Developing a framework linking work-life balance, job demands, and organisational support in engineers' occupational stress

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DECLARATION

I, J.N. Pretorius, do hereby declare that this dissertation is the result of my own investigation and research and that it has not been submitted in part or in full for any degree to any university.

Signature: J.N Pretorius Date: 19 October 2025

PREFACE

This research project marks the culmination of a personal and professional journey. As an engineer working on projects all over the world, I have long been immersed in a high-pressure environment where long hours, long stretches away from home, complex responsibilities, and tight deadlines are the norm. Over the years, I have witnessed firsthand how these demands can affect not only productivity but also the well-being of engineers.

The idea for this study emerged from doing a project in other countries and seeing how professional workers from South Africa try to make up for lost time when on rest and recruitment back in South Africa for a week or two, and this made me question how engineers cope with the competing demands of work and personal life. I became increasingly interested in understanding the mechanisms behind occupational stress and the role that organisational support and job demand play in shaping our experiences.

Being an engineer, resilience is often expected, but rarely nurtured. The culture tends to reward endurance over balance, and support systems are often informal or inconsistent. This research is my attempt to explore these dynamics more systematically and to contribute to a growing body of knowledge that advocates for healthier, more sustainable engineering workplaces.

Conducting this study has been both challenging and rewarding. It required me to step outside the technical realm and engage with human factors, organisational psychology, and statistical modelling.

I hope that the findings presented here will not only inform academic discourse but also inspire practical changes in how engineering organisations - especially in high-demand sectors like mining and construction - approach employee well-being. Ultimately, this work is dedicated to all engineers striving to find balance in a demanding profession.

ABSTRACT

This study investigates the relationship between work-life balance and occupational stress among engineers in South Africa, with a focus on the mediating roles of perceived organisational support and job demands. Drawing on established theoretical models - including the Job Demands–Resources (JD–R) model, Organisational Support Theory (OST), and Role Theory (RT) - the research develops and assesses a conceptual framework using a quantitative, post-positivist approach. Data collected via a cross-sectional survey from engineers across various disciplines, employing validated instruments for work-life balance, occupational stress, organisational support, and job demands.

Descriptive and inferential analyses revealed that engineers experience moderate levels of work-life balance and occupational stress, low perceived organisational support, and high job demands. Structural Equation Modelling (SEM) confirmed a significant direct negative relationship between work-life balance and occupational stress. However, neither perceived organisational support nor job demands significantly mediated this relationship. These findings suggest that while organisational support and job demands are important contextual factors, work-life balance independently influences stress levels among engineers.

The study contributes a refined framework for understanding occupational stress in engineering contexts and offers practical recommendations for organisations. These include enhancing work-life balance through flexible scheduling, reducing excessive job demands, and improving organisational support structures. The research also highlights the need for sector-specific interventions and longitudinal studies to explore causal pathways further and improve engineer well-being in South Africa. The study aligns with United Nations Sustainable Development Goals (SDG 3 and SDG 8), promoting healthier workplaces and economic growth through improved work-life integration.

Keywords: Burnout, engineers, job demand, job demand-resource model, occupational stress, organisation support theory, perceived organisational support, role theory, well-being, work-life balance.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
4IR	Fourth Industrial Revolution
ANOVA	Analysis of Variance
APA	American Psychological Association
BJSQ	Brief Job Stress Questionnaire
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
COPSOQ	Copenhagen Psychosocial Questionnaire
COR	Conservation of Resource Theory
CPD	Continuous Professional Development
CSE	Core Self-Evaluation
CSV	Comma-Separated Values
DCS	Demand Control Support Module
ECSA	Engineering Council of South Africa
EFA	Exploratory Factor Analysis
ERI Model	Effort-Reward Imbalance (ERI) Model
FA	Factor Analysis
GDP	Gross Domestic Product
HPWS	High-Performance Work System
HRM	Human Resource Management
ICD	International Classification of Diseases
ISMA	International Stress Management Association
JCQ	Job Content Questionnaire
JDC	Job Demand Control Model
JD-R Model	Job Demands-Resource Model
JDS	Job Demand Scale

JSS	Job Stress Survey
KMO	Kaiser-Meyer-Olkin
LMX	Leader–Member Exchange
MQW	Measuring Quality of Work Questionnaire
NFI	Normed Fit Index
NIOSH	National Institute for Occupational Safety and Health
OCB	Organisational Citizenship Behaviours
OSI	Occupational Stress Index
OST	Organisational Support Theory
PA	Percentage Agreement
PCA	Principal Component Analysis
PCMT	Personalised Collectivistic Monistic Teleological Model
PCS	Principal Components Analysis
PCT	Psychological Contract Theory
PE	Person-Environment
PLEW	Personal Life Enhancement of Work
PLIW	Personal Life Interference with Work
PMI	Pressure Management Indicator
POS	Perceive Organisational Support
PPS	Professional Provident Society
PSC	Psychosocial Safety Climate
QOQ	Quality of Work Index
QWL	Quality of Work Life
RC	Relative Concentration
RMSEA	Root Mean Square Error of Approximation
RP	Relative Position
RSI	Repetitive Strain Injury

RV	Relative Variance
SCS	Statistical Consultation Services
SDG	Sustainable Development Goal
SDT	Self-Determination Theory
SEM	Structural Equation Modelling
SET	Social Exchange Theory
SOE	State-Owned Enterprises
SPOS	Survey of Perceived Organisational Support
SST	Social Support Theory
STEM	Science, Technology, Engineering, and Mathematics
TMP	Triple-Match Principle
WEPL	Work Enhancement of Personal Life
WHO	World Health Organisation
WHOQOL	The World Health Organisation Quality of Life
WIPL	Work Interference with Personal Life
WSQ	Work Stress Questionnaire

CHAPTER 1 INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

Rapid change, constant work pressure, deadlines, demographic changes, increasing use of technology, and virtual work characterise the current professional job situation in South Africa (Rothmann *et al.*, 2006:2; Staff Writer, 2022:205). The nature of work has evolved from being physically demanding to being more emotionally and mentally demanding (Chamorro-Premuzic, 2022; Rothmann *et al.*, 2006:76). In a rapidly evolving society where “time is money”, striking a balance between personal and work life is crucial for leading a fulfilling lifestyle. Employees must understand that they are valuable to the organisation’s success, and organisations must support their employees, making them feel a sense of belonging.

For employees to live a balanced lifestyle is an essential matter for individuals and organisations alike. A balanced lifestyle and organisational support, or a lack thereof, have been associated with various personal issues, such as job satisfaction, burnout, performance, occupational stress, employee welfare, personal objectives, contributions, self-development, and employee appreciation (Adil & Baig, 2018; Chan *et al.*, 2017; Fitria & Linda, 2019; Padula *et al.*, 2012; Sindhura, 2022).

An article by Jeff Haden (2023) titled “20 Years from now, the only people who will remember that you worked late are your kids” highlights that quality time spent at work and with family is far more critical than quantity. Making each moment count is fundamental for achieving a satisfied and balanced lifestyle. This research aims to assess the work-life balance of engineers in South Africa, its impact on occupational stress, and the mediating roles of organisational support and job demand.

Unlike their counterparts in other countries, engineers in South Africa devote significant time, skill, effort, and flexibility to their jobs and careers (Doherty, 2023). However, they receive fewer career opportunities and have less job security. This unique situation, tied with high job demand, less free time, and a growing need for information, dictates that South African engineers rely more on their strengths to maintain excellent job performance (Engineering News, 2019; Motale, 2021).

Exploring how work-life balance influences occupational stress is a vital focus in organisational research in the area of human behaviour in the workplace (occupational psychology). Accordingly, different studies have been done comparing variables against work-life balance and in various contexts, for instance, organisational support, job demand, and leadership (Chansaengsee, 2017; Fitria & Linda, 2019; Irfan *et al.*, 2023:3). In recent years, work-life balance and occupational stress have gained increased attention in managing and understanding employees' well-being in the workplace and occupational psychology. Still, the industry does not predominantly consider engineers in South African contexts.

For employees to achieve a balance between work and personal life and to minimise occupational stress, it is essential to ensure employee well-being both at home and in the workplace. This balance in an employee's life refers to harmonising work-related responsibilities with family and personal commitments, and effectively managing both these roles. A good balance and low stress levels are essential in promoting a healthy and secure work environment (Irfan *et al.*, 2023:3). There is a strong correlation between work-life balance and levels of job satisfaction, productivity, and overall happiness, whereas extended work stress can result in burnout (Bowen, Govender*, et al.*, 2014; Irfan *et al.*, 2023:6; Schaufeli & Bakker, 2004).

Occupational stress is a significant factor influencing work quality and employee well-being (Rothmann *et al.*, 2006:77). Occupational stress involves a combination of emotional, cognitive, and physical pressures arising from job demands that employees experience due to their work responsibilities (Bowen, Edwards*, et al.*, 2014b). Organisational support means that resources and assistance employers help employees to manage their work and personal responsibilities (Fitria & Linda, 2019:205). Organisational support can help improve employee work-life balance, promote employee engagement, and mitigate stress. When employees feel supported by the organisation and society, they are expected to show more energy and focus on the task at hand, their work, or their private life (Padula *et al.*, 2012).

By examining the mediating roles of organisational support and job demand, this research attempts to provide a comprehensive insight into the relationship between work-life balance and occupational stress, and provides a well-rounded understanding of the relationship between work-life balance and occupational stress among engineers in

South Africa. The aim is to assist employers to better understand how these variables affect engineers' well-being.

A quantitative, survey-based methodology research was conducted with participants recruited from various engineering disciplines in South Africa. The survey included questions about work-life balance, occupational stress, perceived organisational support, and job demand. Data analysis involved frequency, descriptive statistics, correlation and structural equation modelling to analyse and examine the relationships between variables and test the mediating roles of job demand and organisational support. The results of this research provided valuable insights into the influence of work-life balance and occupational stress, as well as the roles of job demand and organisational support in these processes.

The findings of this research have implications for developing effective interventions and enhancing wellness, workplace performance, and work outcomes of engineers in South Africa. They contributed to the development of effective strategies and highlighted the need for work-life balance policies and employee support.

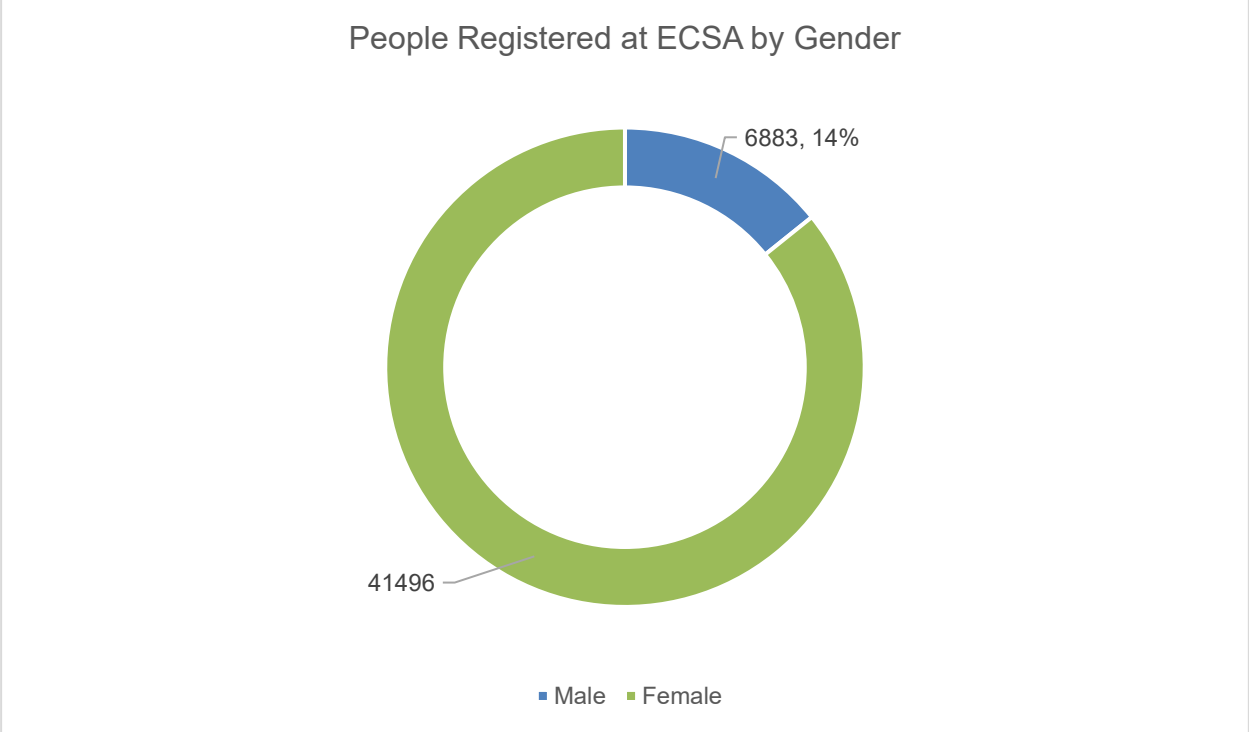
1.2 Engineers in the South African context

Participants were recruited with the support of the Engineering Council of South Africa (ECSA) and its affiliated voluntary associations. ECSA is the statutory body responsible for regulating engineering professionals in South Africa, as mandated by the Engineering Profession Act (Act No. 46 of 2000). Its role includes the registration, professional development, and ethical conduct of engineers. This made ECSA and its networks a key source for identifying and reaching the study population.

ECSA's primary role is to regulate the engineering profession in terms of this Act. ECSA's fundamental functions include the accreditation and registration of individuals as professionals in various engineering categories and engineering programmes, as well as regulating the practice of registered professionals. ECSA has fifty-one recognised voluntary associations regarding the Rules and Requirements for Recognition as a Voluntary Association (Board Notice 60 of 2017) (ECSA, 2024a, 2025).

The ECSA 2022/2023 annual report shows the registered engineers and the gender disproportion in the South African engineering profession (Ngema, 2024). The report

reveals that ECSA has 18,939 professional engineers and 912 professional certificated engineers actively registered, of whom 1,643 (8.3%) are female and 18,208 (91.7%) are male. The ECSA 2023/2024 report shows that ECSA has 18,019 professional engineers and 984 professional certificated engineers actively registered (ECSA, 2024b:24). The 2023/2024 report is not as detailed as the 2022/2023 report (ECSA, 2023:44; 2024b:23). These quantities exclude professional technologies, technicians, candidate engineers, technologists, and technicians. (ECSA, 2023:44). In the United States of America, the number of females in engineering remains low at only 13% (Welker, 2024).



Graph 1-1: People registered at ECSA in all categories by gender

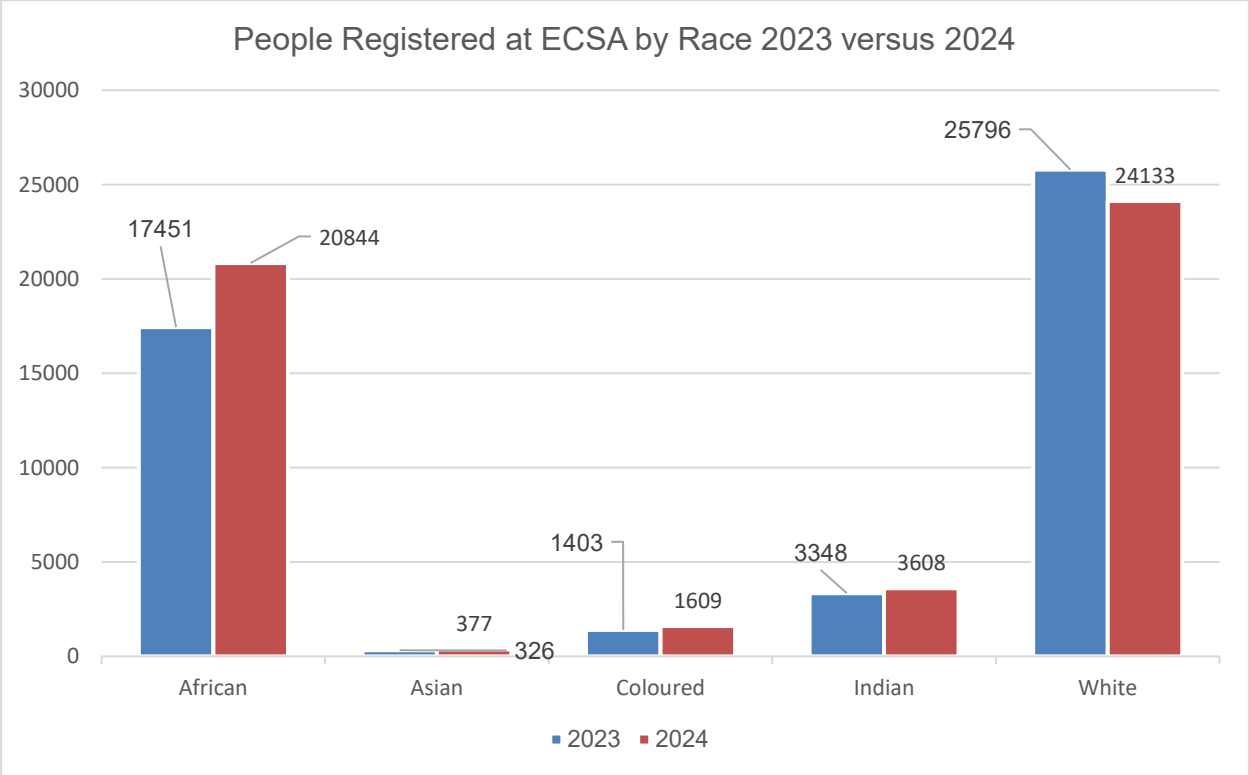
(ECSA, 2023:49)

The table below shows the registration of the 2022/2023 engineers in the professional and professional certificated engineer categories. The 2023/2024 report contains fewer details than the 2022/2023 report.

