1248	0.1270	0.0909	1.3719	0.1704	0.0852	-0.1143	-0.0627	0.2997	0.3400	No
EL -> PE	0.5774	0.5748	0.0466	12.3821	0.0000	0.0000	0.4553	0.4809	0.6594	0.6794	Yes
OC -> TC	0.0413	0.0399	0.0424	0.9722	0.3312	0.1656	-0.0787	-0.0465	0.1213	0.1385	No
OC -> PY	0.1910	0.1863	0.1125	1.6974	0.0899	0.0450	-0.1916	-0.0708	0.3856	0.4164	Yes
TR -> PY	-0.1252	-0.1216	0.0598	-2.0933	0.0366	0.0183	-0.2771	-0.2342	-0.0031	0.0253	No
TR -> EE	0.3308	0.3290	0.0573	5.7714	0.0000	0.0000	0.1805	0.2134	0.4385	0.4662	Yes

Table 6:Inter Construct Correlations

Hence we can conclude that the previous theories have considered human related factors like leadership style, personality and have been more inclined towards setting up organizational and individual goals. They have also provided steps of implementation however through this study we attempt to improvise and upgrade the previous theories and concepts stated. We claim through a quantitative approach of structural equation modelling that factors beyond human characteristics like employer branding(EB), communication (CT), employer liability(EL), organizational change(OC), socio economic status(SE), employee engagement(EE) ,industrial psychology(IP) and training (TR) have a major influence on the output factor of productivity in the telecommuting work environment. Telecommuting is such a rapidly growing trend, the future research possibilities are numerous. The hope of this study was to begin the journey into understanding how to help management create the most productivity telecommuting environment for the 21st century workers. This study can be further extended in different geographies or be more specific to genders. Researchers may also study the relationship between remote teams and organizations while they telecommute.

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