Table 1-1: Registered engineers at ECSA

Professional Engineers		Professional Engineers	Professional Certification Engineers
African	Male	2,027	92
	Female	405	3
White	Male	14,075	763
	Female	960	9
Indian/Asian	Male	933	29
	Female	231	1
Coloured	Male	274	15
	Female	34	0
Total Registered		17,309	899

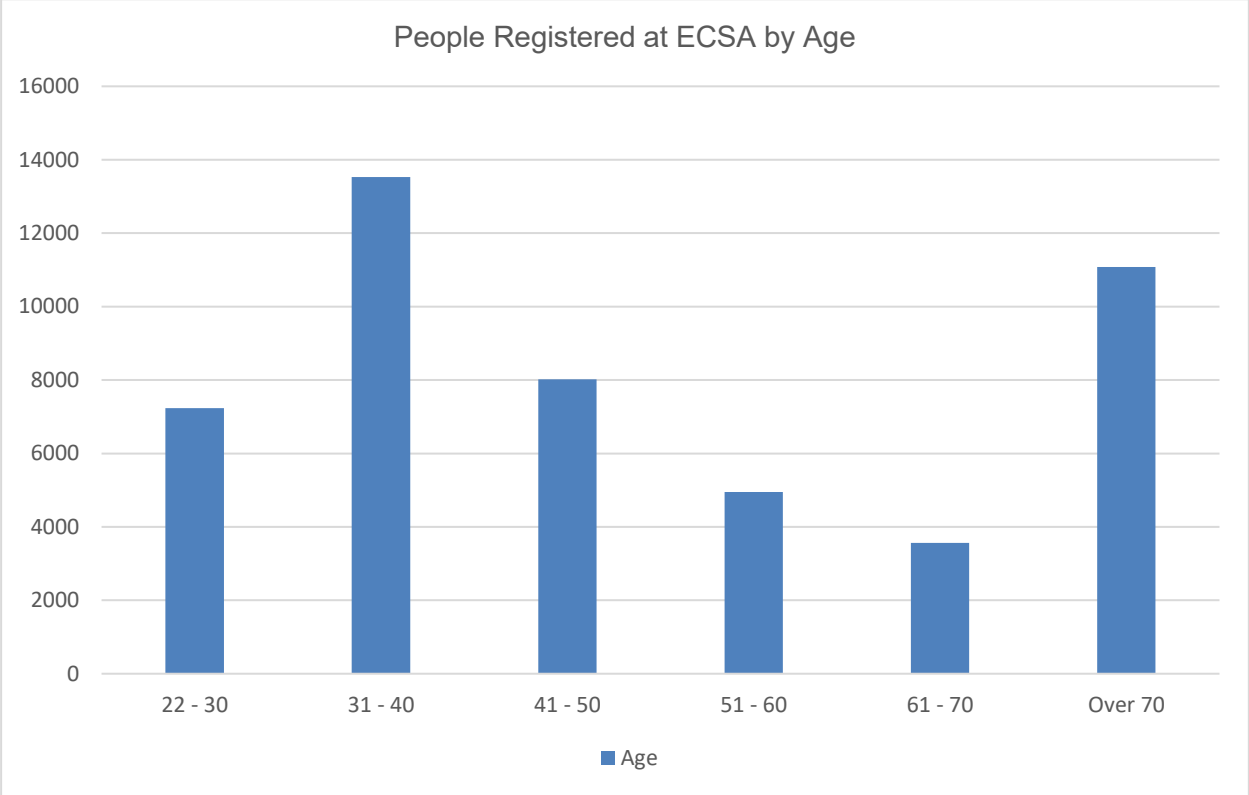
(ECSA, 2023:44)



Graph 1-2: People registered at ECSA in all categories

(ECSA, 2023:49; 2024b:25)

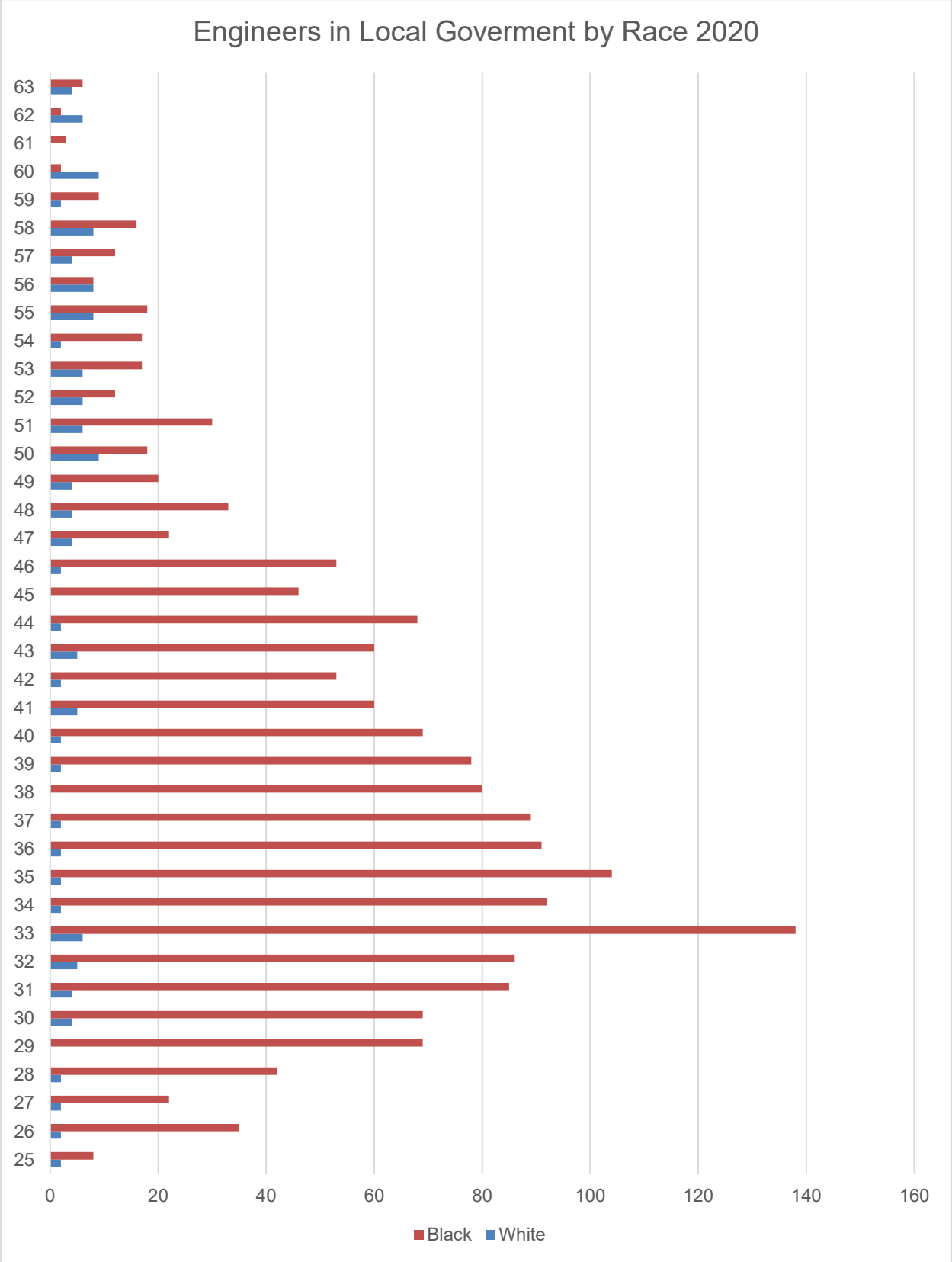
The number of registered individuals in the engineering field between the ages of 22 and 30 is alarmingly low compared to those already in the system. This statistic indicates that the workload will increase for those already in the system, as shown in the figure below.



Graph 1-3: People registered at ECSA in all categories by age

(ECSA, 2023:49)

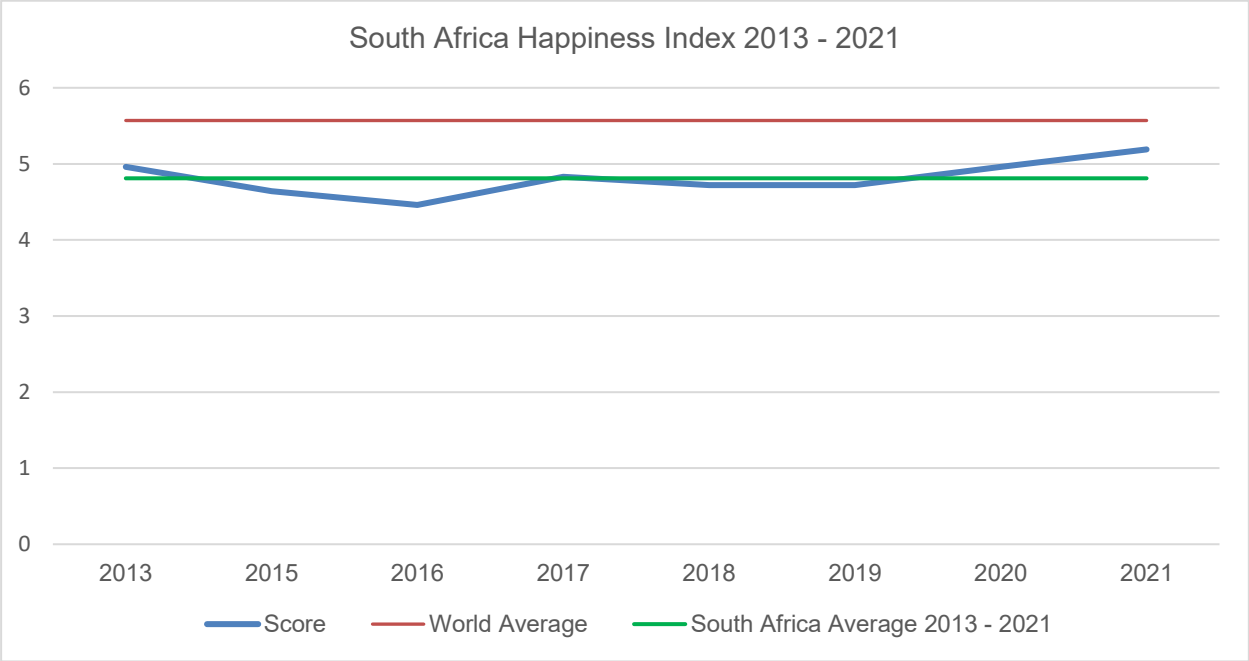
The graph above is supported by the graph below, which indicates the number of engineering practitioners in local government in South Africa. This graph shows that the number of engineers entering the engineering field is insufficient to sustain economic growth and infrastructure development in South Africa.



Graph 1-4: Engineering practitioners in local government by race

(SAICE, 2022:16)

In the World Happiness Report done by Global Economy, where the index is “0” for unhappy and “10” for happy, the ranking of the young engineers (age below 30) is 5.65, and for people aged 60 and above, it is 5.083, with an average for the years 2021 to 2023 of 5.37 in South Africa (Helliwell *et al.*, 2024:24). The graphs above and below do not have any direct connection but indicate fewer engineers in the age range where people are the happiest. Of the 141 countries that comprise the index, South Africa is below the world average (Helliwell *et al.*, 2024:27).

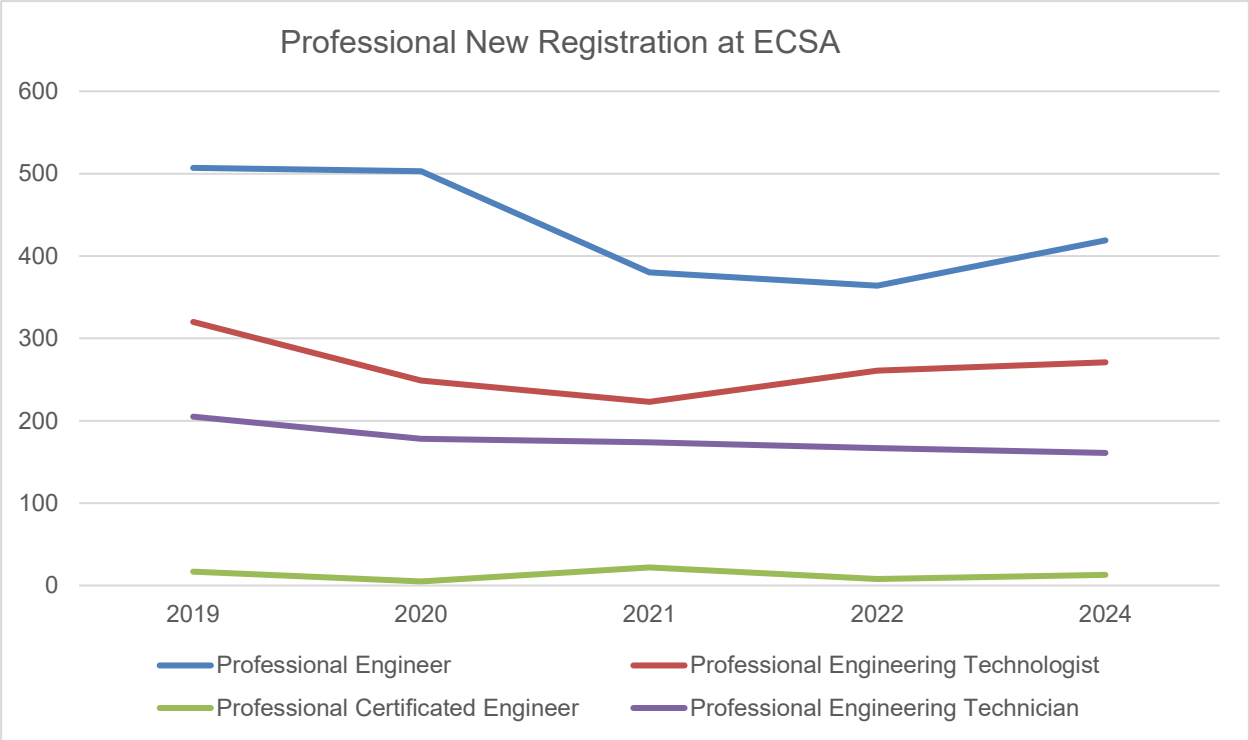


Graph 1-5: South Africa Happiness Index

(Helliwell *et al.*, 2024)

The registration of people at ECSA has declined significantly, as the graph below indicates. The Professional Categories have been steady. Research by ECSA suggests that this decline in the renewal rate of registered persons is due to factors such as financial constraints, unemployment, perceptions of high annual fees, non-compliance with Continuous Professional Development (CPD), health issues, people no longer practising engineering, lack of perceived incentives, emigration, and dissatisfaction with the complex and document-heavy registration process. This decline is evident in the statistics, comparing snapshots of the ECSA database, showing a negative growth of 3,643 persons in just three months from December 2022 to March 2023. However, new registrations increased by 31 March 2024 (ECSA, 2024b:28)

The Identification of Engineering Work (IDoEW) Regulations were gazetted in March 2021 for enforcement in April 2025, requiring all engineering practitioners in all sectors to be professionally registered to perform engineering work. ECSA predicts that registration will show an upward trend from 2024 to 2025 (ECSA, 2023:49).



Graph 1-6: Professional new registrations at ECSA

(ECSA, 2023:50; 2024b:27)

As is evident from the data, there is a shortage of engineers with the specialised skills needed to meet the economy's demands. Engineers leaving the country in high numbers are putting more stress on the current engineering workforce in South Africa (Engineering News, 2019; Staff Writer, 2019). South African engineers must also contend with global competition and the necessity to remain relevant in a rapidly evolving technological landscape. The engineering sector in South Africa is ready for growth, particularly with the government's focus on infrastructure development and renewable energy projects (SAICE, 2022). The country's digital transformation and sustainable development goals are expected to drive demand for engineers in most engineering disciplines.

1.3 Background and problem statement

Work-life balance, occupational stress, and their impact on employee health have become significant concerns among employers in South Africa. Engineers are particularly affected due to their substantial workloads and long working hours. The shortage of qualified engineers in the country places more pressure on those already in the workforce, often leaving their well-being overlooked. The shortfall in engineers' well-being contributes to rising levels of work-related stress and burnout (Barkhuizen *et al.*, 2014; Infinite Potential, 2023).

Understanding how perceived organisational support and job demand influence this relationship between work and life is essential. Organisational support and job demands can either reduce or worsen stress. However, research in South Africa that examines these links within the engineering context is lacking. This study aims to fill that gap by analysing how work-life balance affects occupational stress and how organisational support and job demand mediate this relationship. The findings will help organisations and policymakers understand what practical steps they can take. By enhancing support structures and managing workload expectations, it becomes possible to reduce stress and improve job satisfaction for engineers.

South Africa currently faces a significant skills gap in engineering. The engineer-to-population ratio is 1:3,100. This is significantly lower than in countries such as Germany (1:200), the United Kingdom, the United States, and Japan (each approximately 1:310) (UNI24, 2023). The limited supply of engineers intensifies work demands. Despite this, many organisations fail to provide sufficient support to balance employees' personal and professional responsibilities (Engineering News, 2019; Rothmann *et al.*, 2006:78; Staff Writer, 2019). This lack of support contributes directly to occupational stress and job dissatisfaction.

The shortage of engineers in South Africa, combined with their elevated levels of responsibility, leads to a neglected work-life balance and occupational stress, which could be mitigated by better organisational support. The balance between work and life, as well as occupational stress, is a critical factor that impacts the overall well-being and job satisfaction of South African engineers. Engineers in South Africa face unique challenges in maintaining a healthy work-life balance due to high job demands, such as high

workload, long working hours, and high levels of responsibility (Rothmann *et al.*, 2006:78). Additionally, engineers can experience occupational stress due to factors such as tight deadlines, limited resources, and high performance expectations.

Balancing professional and personal responsibilities is an important priority and an integral aspect of contemporary society. Companies, state-owned enterprises (SOEs), and other public entities implement policies to promote a balanced lifestyle and reduce occupational-related stress (Downes & Koekemoer, 2011). By gaining a deeper understanding of work-life balance and addressing workplace stress, management can enhance organisational efficiency and boost productivity (Russo & Morandin, 2019).

An imbalance between work and life can negatively affect occupational stress levels. It can lead to feeling overwhelmed as individuals struggle to effectively manage their work and personal commitments, increasing their stress levels (Aruldoss *et al.*, 2021; Bowen, Edwards*, et al.*, 2014b:1; Hege *et al.*, 2019). Employees may feel guilty and frustrated as they cannot devote enough time to either domain. When the work-life balance is poor, the employee may be more likely to experience exhaustion-related burnout (Aruldoss *et al.*, 2021; Schwartz *et al.*, 2019). Burnout occurs when an employee exhausts all their energy at work and is unable to take time off to relax and rejuvenate. Burnout can lead to decreased productivity and motivation at work, further exacerbating stress levels (Infinite Potential, 2023:4). Limited time to relax and rejuvenate can lead to decreased motivation and productivity at work, ultimately increasing stress levels. Lack of satisfaction can further contribute to stress as individuals feel they are not making the most of their time or achieving their goals (Fisher *et al.*, 2009; Gragnano *et al.*, 2017:376).

Organisational support can positively influence engineers' work-life balance and lower occupational stress. Organisations that provide supportive policies, practices, and resources to help employees balance their work and personal life can positively impact their well-being and reduce occupational stress. The level of organisational support available to engineers in South Africa and its effect on a balanced lifestyle and occupational stress remains unclear (Manivannan *et al.*, 2022; Osca *et al.*, 2005). High demands, ongoing technological advancements, and demographic shifts characterise the engineering profession in South Africa. However, there is little empirical evidence that explores engineers' perception of work-life balance, job demands, and organisational support in this evolving context.

Although the benefits of work-life balance are well-established, including improved job satisfaction, lower burnout, and better mental health, research has not focused sufficiently on the specific occupational pressure that engineers face in South Africa. This lack of research on work-related pressure and expectations of engineers in South Africa leaves a gap in understanding how these workplace dynamics influence occupational stress.

This study addresses that gap. The study explores the impact of work-life balance on job-related stress within the engineering industry. It also investigates how organisational support and job demand mediate this relationship. The fundamental problem is the lack of clear insight into these relations in the South African context. Without understanding these relationships, it is challenging to design effective workplace strategies for engineers and make the engineering sector in South Africa more attractive to newcomers.

This research makes a practical and academic contribution not only to the engineering industry in South Africa but also to the broader realm of workplace dynamics. This work contributes to the current body of research on work-life balance and job-related stress by examining the mediating roles of organisational support and job demand. The findings will help organisations and policymakers understand how to support engineers more effectively. Better support structures can reduce stress and create healthier, more productive workplaces.

1.4 Rationale and significance of the research

Work-life balance remains a significant focus in business-related academic literature, with considerable emphasis placed on the work environment and the quality of work. Perceived organisational support, first introduced by Eisenberger in the 1980s, remains a core concept in organisational behaviour research (Eisenberger *et al.*, 1990; Worley *et al.*, 2009). It reflects the extent to which employees believe their organisation values their contributions and cares about their well-being.

Work-life balance is closely linked to reduced occupational stress and improved work quality (Pretorius, 2022). Employees who maintain a healthy balance are generally more productive and motivated. They also tend to be more engaged in their work, which leads to better performance outcomes (Maan *et al.*, 2020; Sindhura, 2022; Worley *et al.*, 2009). Regular time away from work allows individuals to recover, resulting in healthier and more satisfied employees (Fernandez-Crehuet *et al.*, 2016). When employees are engaged

and content, they contribute more meaningfully to the organisation's success (Sindhura, 2022).

Work engagement initiatives play a role in promoting this balance. These programmes help reduce stress and improve job satisfaction. Organisational support acts as a key mediator in this process. It provides resources and flexibility that enable employees to manage the demands of their roles meaningfully (Kaiser *et al.*, 2011).

Support mechanisms include flexible work arrangements, mental health services, breaks during the workday, and access to personal development opportunities. Support also involves creating a culture of trust and prioritising employees' emotional well-being (Sindhura, 2022; Worley *et al.*, 2009). These actions help employees maintain balance and improve their performance while reducing stress.

When the work atmosphere is unhealthy, it can harm both the corporate culture and employee engagement, leading to lower self-confidence, a less considerate work approach, diminished morale, and a lack of personal and organisational growth. When employees' work-life balance is poor, they may be more likely to make mistakes, leading to low-quality work (Mooney, 2018; Pretorius, 2022). An employee's work-life balance has a direct impact on the quality of their work. When employees have a poor work-life balance, their work quality can suffer due to fatigue, stress, and burnout. Employees may struggle to focus on tasks, struggle with problem-solving, and become less productive. Poor work-life balance can also lead to increased absenteeism and decreased job satisfaction, further impacting the quality of work (Woods & West, 2015:311).

When work engagement is high, it has a positive influence on work-life balance. People who are highly engaged in their work tend to have a better work-life balance because when they are enthusiastic about their job, they are more likely to find time for activities that help them balance their lifestyle. A balanced lifestyle leads to improved productivity, creativity, and overall well-being. Conversely, when work engagement is low, it can harm work-life balance (Chan *et al.*, 2017:47). Individuals who are not engaged in their work are more likely to become overwhelmed and stressed, which can ultimately lead to burnout. Burnout can lead to an imbalance between work and personal life, making it difficult to achieve a healthy work-life balance.

Perceived organisational support improves the individual's trust and beliefs that the organisation recognises their value and rewards them accordingly. As a result, the individual will respond to the organisation's support in several ways and experience more job satisfaction (Maan *et al.*, 2020:3). Studies have revealed that employees with elevated levels of perceived organisational support are more interested in their company and have more favourable evaluations of their work (e.g., higher job satisfaction, brighter moods, and lower stress). Organisational support is a crucial factor in promoting work-life balance. If organisational commitment is high, it leads to higher performance and lower employee turnover. Employees who receive consistent support and recognition from their organisations tend to be more satisfied with their jobs and more committed to their work. When support structures are available, employees gain better control over their work-life balance. This contributes to improved mental health, greater productivity, and overall well-being (Sindhura, 2022).

Organisational support has a direct effect on work quality. Employees who are supported are more motivated and perform better. Support includes training, open communication, and clear systems for recognising individual contributions (Maan *et al.*, 2020). It also includes practices that promote teamwork, collaboration, and innovative thinking.

By investing in support systems, organisations help employees manage stress more effectively. A supportive environment includes access to resources, reliable guidance, and practical feedback (Irfan *et al.*, 2023). Listening to employees and responding with workable solutions strengthens trust. When employees feel valued, they become more engaged, experience higher job satisfaction, and report lower stress (Sindhura, 2022).

The study examined the relationship between work-life balance and occupational stress within the engineering profession in South Africa. It explored how organisational support and job demand influence this relationship. The findings provide insight into how engineers can better manage work-related stress and how organisations can support this process (Thilagavathy & Geetha, 2021).

The research contributes to engineering practice by identifying key factors that support employee well-being. It highlights the importance of equipping engineers with the necessary resources and systems to manage job demands effectively. These insights help organisations build healthier, more productive workforces (Rothmann *et al.*, 2006).

The findings also have relevance for policy. Policymakers can utilise this evidence to develop effective policies that enhance work-life balance and mitigate occupational stress. This can strengthen workplace well-being, improve employee retention, and make the engineering field more appealing to skilled professionals.

Last, the study supports responsible management and aligns with Sustainable Development Goal 8 (Decent Work and Economic Growth). Promoting work-life balance and reducing stress contribute to more equitable working conditions and improved long-term productivity outcomes. At the same time, the focus on organisational support links to SDG 3 (Good Health and Well-being) by reducing the health impacts of workplace stress.

This research added to the existing literature on organisational support and occupational health, particularly in engineering contexts. It provides a foundation for future academic studies and enables practitioners to develop interventions that enhance employee well-being and performance in technically demanding roles.

1.5 Research objectives, questions and hypotheses

This research develops an empirical framework for assessing the relationship between work-life balance and occupational stress among engineers in South Africa. To attain this aim, the following primary research objectives, questions, and hypotheses were formulated.

Table 1-2: Research objectives, questions and hypotheses

No	Research Questions	Research Objectives	Null Hypothesis (H_0)	Alternative Hypothesis (H_a)
1	What are the work-life balance levels among engineers in South Africa?	To assess the levels of work-life balance among engineers in South Africa.	H_{01}: There is no statistically significant deviation from a neutral or mid-point level of work-life balance among engineers in South Africa.	H_{a1}: There is a statistically significant deviation from a neutral or mid-point level of work-life balance among engineers in South Africa.
2	What are occupational stress levels among engineers in South Africa?	To evaluate the occupational stress levels experienced by engineers in South Africa.	H_{02} There is no statistically significant deviation from a neutral or mid-point level of occupational	H_{a2}: There is a statistically significant deviation from a neutral or mid-point level of occupational

No	Research Questions	Research Objectives	Null Hypothesis (H_0)	Alternative Hypothesis (H_a)
			stress among engineers in South Africa	stress among engineers in South Africa.
3	What are the organisational support levels of engineers in South Africa?	To investigate the organisational support levels of engineers in South Africa.	H_{03}: There is no statistically significant deviation from a neutral or mid-point level of organisational support among engineers in South Africa	H_{a3}: There is a statistically significant deviation from a neutral or mid-point level of organisational support among engineers in South Africa.
4	What are the job demand levels of engineers in South Africa?	To determine the job demand levels faced by engineers in South Africa.	H_{04}: There is no statistically significant deviation from a neutral or mid-point level of job demand among engineers in South Africa	H_{a4}: There is a statistically significant deviation from a neutral or mid-point level of job demand among engineers in South Africa.
5	To what extent does work-life balance influence occupational stress among engineers in South Africa?	To examine the impact of work-life balance on occupational stress among engineers in South Africa.	H_{05}: Work-life balance does not significantly influence occupational stress among South African engineers.	H_{a5}: Work-life balance significantly influences occupational stress among engineers in South Africa.
6	To what extent does organisational support mediate the relationship between work-life balance and occupational stress within the South African engineering sector?	To explore the mediating role of organisational support in the relationship between work-life balance and occupational stress among engineers in South Africa.	H_{06}: Organisational support does not significantly mediate the relationship between work-life balance and occupational stress among engineers in South Africa.	H_{06}: Organisational support significantly mediates the relationship between work-life balance and occupational stress among engineers in South Africa.
7	To what extent does job demand mediate the relationship between work-life balance and occupational stress within the South African engineering sector?	To analyse the mediating role of job demands in the relationship between work-life balance and occupational stress among engineers in South Africa.	H_{07}: Job demands do not significantly mediate the relationship between work-life balance and occupational stress among engineers in South Africa.	H_{a7}: Job demands significantly mediate the relationship between work-life balance and occupational stress among engineers in South Africa.

1.6 Preliminary literature review

The independent variable in this research is work-life balance, with occupational stress as the dependent variable. Organisational support and job demand are the mediating variables. The conceptual framework for this research is illustrated in the figure below.

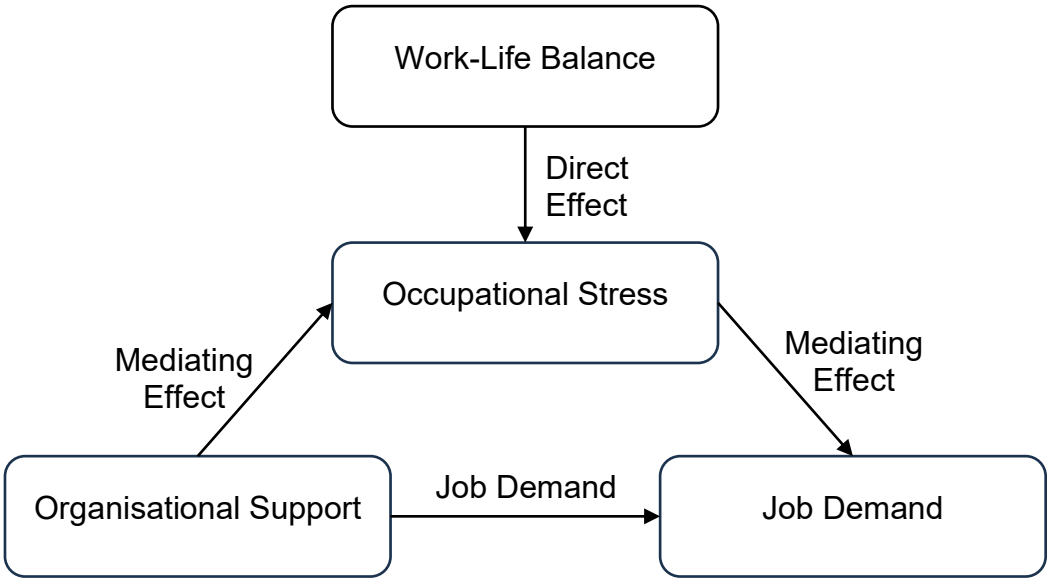


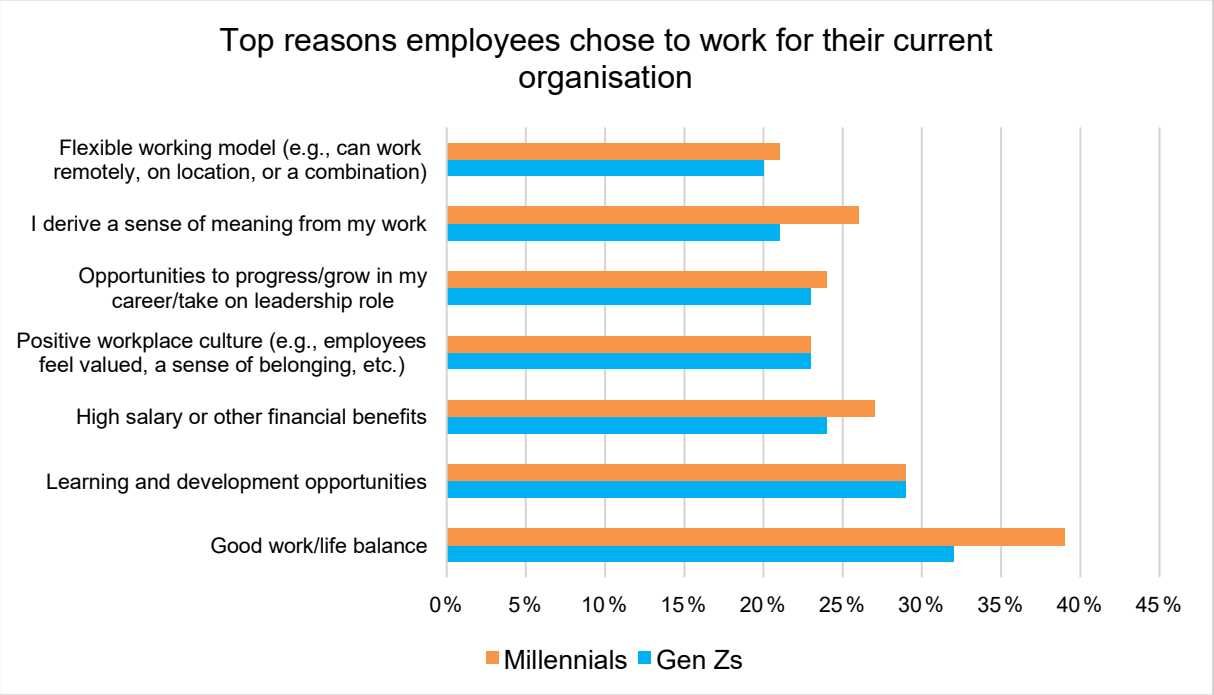
Figure 1-1: Conceptual framework of the research

The control variables are the demographic variables: age, gender, years of experience, highest qualification, and engineering discipline. This research investigates engineers in South Africa and how occupational stress positively or negatively influences work-life balance, with the mediating role of perceived organisational support (POS) and job demand (Fitria & Linda, 2019:503). Previous research indicates that POS has a positive and noteworthy effect on employees' work-life balance. A lack of balance and support can lead to companies struggling to retain qualified and reliable employees because of the desire for a better quality of life (Padula *et al.*, 2012). South Africa is losing a significant number of engineers, primarily due to immigration. Most are between the ages of 30 and 60, leaving to seek better prospects and a more balanced lifestyle (Engineering News, 2019; Staff Writer, 2019).

There is limited research on engineers' work-life balance, even less in Africa. Studies on the subject in South Africa indicate that job demand and work-life imbalance are among the most significant stressors for engineers in South Africa (Bowen, Edwards*, et al.*,

2014b; Malan & Rothmann, 2003:4; Rothmann *et al.*, 2006). According to an article in The Mail & Guardian (2017), the global norm is one engineer for every 40 people. In contrast, South Africa has 2,600 people for one engineer. Another article in UNI24 (2023) gives a ratio of 3,100 people to one engineer. In contrast, Germany has a ratio of 1:200. In Japan, the United Kingdom, and the United States, the ratio is around 1:300. These staggering statistics indicate that South Africa has a problem in the engineering field (ECSA, 2023, 2024b).

In a report by Deloitte in 2022, Striving for Balance, a survey of Gen Z (born between 1995 and 2010) and Millennials (born between 1980 and 1994) discussed why the generation chose to stay with their employer (Deloitte, 2022). Compensation, being part of and connecting with the workplace, was detrimental to their mental health, and burnout is the main reason millennials and Gen Zs have moved to another employer in the last two years. However, when it comes to what makes them stay or move to another organisation, good work-life balance, gaining knowledge, and development opportunities are their top priorities. The graph from Deloitte shows that work-life balance is the top reason for staying with an existing employer, especially for millennials (Deloitte, 2022:14).



Graph 1-7: Reasons employees stay with their current organisation (Deloitte, 2022)

Globalisation and changes in the workplace led to a considerable focus on work-life balance. Constant deadlines, intense pressure, demographic changes, over-politicisation, and the use and change of technology are actual work characteristics of current job scenarios in South Africa, and employees need to rethink how they work and manage their lives (Engineering News, 2019; Posokhov, 2021). In addition, increased workload, time spent commuting to work, and the length of working hours have resulted in employees spending more time at work or being busy with work functions than at home (Fitria & Linda, 2019:504). Professional and personal life (life away from work) should complement each other and positively influence each other (Irfan *et al.*, 2023).

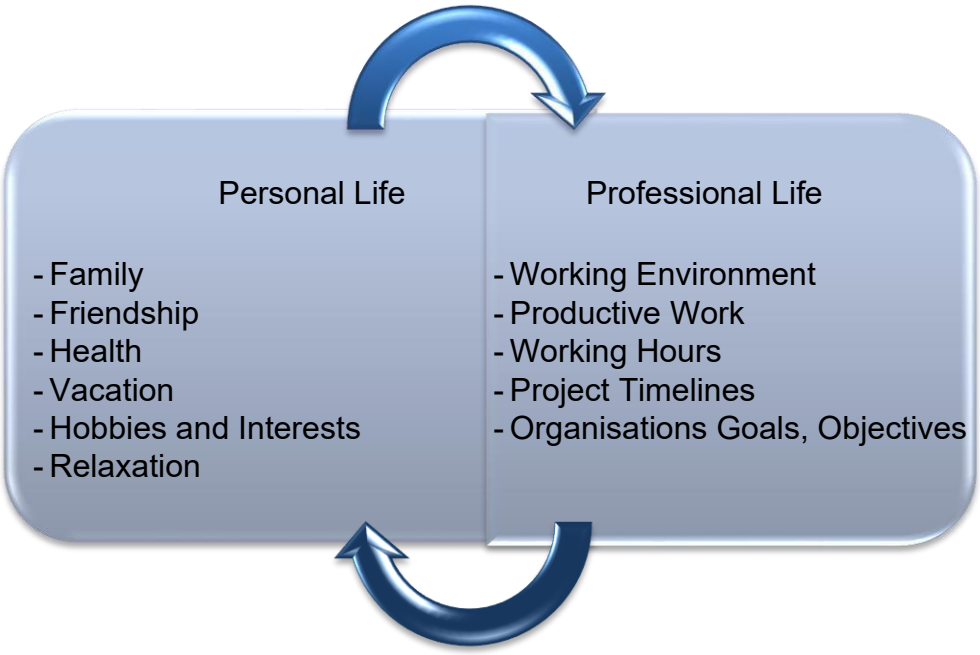


Figure 1-2: Personal versus professional life

(Irfan *et al.*, 2023:4)

When the demands and pressure of the workplace do not match the employees' abilities and knowledge, and challenge their ability to cope with their needs, people's response is work-related stress. Occupational stress can occur in various work environments. However, it is often exacerbated when employees feel they have no control over the work process and receive little support from their employer and colleagues. Work-related stress can also be caused by inadequate work organisation, management, and unsatisfactory working conditions (World Health Organisation, 2020).

Chronic stress, including work and life, can eventually lead to burnout (Adil & Baig, 2018; Jacobs & Broschk, 2023). Burnout is a condition officially recognised by the World Health Organisation (WHO) (World Health Organisation, 2019). According to Dr Christina Maslach, a leading burnout specialist, the following factors contribute immensely to burnout (Jacobs & Broschk, 2023): job demand, the employees' values not aligning with those of the organisation, insufficient rewards for performance, lack of job control because of micromanagement, disrespect, and feeling that employees' input is not valued and not being treated impartially. Previous research has found that a balanced lifestyle can benefit employees and organisations, as it can reduce absenteeism, improve productivity, promote better job independence, enhance employee retention, improve employee attitudes, increase job satisfaction and positive behaviours, and attract talent (Manivannan *et al.*, 2022).

Occupational stress has a direct impact on the work-life balance of professionals. Research reveals that occupational stress may be related to organisational culture, physical conditions, work conditions, social conflict, and personal characteristics (Manivannan *et al*., 2022:28). According to the WHO, occupational stress risks can be divided into work content and context. The work context encompasses work-life balance that consists of opposing pressures from work and home, limited assistance for cross-domain challenges, and inadequate workplace guidelines, and this contributes to poor work-life integration (World Health Organisation, 2020).

Previous studies found that hours spent at work and job and family demands are negatively related to work-life balance. In contrast, job self-sufficiency and organisational and supervisory support correlate positively (Haar *et al.*, 2019:261). Furthermore, self-sufficient and engaged individuals are enthusiastic about their work, have higher energy levels, and are more absorbed in their job activities (Bakker & Albrecht, 2018:4). Research also indicates that job autonomy (also known as job independence or self-sufficiency) and supervisor support are strongly and positively related to work-life balance. It also suggests that support and job direction are valuable contextual resources that can assist employees in creating a balance between their work and non-work roles (Haar *et al.*, 2019:276).

The social exchange theory is based on the concept that an exchange process between two parties influences social behaviour. Employees or employers weigh the potential risks

and benefits of the relationship (Cherry, 2023). Suppose the rewards outweigh the risk, employees will stay with the employer and work toward a common goal that benefits both employer and employee. This relationship is driven by organisational support that generates positive work attitudes (Osca *et al.*, 2005). Research shows that organisational support leads to higher job satisfaction, better performance, and better psychological well-being, and it is positively related to job satisfaction (Osca *et al.*, 2005:293). Urien *et al*. (2005:294) state that a characteristic of so-called high-performance teams is that members support and motivate each other both personally and professionally, and that another form of support is the reward and appreciation presented to employees.

1.7 Definition of key concepts

Work-life balance

The Cambridge Dictionary defines work-life balance as the ratio of time spent on one's job to the time spent with family and friends and doing things one enjoys (Cambridge Dictionary, 2023). Kalliath and Brought (2008:326) describe work-life balance as follows: "Work-life balance is the individual perception that work and non-work activities are compatible and promote growth by an individual's current life priorities." Bulger and Fisher (2012:182) define work-life balance as the "ability to accomplish the goals or meet the demands of one's work and personal life and achieve satisfaction in all life domains". Finally, Shah (2017:86) defines work-life balance as an understanding between all priorities and aspects of life.

Occupational stress

Everyday stress can be defined as a state of mental tension or worry caused by a problematic situation. Stress is a natural human response that prompts us to address daily challenges and threats. Of course, everyone experiences stress to some degree. However, how we respond to stress dramatically affects our overall well-being (World Health Organisation, 2023).

Occupational stress is a universal term used to describe stress related to work or a job. The *Business Dictionary* (2020) describes it as a "physical or psychological disorder associated with an occupational environment and manifested in symptoms such as extreme anxiety, tension, cramps, headaches, or digestion problems." Hence, occupational stress is mental stress associated with one's job

Perceived organisational support

Perceived Organisational Support (POS) is an employee's understanding of the support, assistance, and benefits offered by their organisation (Sindhura, 2022:210). The support can differ from organisation to organisation and consist of different benefits. For example, support can be offered in the form of freedom of creativity in the employee's work or enough vacation days for health or leisure. POS relies on how the business treats the employee and how the employee perceives the support (Indeed Editorial Team, 2022b). POS relates to an employee's perception of how the employer values their contribution and cares about their well-being and socio-emotional needs (Fitria & Linda, 2019:503; Sindhura, 2022:210). Organisational support refers to the relationships the employee has with their direct supervisor or leadership, access to information, internal communication, employee involvement, peer support, and opportunities for interpersonal interaction within the organisation (Rothmann *et al*., 2006:88).

Job demand

The Job Demands-Resources Model (JD-R Model) is an occupational stress model that posits strain is a response to a discrepancy between the demands the employee encounters and the resources available to address those demands. The JD-R Model states that stress and burnout are prevalent when job demands are high and job resources are low. In contrast, satisfactory job positives can counterbalance the effects of excessive job demands, thereby enhancing motivation and engagement (Tummers & Bakker, 2021).

Job demand refers to the physical, psychological, social, or organisational aspects that require sustained physical and psychological (cognitive and emotional) effort or skills and are therefore associated with specific physiological and psychological costs. Examples of job demands include work overload, time pressures, a heavy workload, a stressful work environment, role ambiguity, emotional labour, and poor relationships (Schaufeli & Bakker, 2004).

1.8 Research philosophy

The research considered four primary epistemological positions: positivism, post-positivism, realism, and interpretivism. Epistemology is the theory about the validity, scope, and methods of knowledge. It concerns what constitutes adequate knowledge in

a discipline (Bryman *et al.*, 2019:377). Post-positivism was employed in this research since it strikes a balance between positivist and interpretive approaches. Together with the quantitative approach, it recognises that while objective reality exists, the understanding of the research is inherently limited and influenced by human perception, context, and bias. It emphasises the use of scientific methods while acknowledging that all observation is frail and theory-laden (Panhwar *et al.*, 2017:253).

1.9 Research methodology

This research used a quantitative approach. The quantitative approach focuses on objective measurement, statistical analysis, and establishing causal relationships. Quantitative research aims to analyse, gather, and define collected numerical data and emphasise the quantification of the data (Bryman *et al.*, 2019:382).

1.10 Research design

A cross-sectional correlational survey approach was used to provide answers to the questions, attain the research objectives, and test the hypotheses. A cross-sectional research design involves collecting data from more than one case of different demographic characteristics simultaneously (Bryman *et al.*, 2019:106).

1.11 Demarcation and delimitation of research

The research focused on engineers in South Africa, which limits the generalisability of the findings to engineers in other countries. The occupational scope concentrated on engineers from various engineering disciplines (e.g., mechanical, electrical, civil) and did not include professionals from other fields. Excluding professionals from other occupations helps maintain a clear focus on the specific group under investigation. Little scientific information exists concerning the work-life balance, occupational stress, organisational support and job demands of engineers in South Africa. The available research for engineers in South Africa examines occupational stress, job demands, and work-life balance separately. However, it does explore how organisational support and occupational stress impact engineers' life balance.

The research examined how work-life balance and occupational stress interact with each other, as well as the mediating role of organisational support and job demand on these factors. Although related factors such as job satisfaction, burnout, and career

development may influence the outcomes, they should be considered in the context of their impact on work-life balance and occupational stress.

The research's delimitation was the time frame, which was restricted to a survey conducted over a specific period, typically three to six months. This temporal limitation helps to ensure that the research remains focused and feasible. Other delimitations included the research design, self-report measurement, and the language used. The research will adopt a cross-sectional design, which captures data at a specific point in time. This choice may limit the ability to draw causal conclusions or examine longitudinal effects.

The research relied on self-reported data collected through an online questionnaire. While these measures were commonly used and efficient, they were susceptible to potential biases. They may not have fully captured the complexity of work-life balance, occupational stress, and organisational support. The questionnaires were provided only in English. This created a barrier for participants whose first language was not English. Language limitations may have influenced how participants understood and responded to items on work-life balance, occupational stress, and organisational support. Cultural context also likely shaped their perceptions and experiences.

This was necessary to define the study's boundaries clearly. Stating the demarcations and delimitations ensured transparency and helped readers understand the scope and limitations of the research. One of the study's main gaps was its limited focus on how engineers manage high job demands and the stress that comes with them while trying to maintain a work-life balance. The issue of how engineers manage high job demand remains underexplored and requires further research. A deeper understanding of the coping strategies engineers use in high-pressure environments can help improve organisational support and employee well-being.

1.12 Population and sample strategy

The target population for this study was all engineers registered with the Engineering Council of South Africa (ECSA), totalling 18,019 professional engineers and 984 professional certificated engineers at the time of data collection (ECSA, 2024b). These professionals are organised into fifty-one voluntary associations recognised under Board Notice 60 of 2017 (ECSA, 2024a). The original design aimed to distribute the

questionnaire across all associations to achieve proportionate coverage of the population, but recruitment was restricted by gatekeeping practices, confidentiality concerns, and the refusal of most associations to disclose membership numbers or circulate the survey. Only eight associations agreed to participate, which made a probability-based design unfeasible. The study therefore employed a non-probability, cluster-based sampling strategy, with the eight cooperating associations serving as clusters and respondents within them self-selecting to complete the questionnaire. While this approach limits statistical generalisation to the whole ECSA population, it ensures ethical compliance, protects respondent privacy, and allows for analytic generalisation by testing theoretically grounded relationships between work-life balance, occupational stress, organisational support, and job demand. The sample remains valuable as it covers a range of engineering disciplines, enables robust quantitative analysis, and highlights methodological challenges of research with professional associations in South Africa.

1.13 Data collection instrument

The questionnaire consists of five sections: the first section collects demographic information, the second section examines work-life balance, the third section assesses occupational stress, the fourth section evaluates perceived organisational support (POS), and the fifth section measures job demand.

The demographic section collects information on participants' age range, gender, work experience, supervisory roles, educational qualifications, and specific fields within engineering. The demographic characteristics of the participants will only be used for background information. Therefore, statistical analyses will be conducted using these demographic variables, but only to determine if any patterns exist among the participants.

The Work-Life Balance (WLB) instrument was developed by Fisher, Bulger, and Smith (2009:451) and was utilised in this research to measure the interface between work and non-work roles, focusing on both interference and enhancement. The scale included 17 items grouped into four categories: work interference with personal life, personal life interference with work, work enhancement of personal life, and personal life enhancement of work. This multidimensional, bidirectional measure was designed to be inclusive for all workers, irrespective of their cultural background, family, or marital status. It aimed to capture the broader scope of non-work roles beyond family responsibilities.

The Work Stress Questionnaire (WSQ) is a short, participant-completed tool used to identify employees at risk of sick leave due to work-related stress. It includes 21 items, grouped into four categories: indistinct organisation and conflicts, individual demands and commitment, influence at work, and work-to-leisure time interference. The tool has shown acceptable face validity and reliability for both male and female respondents. Its concise format and focus on stress symptoms make it suitable for both research and clinical settings (Frantz & Holmgren, 2019; Holmgren, 2008; Holmgren *et al.*, 2009).

To assess perceived organisational support (POS), the study used an eight-item version of the established POS scale (Eisenberger *et al.*, 1986). Participants responded on a seven-point Likert scale (Rhoades *et al.*, 2001:828). The scale evaluates how much employees feel their organisation values their contributions and supports their well-being. It has demonstrated strong reliability and is widely used in workplace research (Rhoades & Eisenberger, 2002).

Job demands were measured using the Job Demand Scale (JDS), adapted from the Brief Job Stress Questionnaire (BJSQ). This instrument captures the intensity and frequency of work-related pressures, helping to assess how job demands relate to employee stress and well-being. This six-item scale measured workload and cognitive demands. Items were scored on a four-point Likert scale and focused on time pressure, task load, and mental effort (Kawada & Otsuka, 2011). Higher scores indicated more demanding work conditions, which are linked to higher stress and lower job satisfaction (Kawada & Otsuka, 2011:399).

1.14 Data collection

Data were collected through an online questionnaire developed using Microsoft Forms. A cross-sectional approach was used to explore the relationships between the variables. The questionnaire was based on previously established scales from the literature. It was distributed to members of voluntary associations recognised by the Engineering Council of South Africa (ECSA). These associations acted as gatekeepers and shared the survey link or QR code with their members.

Link: https://forms.office.com/r/Jd55Bt1qYm

1.15 Data analysis

Data were collected from the questions created in the Microsoft Forms response. A summary of the responses was sent to the NWU Statistical Consulting Service in a Microsoft Excel Worksheet or Comma-Separated Values (CSV) format. Microsoft Forms provided a detailed summary of all the questions and responses from the participants. It showed each participant's time to answer the questions and provided insight into how each question was answered. The responses to all questions were summarised in a Microsoft Excel file, which was also used for data analysis. The researcher utilised the NWU Statistical Consultation Services to assist with the statistical analyses.

The statistical techniques outlined below were used to explore the research questions, fulfil the study's aims, and test the proposed hypotheses.

Table 1-3: Research questions, objectives, hypotheses and statistical methods

No	Research Objectives	Statistical Techniques
1	To assess the levels of work-life balance among engineers in South Africa.	Descriptive statistics were used to measure and summarise the levels of work-life balance. (Mean, Standard Deviation, Frequency, Percentage) Confirmatory Factor Analysis (CFA) validated the WLB measurement scale.
2	To evaluate the occupational stress levels experienced by engineers in South Africa.	Descriptive statistics were used to summarise occupational stress levels. (Mean, Standard Deviation, Frequency, Percentage) Confirmatory Factor Analysis (CFA) validated the occupational stress measurement scale.
3	To investigate the organisational support levels of engineers in South Africa.	Descriptive Statistics were used to measure organisational support levels. (Mean, Standard Deviation, Frequency, Percentage) Confirmatory Factor Analysis (CFA) validated the organisational support measurement scale.
4	To determine the job demand levels faced by engineers in South Africa.	Descriptive Statistics were used to summarise the job demand levels (Mean, Standard Deviation, Frequency, and Percentage) Confirmatory Factor Analysis (CFA) validated the job demand measurement scale.
5	To examine the impact of work-life balance on occupational stress among engineers in South Africa.	Spearman's rank-order Correlation Analysis

No	Research Objectives	Statistical Techniques
6	To explore the mediating role of organisational support in the relationship between work-life balance and occupational stress among engineers in South Africa.	Mediation Analysis (Using Structural Equation Modelling - SEM)
7	To analyse the mediating role of job demands in the relationship between work-life balance and occupational stress among engineers in South Africa.	Mediation Analysis (Using Structural Equation Modelling - SEM)

1.16 Ethical Considerations

The North-West University is guided by four main principles: honesty, accountability, professionalism, and good stewardship. To gather information about professionals' everyday experiences related to the research topic, a cover letter with a link to an online survey was sent to each participant through an appointed gatekeeper. Participation was voluntary, and contributors could withdraw at any time. They could also choose not to answer specific questions. The survey requested necessary demographic information, including age group, gender, years of work experience, and qualifications, but did not require participants to provide any personally identifiable information. The data were kept confidential, and only the combined results were used for research and publication. All information provided by the participants was anonymous and treated with the highest standard of privacy and confidentiality. The survey consisted of five sections and took participants between 15 and 30 minutes to complete, with an average duration of 16 minutes.

To participate in the survey, individuals had to meet two criteria: they had to be at least 18 years old and currently employed by a South African organisation. As willing participants, they were only responsible for completing the survey as honestly as possible. It is worth noting that participants did not face any negative consequences if they chose not to complete the survey. Additionally, any information provided by the participants remained confidential, and personal identifying information, such as demographics, was handled in accordance with the Protection of Personal Information Act (Act 4 of 2013) rules. The Act also stated that participants were not obligated to provide personal information, such as demographics. However, there would have been no negative consequences if they had not offered it. The answer sheets were securely

stored at the University for five years. Only the student and their supervisor could access the data after that. It was important to note that the data would not cross the borders of South Africa. Results from the total sample would only be used and presented anonymously. The results would not be released to the public domain, and no reference was made to email, telephone number, or name. By completing the survey, the participants agreed that the information provided could be used for research purposes. It was important to remember that there were no correct or incorrect answers to the questions in the questionnaire.

1.17 Research contribution

Existing research has extensively explored work-life balance and occupational stress globally. However, a gap remains in understanding these dynamics within the South African engineering sector, where unique challenges such as high job demands, skill shortages, and limited organisational support are prevalent. This research aims to contribute empirical data about these factors for engineers in South Africa, addressing the geographical and occupational gap. Previous studies have rarely examined the combined effect of work-life balance, job demands, and organisational support on occupational stress in the engineering sector. Most research treats work-life balance and stress as directly related without considering the role of mediators. This study addresses that gap by introducing a mediation model. It examines how organisational support and job demands influence the connection between work-life balance and occupational stress among South African engineers. This approach moves beyond basic correlation and adds depth to the existing body of knowledge.

The research also addresses the unique challenges faced by the South African engineering sector. These include skills shortages, high workloads, and economic instability. These conditions are rarely examined in relation to employee stress and balance. Focusing on this specific context improves the relevance of the findings. It also highlights the need for localised strategies.

The study applies Structural Equation Modelling to test the proposed framework. This technique enables the precise analysis of multiple relationships simultaneously. The use of established tools adapted for engineers in South Africa strengthens the methodological design. This mix of theoretical and statistical rigour lends credibility to the findings.

By showing how organisational support and job demands act as mediators, the research offers practical guidance. Organisations can use the results to rethink how they design well-being programmes. This could lead to better stress management and improved work-life balance for engineers. The findings may also assist professional bodies, such as the Engineering Council of South Africa, in setting workplace standards and designing retention strategies.

This study contributes to theory by extending our understanding of social exchange in engineering contexts. It highlights how organisational support can buffer the adverse effects of high job demands, offering a more detailed view of how stress and well-being interact in demanding environments.

The research builds an integrated framework that connects work-life balance, occupational stress, organisational support, and job demands. It provides practical, evidence-based recommendations for employers and policymakers. These insights aim to improve job satisfaction, reduce employee turnover, and strengthen performance in the engineering sector.

1.18 Outline of the dissertation

Chapter 1: Introduction and background of the research
Chapter 2: Literature review
Chapter 3: Research methodology and design
Chapter 4: Results, discussion, and Interpretation of findings
Chapter 5: Discussion of results, conclusion and recommendations

1.19 Summary

This chapter outlines a structured approach to understanding various factors that affect engineers in South Africa, focusing on work-life balance, occupational stress, organisational support, and job demands. It presents a comprehensive table (Table 1.2) that outlines seven research questions, their corresponding objectives, and their associated hypotheses.

The first four research questions aim to assess engineers' levels of work-life balance, occupational stress, job demands, and organisational support. Each question is

accompanied by null and alternative hypotheses that test for significant deviations from a neutral level, utilising descriptive statistics and Confirmatory Factor Analysis (CFA) to validate measurement scales.

Questions five and six assess the effect of work-life balance on occupational stress. The sixth also tests whether job demands mediate this relationship. The seventh question examines whether organisational support acts as a mediator. Structural Equation Modelling (SEM) is used to analyse the direct and indirect effects among the variables.

Additionally, the chapter emphasises ethical considerations, noting that the North-West University adhered to principles such as honesty, accountability, professionalism, and good stewardship in conducting the research. Participants were recruited through an appointed gatekeeper and were assured of voluntary participation, the right to withdraw, and the choice to skip questions, thereby enhancing the ethical integrity of the research.

This research aims to contribute valuable insights into the dynamics of a balanced lifestyle and the effect of stress within the engineering profession in South Africa, ultimately informing better organisational practices and support mechanisms.

CHAPTER 2 LITERATURE REVIEW ON WORK-LIFE BALANCE, OCCUPATIONAL STRESS, ORGANISATIONAL SUPPORT AND JOB DEMANDS

2.1 Introduction

This chapter reviews the main concepts of the study: work-life balance, occupational stress, organisational support, and job demands. It begins by defining work-life balance as the ability of individuals to manage their work duties and personal life effectively. This idea is explained using Role theory and Conservation of Resources (COR) theory. Next, it examines occupational stress, an ongoing workplace issue that affects both mental and physical health. The Job Demand-Control Model and Effort-Reward Imbalance theory support the discussion. Thereafter, the chapter explores organisational support, focusing on how employees feel valued and cared for. This is examined through Organisational Support theory, Leader-Member Exchange theory, and Social Exchange theory. The construct of job demands is assessed using the Job Demands-Resources (JD-R) Model and the Demand-Control-Support (DCS) Model, explaining how excessive demands can impair employee well-being without adequate resources.

To establish a contextual foundation for the research, attention is given to sector-specific insights, particularly within the engineering context and the South African labour market. These discussions culminate in a conceptual and theoretical framework that integrates the four constructs. The framework positions work-life balance as the independent variable, occupational stress as the dependent variable, and organisational support and job demands as mediating mechanisms. This literature review lays the theoretical groundwork for understanding the complex relationships that influence stress and well-being in demanding professional environments.

This chapter aligns with the research questions, objectives, and hypotheses.

Table 2-1: Alignment of research questions, objectives, and hypotheses with the literature review sections

Research Question	Objective	Hypotheses (H_0/H_a)	Exact Sections in Chapter 2
RQ1: What is the work-life balance levels among engineers in South Africa?	To assess the levels of work-life balance among engineers in South Africa.	H_{01}: There is no statistically significant deviation from a neutral or mid-point level of work-life balance among engineers in South Africa. H_{a1}: There is a statistically significant deviation from a neutral or mid-point level of work-life balance among engineers in South Africa.	2.2 Work-life balance 2.2.1 Definition and conceptualisation 2.2.2 Theoretical frameworks 2.2.2.1 Role Theory 2.2.2.2 Conservation of Resources (COR) Theory 2.2.3 Measurement of work-life balance 2.2.4 Work-life balance in the engineering sector 2.2.5 Work-life balance in South Africa 2.2.6 Benefits of WLB for organisations and employees
RQ2: What are the occupational stress levels among engineers in South Africa?	To evaluate the occupational stress levels experienced by engineers in South Africa.	H_{02}: There is no statistically significant deviation from a neutral or mid-point level of occupational stress among engineers in South Africa. H_{a2}: There is a statistically significant deviation from a neutral or mid-point level of occupational stress among engineers in South Africa.	2.3 Occupational stress 2.3.1 Definition and conceptualisation 2.3.2 Theoretical frameworks 2.3.2.1 Job Demand-Control Model 2.3.2.2 Effort-Reward Imbalance (ERI) Theory 2.3.2.3 Transactional Model of Stress and Coping 2.3.2.4 Person-Environment (PE) Fit Theory 2.3.2.5 Social Support Theory 2.3.3 Measurement of occupational stress 2.3.4 Occupational stress in the engineering sector 2.3.5 Occupational stress in South Africa 2.3.6 Benefits of addressing occupational stress for organisations and employees

Research Question	Objective	Hypotheses (H_0/H_a)	Exact Sections in Chapter 2
RQ3: What are the organisational support levels of engineers in South Africa?	To investigate the organisational support levels of engineers in South Africa.	H_{03}: There is no statistically significant deviation from a neutral or mid-point level of organisational support among engineers in South Africa. H_{a3}: There is a statistically significant deviation from a neutral or mid-point level of organisational support among engineers in South Africa.	2.4 Perceived organisational support 2.4.1 Definition and conceptualisation 2.4.2 Theoretical frameworks 2.4.2.1 Organisational Support Theory (OST) 2.4.2.2 Social Exchange Theory (SET) 2.4.2.3 Leader-Member Exchange Theory (LMX) 2.4.2.4 Social Support Theory 2.4.2.5 Economic Exchange Theory 2.4.2.6 Psychological Contract Theory (PCT) 2.4.3 Measurement of organisational support 2.4.4 Organisational support in the engineering sector 2.4.5 Organisational support in South Africa 2.4.6 Benefits of POS for organisations and employees
RQ4: What are the job demand levels of engineers in South Africa?	To determine the job demand levels faced by engineers in South Africa.	H_{04}: There is no statistically significant deviation from a neutral or mid-point level of job demand among engineers in South Africa. H_{a4}: There is a statistically significant deviation from a neutral or mid-point level of job demand among engineers in South Africa.	2.5 Job demand 2.5.1 Definition and conceptualisation 2.5.2 Theoretical frameworks 2.5.2.1 Job Demands-Resources (JD-R) theory 2.5.2.2 Demand-Control-Support (DCS) model 2.5.3 Measurement of job demands 2.5.4 Job demands in the engineering sector 2.5.5 Job demands in South Africa 2.5.6 Benefits for organisations and employees

Research Question	Objective	Hypotheses (H_0/H_a)	Exact Sections in Chapter 2
RQ5: To what extent does work-life balance influence occupational stress among engineers in South Africa?	To examine the impact of work-life balance on occupational stress among engineers in South Africa.	H_{05}: Work-life balance does not significantly influence occupational stress among South African engineers. H_{a5}: Work-life balance significantly influences occupational stress among engineers in South Africa.	2.6 Relationship between work-life balance and occupational stress
RQ6: To what extent does organisational support mediate the relationship between work-life balance and occupational stress within the South African engineering sector?	To explore the mediating role of organisational support in the relationship between work-life balance and occupational stress among engineers in South Africa.	H_{06}: Organisational support does not significantly mediate the relationship between work-life balance and occupational stress among engineers in South Africa. H_{a6}: Organisational support significantly mediates the relationship between work-life balance and occupational stress among engineers in South Africa.	2.7 Mediator role of organisational support
RQ7: To what extent does job demand mediate the relationship between work-life balance and occupational stress within the South African engineering sector?	To analyse the mediating role of job demands in the relationship between work-life balance and occupational stress among engineers in South Africa.	H_{07}: Job demands do not significantly mediate the relationship between work-life balance and occupational stress among engineers in South Africa. H_{a7}: Job demands significantly mediate the relationship between work-life balance and occupational stress among engineers in South Africa.	2.8 Mediator role of job demand

2.2 Work-life balance

The discussion begins by defining and conceptualising work-life balance. Thereafter, it progresses to its theoretical foundations, measurement approaches, and contextual applications within the engineering sector and South Africa. It concludes by highlighting its organisational and individual benefits.

2.2.1 Definition and conceptualisation

Work-life balance is a state in which people effectively manage their roles at work, at home, and in the community (Buddhapriya, 2005). It means balancing personal, job-related, and family demands in a way that doesn't compromise any of them (Chaudhary, 2024). The term became popular in the late 1970s and 1980s. During this period, job stress increased, and employees began seeking more control over their work schedules (Byrne, 2005; Chaudhary, 2024).

Many factors affect work-life balance, including a person's age, working conditions, the role of technology, and the level of management support (Byrne, 2005). A good balance helps both employees and employers; it can boost motivation, improve productivity, and increase staff retention (Byrne, 2005; Uma, 2016). Recent studies show that work-life balance isn't just about avoiding stress. It also includes how experiences in one part of life can improve or drain other parts (Rothbard *et al.*, 2021). Even so, it remains harder for some groups. Women, in particular, face challenges when trying to grow in their careers while managing family responsibilities (Rani, 2013).

2.2.2 Theoretical frameworks

This study uses the Work-Life Balance Scale developed by Fisher, Bulger, and Smith (2009). The scale is grounded in two psychological theories: Role theory and the Conservation of Resources (COR) theory. These theories shape how the study defines and examines the concept of work-life balance.

2.2.2.1 Role Theory

Role theory, introduced by Kahn *et al.* (1964), focuses on how people manage multiple roles, such as being a worker, a partner, or a volunteer. It explains how societal expectations tied to each role can create stress, especially when roles clash or

expectations are unclear (Keller, 1975; Tosi, 1971). Role ambiguity, where responsibilities or outcomes are not clearly defined, lowers satisfaction and reduces a person's sense of control (Beauchamp & Bray, 2001; Beauchamp *et al.*, 2005; Sawyer, 1992). Toffler (1980) noted that these role challenges can evolve as roles change. Clarifying each person's role in a team helps people work together more effectively (Benson *et al.*, 2013). The team performs better when roles are well-defined in complex organisations (Fischer *et al.*, 2010).

Role theory also examines how people's behaviours are shaped by their roles, based on their position or status within a group (Murphy, 2022). It helps explain how people perform under stress and how conflicting expectations impact them (Herrmann & Brennan, 2018; Murphy, 2022). One issue it highlights is role overload: when job demands exceed what someone can handle. This leads to burnout and is connected to COR theory, which focuses on how people utilise and safeguard their resources (Tang & Vandenberghe, 2021). Another idea, Role Enhancement theory, suggests that performing well in one role can help someone excel in another. This supports a more positive view of work-life balance (Manyuchi & Sukdeo, 2021). These theories offer a clear framework for understanding the interplay between workplace roles, expectations, and employee well-being.

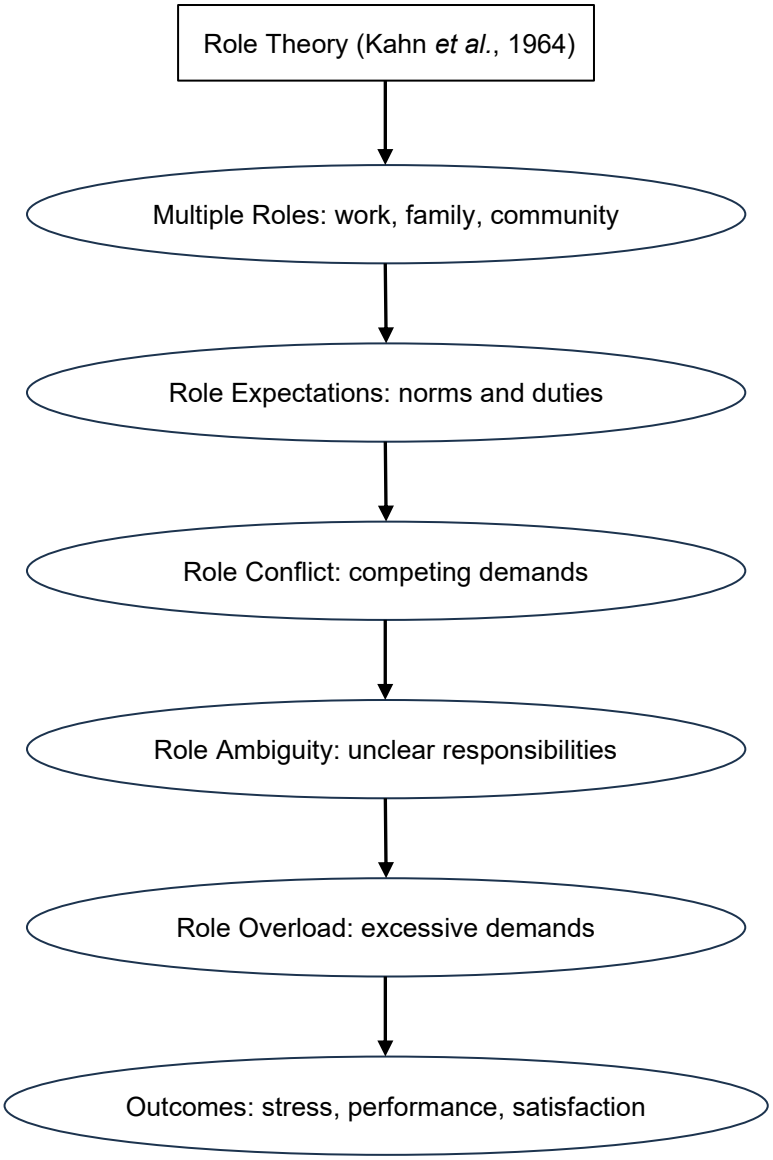


Figure 2-1: Role Theory

2.2.2.2 Conservation of Resources (COR) Theory

Conservation of Resources theory, developed by Hobfoll, explains how people respond to stress by attempting to maintain, protect, and enhance what they value. These resources include time, energy, support from others, and self-worth (Hobfoll, 2011). When people lose resources, it causes more stress than the relief they gain from acquiring new ones (Hobfoll, 2001). Resources are connected. Hobfoll (2014:21) refers to these linked sets as “resource caravans”. Losing one resource, such as job stability, triggers further loss. Loss erodes self-confidence and family well-being. Stress management becomes

harder as losses accumulate (Hobfoll, 2001). The conservation of resources theory explains responses to ongoing pressure and significant life events. Researchers apply it across work stress, trauma recovery, and health outcomes (Bon & Shire, 2022; Hobfoll, 2001). The theory now includes cultural and social influences, including family support and community ties. These additions improve relevance across settings and populations (Bon & Shire, 2022). Recent work shows resources differ in value. Importance depends on personal goals and values (Morelli & Cunningham, 2012). This flexibility supports use in personal and professional contexts. COR theory offers a clear framework for protecting valued resources, coping with loss, and managing stress (Hobfoll, 2001).

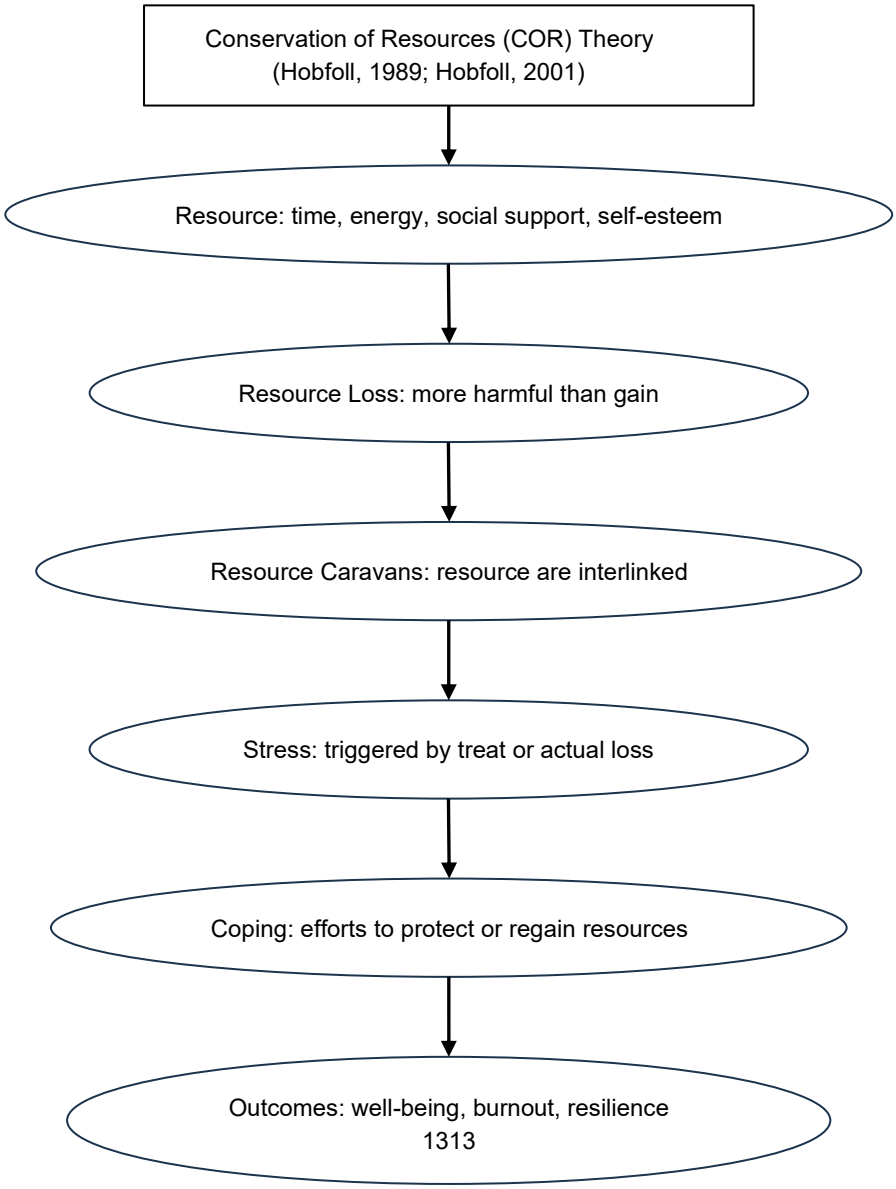


Figure 2-2: COR Theory

2.2.3 Measurement of work-life balance

Work-life balance supports employee well-being and organisational performance (Dex & Bond, 2005; Rajendran *et al.*, 2025). Employees with balanced roles report higher satisfaction and lower strain. Organisations benefit through retention and sustained performance.

Researchers have produced several WLB measures. Examples include the Family and Business Audit, the Work Life Balance Barometer, and a 42-item survey designed for service sector employees in India (Hoffmann-Burdzińska & Rutkowska, 2015; Rincy & Panchanatham, 2010; Vloeberghs, 2002). Health care studies often draw on the Brooks Quality of Nursing Work Life and the Work-Related Quality of Life scale (Mišovičová & Tomagová, 2023). These instruments support benchmarking and targeted improvement across settings.

Most tools assess a shared set of dimensions. Typical domains include work environment, job satisfaction, stress, and career development opportunities (Shea & De Cieri, 2011). Scholars stress the importance of sensitivity to cultural and professional context, since role expectations and support systems differ across occupations and countries (Alameddine *et al.*, 2023). A practical design framework guides new WLB measures. Core elements include precise planning, adaptability to diverse contexts, a supportive workplace culture, and attention to organisational impact (Bardoel & De Cieri, 2014). Despite available instruments, many settings still require inclusive and flexible measures, with health care highlighted as a priority due to complex shift patterns and emotional demands (Dex & Bond, 2005; Rajendran *et al.*, 2025).

This study employed the Work Nonwork Interference and Enhancement Questionnaire, validated by Fisher *et al.* (2009), to assess the WLB of engineers in South Africa. The instrument captures both strain between roles and positive spillovers, which suits analyses of professional groups with high cognitive demands and variable workloads.

2.2.4 Work-life balance in the engineering sector

Work–life balance remains a persistent concern in engineering, with extended hours and demanding workloads placing strain on personal relationships and overall satisfaction (Lingard & Sublet, 2002). These pressures shape daily routines and recovery time,

reducing the capacity to meet nonwork responsibilities and eroding well-being over time (Lingard & Sublet, 2002). Women engineers face distinct barriers associated with to male-dominated cultures, limited informal support, and expectations surrounding caregiving. These conditions intensify role conflict and narrow opportunities for advancement (Lingard & Sublet, 2002; Maji, 2019). The energy sector shows the sharpest effects, where participation by women remains low in part due to inflexible scheduling, site-based demands, and cultural bias that amplifies work–family strain (Lazoroska *et al.*, 2024).

Key determinants of WLB in engineering include job satisfaction, health and safety conditions, and the broader organisational climate that sets norms for availability and support (Franco *et al.*, 2020a). Evidence points to targeted remedies that are practical and measurable: flexible work policies aligned to project cycles, reliable supervisory backing, structured mentorship, and responsive support systems that stabilise care arrangements and protect recovery time (Brega *et al.*, 2023; Crutchfield, 2017). Such measures strengthen retention and sustain career continuity for women in engineering by easing conflict between work and family domains and by signalling a climate that values both performance and well-being (Franco *et al.*, 2020a). Solutions such as open organisational practices (Johri, 2010) and improving the quality of work-life (Anandh & Gunasekaran, 2016) can also enhance work-life balance. Today, work-life balance initiatives are essential for employers across different industries (Purohit & Patil, 2013).

An extensive survey of software engineers working from home during the COVID-19 period in Sri Lanka reported descriptive statistics for seven work–life balance items. On a five-point scale, the mean scores ranged from 2.92 to 3.50 with standard deviations close to one. Item-level results were as follows: WLB1 mean 3.44, SD 0.93; WLB2 mean 3.14, SD 1.01; WLB3 mean 3.26, SD 1.14; WLB4 mean 3.42, SD 0.98; WLB5 mean 3.46, SD 0.93; WLB6 mean 3.25, SD 1.08; and WLB7 mean 3.20, SD 1.16 (Weerarathna *et al.*, 2022). These values show that most responses clustered around the midpoint, with variability suggesting differences in how engineers manage their boundaries at home. A study of civil engineers in Chennai reported an overall mean score of 3.74 with a standard deviation of 2.84 on a seven-point scale (Anandh & Gunasekaran, 2016). More than half of the respondents (55 percent) scored in the low band of 1.0 to 3.0. This suggests that many construction engineers face an imbalance due to extended hours, site-based demands, and coordination challenges.

2.2.5 Work-life balance in South Africa

In South Africa, achieving a work-life balance faces significant challenges, particularly for women and black female academics (Naong & Naong, 2023; Shadrack & Pillay, 2023). Cultural practices, family obligations, and workplace barriers make it harder to achieve balance (Shadrack & Pillay, 2023). Although constitutional rights exist, South African laws still lag European standards in supporting parents and carers (Malherbe, 2020). Organisations often fail to implement effective work-life balance strategies, and many wellness programs do not address employees' real work-related issues (Abe *et al.*, 2016). Without strong WLB practices, job satisfaction, retention, and employee well-being suffer (Melanie, 2012). Younger generations show more progressive views about gender roles, but real change is slow (Naong & Naong, 2023). In male-dominated sectors like ICT, addressing WLB challenges is crucial to building a more diverse workforce (Munyeka & Maharaj, 2022). Achieving work-life balance in South Africa remains a complex issue that demands more substantial efforts from policymakers and organisations (Mageni & Slabbert, 2005; Soni, 2013).

2.2.6 Benefits of WLB for organisations and employees

Work-life balance supports both organisational performance and employee well-being. Effective work-life balance policies help organisations reduce absenteeism and staff turnover while improving loyalty, productivity, and public image (Chimote & Srivastava, 2013; Garg & Yajurvedi, 2016). Work-life balance enhances job satisfaction, autonomy, mental health, and overall well-being for employees (Waworuntu *et al.*, 2022). Work-life balance contributes to staff retention and stronger outcomes for both employees and organisations (Zheng *et al.*, 2015). Evidence also indicates that broader features of workplace culture—such as norms, leadership, and climate—can weigh more heavily on engagement and retention than WLB provisions alone (Parkes & Langford, 2008). The practical implication is to treat WLB as one pillar within a wider organisational system that shapes employees' attachment and performance.

Flexible and supportive WLB policies remain necessary because they attract and retain skilled workers, lift morale, and foster creativity (Antunes *et al.*, 2023). For impact, strategies must fit employee needs and operational realities, with clear feedback loops and scheduled reviews to refine scope and delivery over time (Garg & Yajurvedi, 2016).

This alignment approach positions WLB as an enabling mechanism within a coherent culture that sustains engagement and retention.

2.3 Occupational stress

This section defines occupational stress and explains its main concepts. Thereafter, it outlines key theories, standard methods for measuring stress, and recent research, with a focus on engineers and the South African work environment. The section concludes by examining how stress impacts both organisations and individuals.

2.3.1 Definition and conceptualisation

Occupational stress is a significant health risk linked to psychological, behavioural, and physical disorders (Quick & Henderson, 2016). Occupational stress occurs when individuals believe that the demands placed upon them exceed their capabilities (Narahari & Koneru, 2017).

Key causes include the work environment, organisational climate, and job demands (Mustafa *et al.*, 2015). Symptoms often involve fatigue, hypertension, depression, and anxiety (Mucci *et al.*, 2016). Occupational stress reduces productivity, increases absenteeism, and raises healthcare costs for organisations (Batista-Taran & Reio, 2013). Different models, such as the effort-reward imbalance model, help explain the development of stress (Batista-Taran & Reio, 2013). Managing occupational stress needs action from both organisations and individuals (Mustafa *et al.*, 2015). Despite extensive research, a single, agreed-upon definition remains elusive due to the complex nature of the concept (Gunasekra & Perera, 2023).

2.3.2 Theoretical frameworks

For this study, several occupational stress theories serve as the theoretical foundations. These include, among others, the Job Demand-Control (JDC) Model (Karasek Jr, 1979; Karasek, 1990), the Effort-Reward Imbalance (ERI) Model (Siegrist, 1996), the Transactional Model of Stress and Coping (Lazarus, 1984), Person-Environment Fit theory (French *et al.*, 1982), and Social Support theory (Cohen & Wills, 1985; House, 1983).

2.3.2.1 Job Demand-Control Model

The Job Demand-Control Model, developed by Karasek and colleagues, describes how job demands, decision-making freedom, and social support shape employee well-being. It states that high demands, combined with low control and low support, raise the risk of mental health problems and cardiovascular disease (Kristensen, 1995; Muntaner & Schoenbach, 1994).

This model has guided much of the research on occupational stress. The Job Content Questionnaire (JCQ) is the primary tool to measure its core ideas (Araújo *et al.*, 2003; Lourel *et al.*, 2008). Scholars have progressively refined the model by specifying discrete learning behaviours and differentiating social from technical control, improving construct clarity and explanatory reach (Weststar, 2009). The model remains a mainstay in research on work and health, with extensive applications across occupational settings (Alves *et al.*, 2013). Critiques focus on the operationalisation of job demands and control, as well as study designs that limit generalisability and practical uptake (Van den Broeck *et al.*, 2013). Evidence also shows that individual dispositions and cultural context shape perceived control and stress responses, signalling the need for calibrated interpretation across populations (Györkös *et al.*, 2012). Taken together, these points support careful, context-sensitive use and selective adaptation rather than wholesale rejection of the model (Györkös *et al.*, 2012; Van den Broeck *et al.*, 2013; Weststar, 2009).

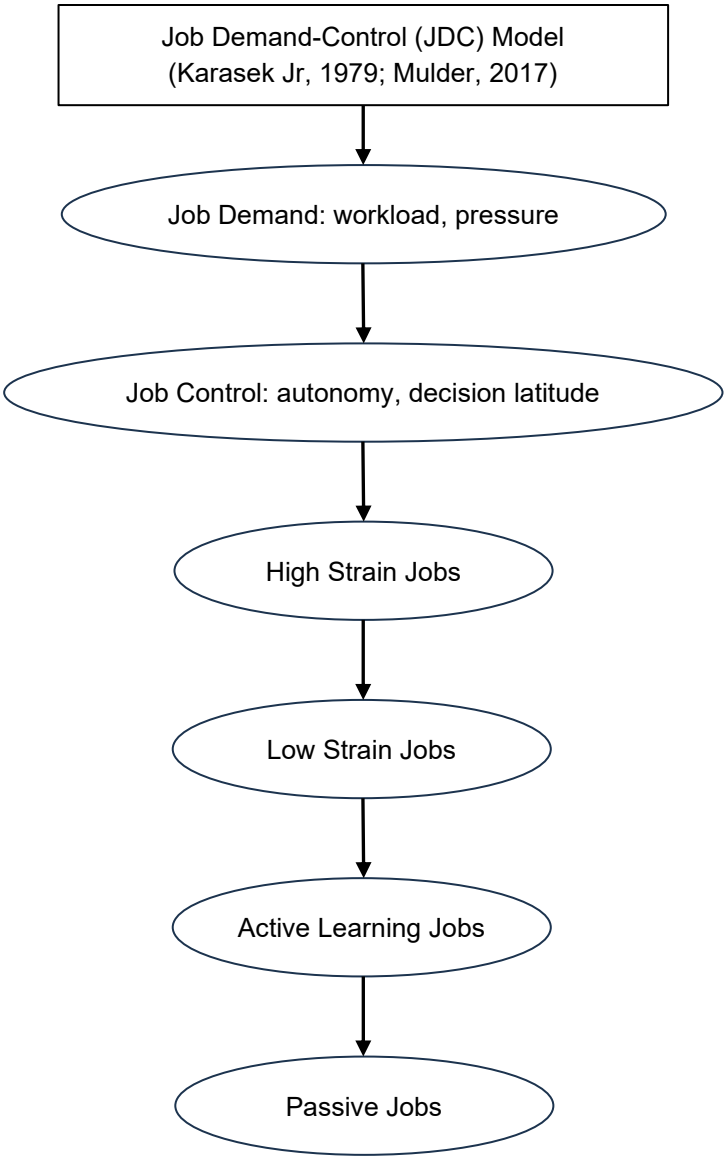


Figure 2-3: Job-Demand Control Model

2.3.2.2 Effort-Reward Imbalance (ERI) Theory

The Effort-Reward Imbalance theory posits that strain emerges when employees expend high effort but receive inadequate returns, creating a chronic mismatch that elevates stress risk (Stanhope, 2017:314). Conceptually, the model is often likened to a balance scale: effort on one side and rewards on the other. When demanding workloads, time pressure, or role intensity are not matched by commensurate returns, the balance tips toward distress; persistent imbalance is associated with adverse psychological and physiological outcomes (Stanhope, 2017).

ERI specifies three interrelated components—effort, reward, and their imbalance. Effort refers to the cognitive, emotional, and physical investments required by the job. At the same time, rewards encompass salary and career prospects, job security, esteem and respect, and a sense of pride derived from meaningful work (Siegrist *et al.*, 2004a). Perceived unfairness in the exchange heightens the likelihood of burnout, anxiety, and broader health complaints (Hämmig *et al.*, 2012:1). Longitudinal evidence links sustained imbalance to more serious conditions, including depressive symptoms and coronary morbidity, underscoring the model's relevance for occupational health surveillance and intervention (Siegrist *et al.*, 2004a).

A pivotal amplifier within ERI is overcommitment. Overcommitment captures a pattern of excessive striving, high self-imposed standards, and difficulty disengaging from work demands. Individuals high in overcommitment are more vulnerable to the adverse effects of imbalance because they continue to invest effort despite inadequate returns, reinforcing the cycle of strain (Van Vegchel *et al.*, 2005). In practice, overcommitment can mask early warning signs of distress, delaying help-seeking and organisational responses.

The ERI framework provides employers with concrete guidance. Interventions that strengthen job security, calibrate workloads, enhance recognition and esteem, and address distributive and procedural fairness can reduce chronic imbalance and its sequelae (Siegrist *et al.*, 2004a). Organisations should regularly review role demands against available rewards, ensure transparent advancement pathways, and train supervisors to provide timely acknowledgement and support. Integrating these actions within routine people-management processes helps restore reciprocity in the effort-reward exchange and supports sustainable well-being and performance (Hämmig *et al.*, 2012; Siegrist *et al.*, 2004a; Van Vegchel *et al.*, 2005).

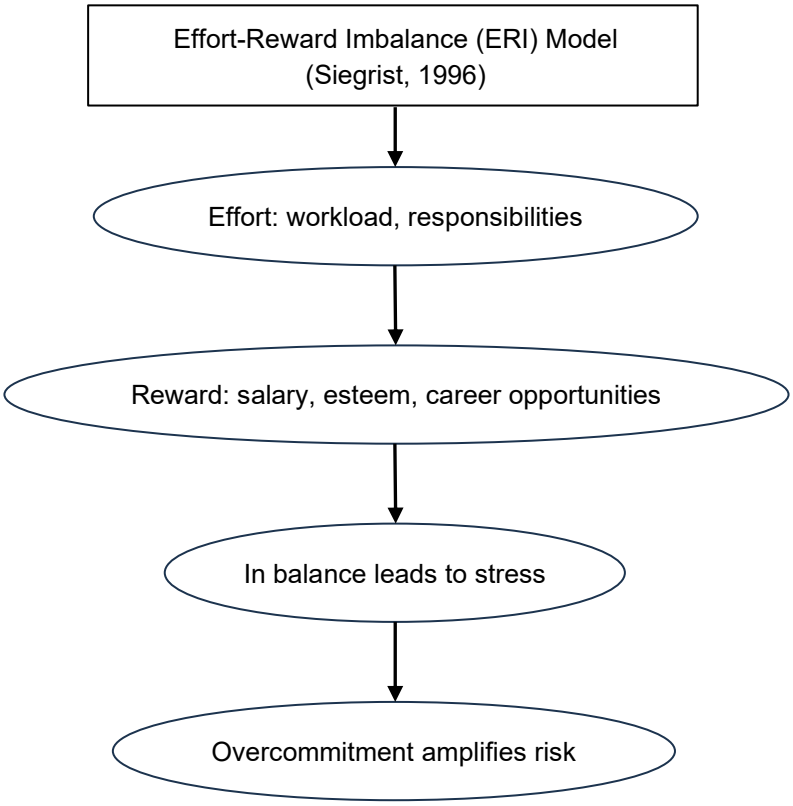


Figure 2-4: ERI Model

2.3.2.3 Transactional Model of Stress and Coping

The Transactional model of Stress and Coping describes how people evaluate events and respond under pressure. Individuals complete two linked appraisals. A primary appraisal judges whether a situation poses harm, loss, or threat. A secondary appraisal reviews available resources for managing the event and its demands (Lau & Morse, 2001). These appraisals guide coping choices and shape outcomes.

Coping strategies follow two broad paths. Problem-focused coping targets sources of strain. Emotion-focused coping regulates feelings linked to the event (Miller & McCool, 2003). Research uses this model across diverse settings. Parents in neonatal intensive care units show appraisal patterns linked to support needs and coping style (Lau & Morse, 2001). Employees under workplace pressure display appraisal-driven responses that influence health and performance (Goh *et al.*, 2010). Participants facing difficult outdoor challenges use problem-focused and emotion-focused strategies in line with their appraisals and goals (Miller & McCool, 2003).

Several influences shape appraisal and coping. Meaning assigned to the situation directs attention and sets the tone for coping efforts (Park & Folkman, 1997). Access to coping resources, such as social support, skills, and time, alters choices and results (Quine & Pahl, 1991). Personal interpretation and information processing style also steer responses to stressors (Matthews, 2001).

Later work extends the model and clarifies its reach. Studies link appraisal-driven strain to workplace deviance as a maladaptive coping response under pressure (Grant, 2013). Cross-cultural research shows that cultural norms guide preferred coping styles and perceived efficacy of support (Scherer *et al.*, 2000). Recommendations for complex work settings propose refinements to concepts, measures, and pathways so the model fits modern organisational demands (Goh *et al.*, 2010). Overall, the model presents stress as an ongoing person-environment process. Outcomes reflect event features, personal meaning, available resources, and the actions people take in response (Lau & Morse, 2001; Miller & McCool, 2003; Park & Folkman, 1997).

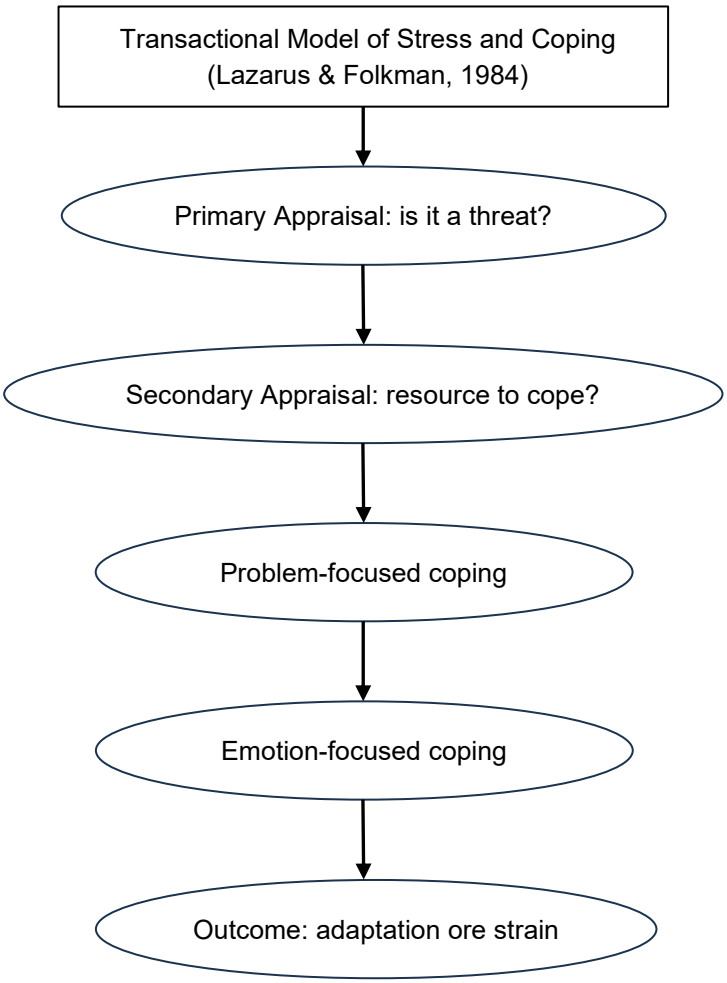


Figure 2-5: Transactional Model of Stress and Coping

2.3.2.4 Person-Environment (PE) Fit Theory

The Person-Environment Fit theory describes how well people match their work settings. It includes several distinct forms of fit: person-vocation, person-job, person-organisation, person-group, and person-supervisor (Edwards & Billsberry, 2010; Sekiguchi & Yang, 2021). These dimensions work independently and are not combined into a single overall measure (Edwards & Billsberry, 2010).

When people feel their roles suit them, they are more satisfied at work, show greater commitment, and are less likely to leave (Andela & van Der Doef, 2019). Cultural context also matters. In individualistic cultures, fit often refers to how well a person's skills align with the job's demands. Collectivist cultures tend to prioritise social harmony and emotional connection (Oh *et al.*, 2014).

Fit is not a fixed state. It evolves as people change and their environments shift (Sekiguchi & Yang, 2021; Wightman & Christensen, 2025). Recent studies have expanded the theory to encompass aspects such as workplace spirituality. Employees who find purpose and meaning in their work report more substantial alignment with their jobs and organisations (Milliman *et al.*, 2017).

Some scholars have questioned whether there is one ideal level of fit for everyone. Others have explored how poor fit affects outcomes such as stress or disengagement (Van Vianen, 2018). Overall, the theory helps explain why the relationship between a person and their environment matters. It links the quality of that fit to critical outcomes, such as satisfaction, performance, and well-being.

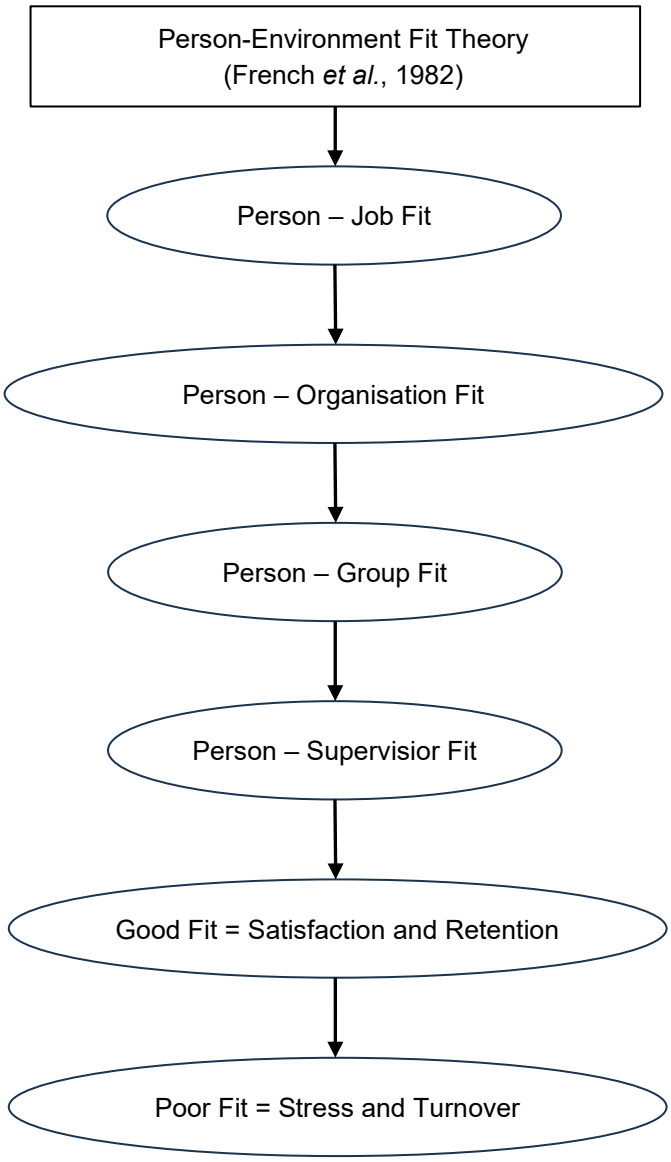


Figure 2-6: Person-Environment Fit Theory

2.3.2.5 Social Support Theory

Social Support theory explains how relationships help people manage stress. When individuals face pressure at work or in their personal lives, support from others can offer helpful information, practical help, and emotional comfort (Blackbyrn & Maryel, 2023). These social connections play a key role in coping and recovery. The theory is considered an in-between theory that concentrates on the interaction and connection within those supportive relationships. Social Support theory is critical to engineers because it can play a crucial role in the well-being of engineers and the success of an organisation (Leahy-Warren, 2014). Social Support theory is a psychological framework that emphasises the significance of social connections and relationships in promoting individual well-being when facing occupational stress and a lack of work-life balance (Blackbyrn & Maryel, 2024). Organisational or social support can influence well-being and health through various mechanisms and paradigms, including regulation and self-esteem, stress buffering, and the individual's social role within the organisation and society (Lakey & Cohen, 2000).

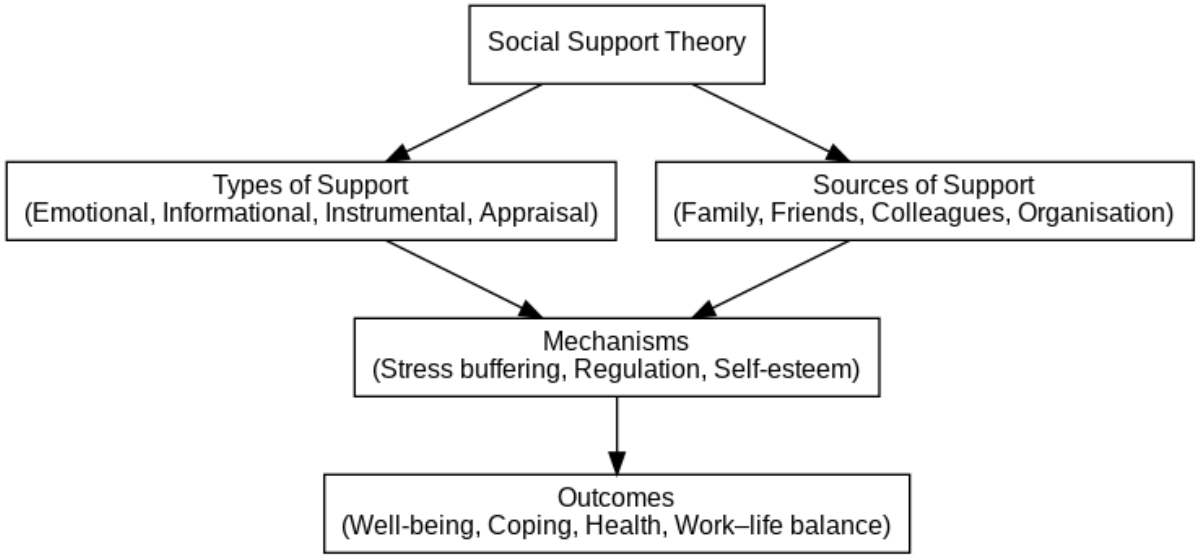


Figure 2-7: Social Support Theory

2.3.3 Measuring of occupational stress

Occupational stress measurement tools have been developed to assess different aspects of workplace stress and strain. Standard instruments include the Pressure Management Indicator (PMI), the Job Stress Survey (JSS), and the Copenhagen Psychosocial

Questionnaire (COPSOQ) (Vagg & Spielberger, 1998a; Williams & Cooper, 1998a). These tools usually measure stressors, stress responses, personal characteristics, and buffer factors (SF, 2000). Self-report questionnaires are widely used because they are cost-effective; however, observational and physiological measures are also employed (Hurrell Jr *et al.*, 1998b). The main dimensions assessed are job pressure, organisational support, workload, workplace relationships, and coping strategies (Vagg & Spielberger, 1998b; Williams & Cooper, 1998b). Although many instruments demonstrate acceptable reliability and validity, researchers continue to call for the refinement of measurement methods (Abbas *et al.*, 2013; Shan, 2000). Challenges include a lack of standardised instruments, few validated versions for different cultural contexts, and overlapping measures of stressors and strain (Conway, 2009; Hurrell Jr *et al.*, 1998a). The Work Stress Questionnaire (WSQ) used in this study was a self-administered tool designed by Frantz and Holmgren (2019).

2.3.4 Occupational stress in the engineering sector

Occupational stress is a significant issue in the engineering sector. It affects productivity, health, and job satisfaction. Key stressors include work overload, work-life balance problems, time pressure, and lack of control (Rothmann & Malan, 2006; Saleh & Desai, 1986). Engineers often report higher levels of role ambiguity, role conflict, and overall stress compared to executives and managers (D'Souza *et al.*, 2003). Physical symptoms of stress include headaches and sleep problems, while emotional symptoms include anger and depression (Mucci *et al.*, 2016). Occupational stress in global software development blocks knowledge sharing, a core driver of project success (Ahmed *et al.*, 2011). Effective stress management lifts productivity and supports well-being in engineering workplaces (Saleh & Desai, 1986; Sankalp, 2025).

Organisations reduce strain when they strengthen rewards, expand development opportunities, and support work-life balance (DeCarbo, 2024; Lee & Sirgy, 2024; Saleh & Desai, 1986). Fair and visible recognition encourages participation in communities of practice. Access to training builds capability and confidence. Flexible arrangements protect recovery time and family commitments. These actions work best when leaders track outcomes and adjust delivery to local needs (Rowland *et al.*, 2023).

Evidence from the Stress Diagnostic Survey offers a valuable benchmark. In a large engineering sample, macro-stressor scores on a scale from 4 to 28 showed a mean of 13.38 with a standard deviation of 4.30 (Saleh & Desai, 1986). This profile points to material pressures at the system level. Teams facing such pressures often withhold knowledge or reduce discretionary sharing under time and evaluation strain (Ahmed *et al.*, 2011). Programmes that renew reward systems, widen development paths, and stabilise work-life balance directly address these barriers and promote sustained knowledge exchange (Saleh & Desai, 1986). For micro stressors, the mean was 11.53 with a standard deviation of 3.63. The total stress score averaged 12.39 with a standard deviation of 3.71 (Saleh & Desai, 1986). These values indicate moderate stress. Macro stressors such as organisational rules and policies scored higher than task-related stressors, suggesting that structural features of work environments contribute more strongly to engineers' stress. Hazeen and Umarani (2022) analysed role stress in 360 construction engineers. They measured three forms of stress: role ambiguity, role conflict, and role overload. On a one-to-five scale, role ambiguity had a mean of 2.61 with a standard deviation of 1.27. Role conflict recorded a mean of 3.29 with a standard deviation of 1.16. Role overload scored the highest, with a mean of 3.37 and a standard deviation of 1.15 (Hazeen Fathima & Umarani, 2022). These figures show that engineers experience most stress when demands exceed their capacity or when expectations conflict, rather than when roles are unclear.

Rothmann and Malan examined occupational stress among South African engineers using the ASSET tool. Results were reported in sten scores, where the average is 5.5 and higher scores indicate greater strain. Work overload and work-life balance emerged as the most prominent sources of stress, aligning with the findings from India and North America (Rothmann & Malan, 2006). Although the sten scale differs from raw mean scores, the pattern confirms that workload and balance are universal stressors for engineers.

Across various studies and regions, engineers report moderate levels of stress. Organisational features such as policies and bureaucracy drive macro-level stress. Task demands, such as workload and conflicting expectations, drive micro-level and role-related stress. The consistent finding is that role overload and work-life imbalance are the leading contributors. Mean scores above the midpoint for conflict and overload, combined

with high macro-stressor scores, indicate that engineers frequently encounter pressures that threaten their well-being. These results suggest the need for interventions that address organisational policies, manage workloads, and promote supportive supervisory practices.

2.3.5 Occupational stress in South Africa

Occupational stress is a significant concern across various professions in South Africa. Engineers often struggle to achieve a work-life balance and experience overload (Rothmann & Malan, 2006). Nurses face staff shortages and excessive duties (Van der Colff & Rothmann, 2009). HIV/AIDS caregivers deal with bereavement overload and stigma (Van Dyk, 2007). Academic staff report high stress levels, which are linked to issues such as inadequate pay, excessive workload, and work-life balance problems (Barkhuizen & Rothmann, 2008; Coetzer & Rothmann, 2007). Police officers highlight the stress caused by poor salaries, inadequate equipment, and exposure to crime (Rothmann & Pienaar, 2006). Across various professions, everyday stressors include excessive workload, insufficient support, and high job demands (Mayer & Oosthuizen, 2021; Rothmann *et al.*, 2006). Occupational stress leads to physical and psychological health problems and reduces organisational commitment (Coetzer & Rothmann, 2007; Rothmann & Malan, 2006). These patterns show the need for stress management strategies in South Africa at individual, organisational, and societal levels (Mayer & Oosthuizen, 2021).

2.3.6 Benefits of addressing occupational stress for organisations and employees

Occupational stress affects individual well-being and organisational success. It increases turnover, reduces performance, and damages employee health (Ongori & Agolla, 2008). While a moderate level of stress can support focus and short-term performance (Narahari & Koneru, 2017), high levels cause anxiety, fatigue, and disengagement (Simon & Amarakoon, 2015). Effective stress management improves employee retention, health, and organisational profitability (Cooper & Cartwright, 2018). Organisations must implement targeted stress management programmes, conduct stress audits, and enhance working conditions to prevent burnout and mental health issues (Maria-Elena & Laura-Filofteia, 2014; Mohajan, 2012). The impact of stress also extends beyond work,

affecting families and society. A preventative approach to stress protects employees and ensures long-term organisational performance (Quick & Henderson, 2016).

2.4 Perceived organisational support

This section opens with the conceptualisation of organisational support, then outlines its key theoretical foundations, proceeds to the measurement tools used in its assessment, explores its relevance within the engineering sector and South African context, and concludes with an overview of the benefits for employees and organisations.

2.4.1 Definition and conceptualisation

Perceived organisational support (POS) is employees' belief that their organisation values their contributions and cares about their well-being. This concept is grounded in social exchange theory, which posits that workplace relationships are characterised by reciprocity. Employees who feel supported are more likely to reciprocate with commitment (Eisenberger & Stinglhamber, 2011; Wayne *et al.*, 1997). POS grows from everyday organisational practices. Fair treatment, supportive leadership, and consistent human resource policies shape employees' sense of support (Sun, 2019). POS is not just about how leaders treat people; it also includes whether employees feel they are recognised, consulted, and respected.

POS predicts a wide range of positive outcomes. Employees who believe their organisation values their contributions and cares about their well-being report higher job satisfaction, stronger organisational citizenship behaviours, and better performance (Kurtessis *et al.*, 2017). These associations suggest that culture is a central lever: when policies, practices, and daily interactions convey support, employees are more willing and able to invest effort in their roles.

POS is conceptually distinct from leader-member exchange (LMX). LMX centres on the quality of a dyadic relationship with a supervisor, whereas POS reflects employees' global beliefs about the organisation as a whole, with different antecedents and consequences (Wayne *et al.*, 1997). The construct is grounded in broader theories of social support that explain how supportive relationships form, signal reciprocity, and shape coping and motivation at work (Ahmed *et al.*, 2011).

Measurement commonly relies on the Survey of Perceived Organisational Support (SPOS). The instrument asks whether employees feel valued and whether their well-being matters to the organisation, providing a reliable indicator of the supportiveness of the work environment (Caesens & Stinglhamber, 2020). High POS scores offer leaders actionable feedback: strengthen supportive practices, reinforce fair treatment, and maintain credible recognition systems to sustain satisfaction, citizenship, and performance (Wayne *et al.*, 2002).

2.4.2 Theoretical framework

This study integrates several theories to understand organisational support: Organisational Support Theory (OST), Social Exchange Theory (SET), Leader-Member Exchange theory (LMX), Social Support Theory (SST), Economic Exchange theory, and Psychological Contract theory.

2.4.2.1 Organisational Support Theory (OST)

Organisational Support theory explains how employees form perceived organisational support —the belief that the organisation values their contributions and cares for their well-being. Higher POS predicts greater job satisfaction, stronger commitment, and more citizenship behaviour (Kurtessis *et al.*, 2017; Rhoades & Eisenberger, 2002). POS increases when employees are treated fairly, supported by leaders, and work in good conditions (Eisenberger *et al.*, 2020). These factors lead to stronger engagement and better performance.

OST is based on social exchange. Employees respond to support with trust, loyalty, and effort. They also view fair treatment as a sign of the organisation’s intent, which boosts motivation (Kurtessis *et al.*, 2017). The theory is closely linked to psychological contracts; when employees perceive that promises are broken, their trust and sense of support weaken (Aselage & Eisenberger, 2003).

Recent studies show that POS works differently across cultures and organisations. It affects individuals, teams, and departments. POS is also tied to creativity, lower burnout, and improved well-being (Eisenberger *et al.*, 2020). These findings show that support is not just personal, it is essential to how organisations function (Caesens & Stinglhamber, 2020).

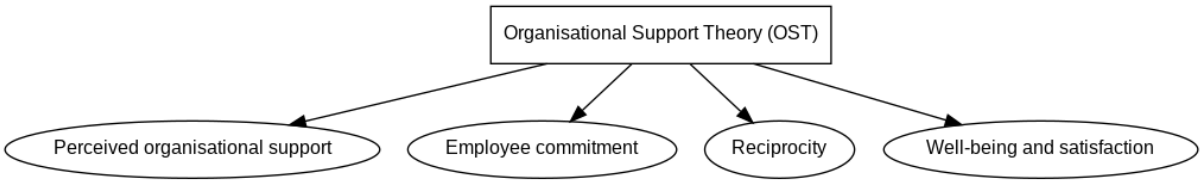


Figure 2-8: Organisational Support Theory

2.4.2.2 Social Exchange Theory (SET)

POS is rooted in Social Exchange theory. It describes how employees judge whether their organisation values their work and well-being (Eisenberger *et al.*, 1986). POS grows through fair treatment, supportive leadership, and positive working conditions (Rhoades & Eisenberger, 2002). When support is high, employees are more satisfied, committed, and productive (Rhoades & Eisenberger, 2002; Wayne *et al.*, 1997). This highlights the need for a supportive workplace culture.

While POS and Leader-Member Exchange (LMX) are related, they are different. POS reflects how the organisation treats all employees. LMX focuses on the relationship between a leader and a team member (Wayne *et al.*, 1997). POS builds commitment through mutual exchange; when employees feel valued, they reciprocate with effort and loyalty (Fuller *et al.*, 2003). This builds trust over time.

A review of 558 studies confirms that POS is shaped by how organisations behave. These perceptions, in turn, influence how employees act and feel at work (Kurtessis *et al.*, 2017). POS helps explain how certain workplace practices build commitment (Hutchison, 1997).

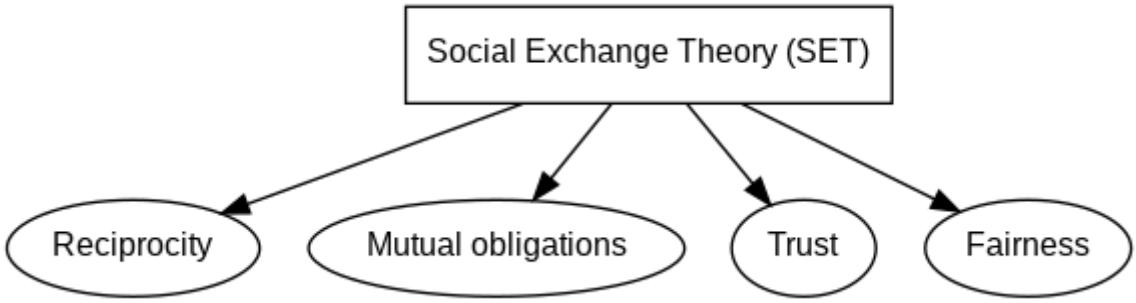


Figure 2-9: Social Exchange Theory

2.4.2.3 Leader-Member Exchange Theory (LMX)

The Leader-Member Exchange theory examines how leaders establish various relationships with team members. Some relationships are built on trust and respect, while others are more transactional (Erdogan & Bauer, 2015). Like POS, LMX is based on social exchange—trust and mutual obligation guide behaviour (Wayne *et al.*, 1997).

High-quality LMX is linked to higher job satisfaction and performance (Erdogan & Enders, 2007). It also shapes how employees see organisational support (Ahmadi *et al.*, 2014), especially when leaders feel supported (Neves & Eisenberger, 2014).

Both POS and LMX drive key workplace outcomes. They encourage safety behaviours (Hofmann & Morgeson, 1999), promote organisational citizenship (Siddiqi & Ahmed, 2016), and lower absenteeism (Neves & Eisenberger, 2014). While LMX develops through leader actions, such as rewards (Wayne *et al.*, 2002), POS depends on broader factors, including fairness and recognition. Understanding both helps leaders build stronger, more effective teams.

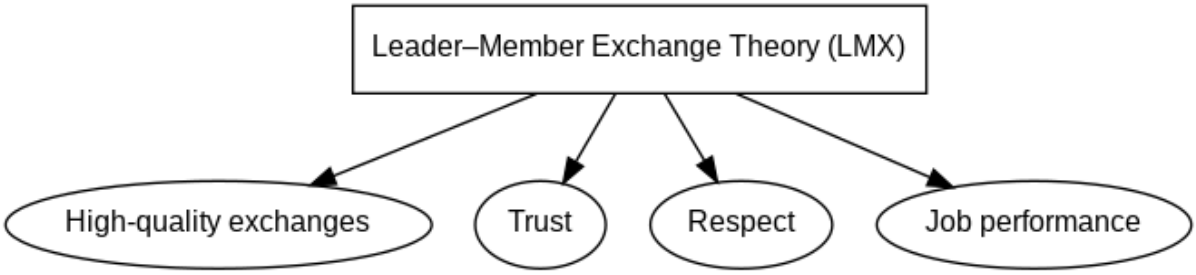


Figure 2-10: Leader-Member Exchange Theory

2.4.2.4 Social Support Theory

POS also comes from Social Support theory, which explains how supportive relationships improve motivation and resilience. POS reflects how employees perceive their organisation's care and appreciation (Caesens & Stinglhamber, 2020; Eisenberger *et al.*, 1986). It grows when workers are treated fairly, led in a supportive manner, and provided with good working conditions (Rhoades & Eisenberger, 2002). When these are present, employees are more satisfied and committed. POS also helps reduce negative behaviours at work (Kurtessis *et al.*, 2017).

POS overlaps with psychological contract theory. This theory examines the unwritten expectations that exist between employees and employers. POS reflects how well the organisation meets these expectations (Aselage & Eisenberger, 2003). While often studied in corporate settings, POS also applies in other fields. For example, supported teachers are more likely to trust their schools (Tasdan & Yalcin, 2010). This shows that POS matters in different workplaces.

Understanding POS is important. It builds trust, improves loyalty, and helps organisations build stronger relationships with their employees (Ahmed *et al.*, 2011; Eisenberger & Stinglhamber, 2011).

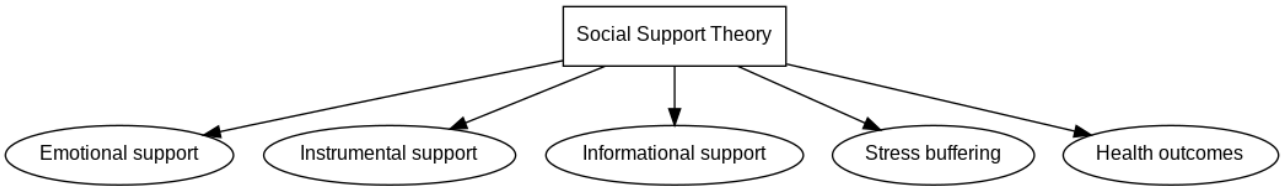


Figure 2-11: Social Support Theory

2.4.2.5 Economic Exchange Theory

Economic Exchange theory, which builds on Social Exchange theory, explains how employees form both economic and social relationships with their organisations (Shore *et al.*, 2006). Economic exchanges focus on clear, measurable rewards, such as salary and bonuses. Social exchanges are built on trust, respect, and shared obligations (Küçük, 2020).

Perceived organisational support is central to this framework. It shows how much employees believe their organisation values their work and cares about their well-being (Ahmed *et al.*, 2011). High POS is associated with a more substantial emotional commitment, higher job satisfaction, and lower intentions to leave (O'Donnell *et al.*, 2012). Economic exchanges, in contrast, are more likely to build continuance commitment, where employees stay because they feel they have to. Social exchanges, however, are better predictors of emotional commitment and stronger work performance (Jiwen Song *et al.*, 2009).

Positional status (POS) and leader-member exchange (LMX) are related but distinct concepts. Both influence important employee outcomes, but they operate at different

levels of influence: POS focuses on the organisation, while LMX focuses on the relationship with a direct supervisor (Wayne *et al.*, 1997).

Understanding these exchange types helps organisations manage employees effectively. Supportive relationships in the workplace can reduce deviant behaviour (Farasat & Ziaaddini, 2013) and help ensure fair treatment for both part-time and full-time staff (Gakovic & Tetrick, 2003).

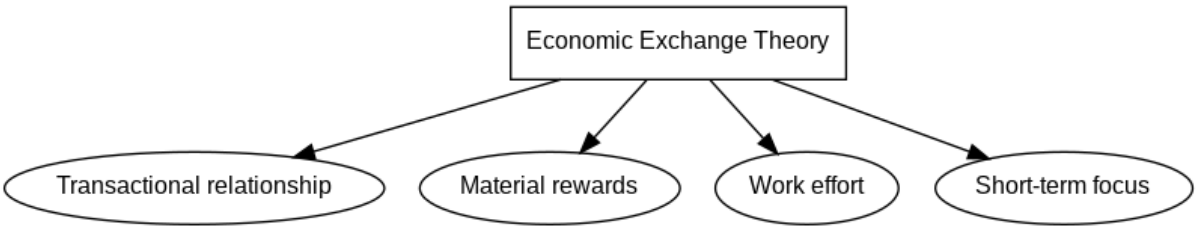


Figure 2-12: Economic Exchange Theory

2.4.2.6 Psychological Contract Theory (PCT)

Psychological Contract theory and Organisational Support theory both explain how employees see their relationship with their organisation. PCT focuses on what employees believe the organisation has promised or owes them. OST focuses on employees feeling valued and supported (Aselage & Eisenberger, 2003).

Research shows that employees are more likely to show organisational citizenship behaviours (OCB) when psychological contracts are fulfilled. This effect is more potent when combined with high perceived organisational support (Sasmita & Suchitra, 2022). Studies also show that POS and psychological contracts together better predict OCB than contract fulfilment alone (Coyle-Shapiro & Conway, 2005). When employees believe promises have been broken, they often feel less supported, especially in workplaces with high internal politics (Kaiser *et al.*, 2011).

There is a two-way relationship between fulfilling the psychological contract and job performance. This relationship depends on how long someone has been with the organisation and how supported they feel (Conway & Coyle-Shapiro, 2012). When employees think their contract is broken, both their core and extra-role work suffer. Feelings of betrayal explain much of this, but strong POS can help reduce the adverse effects (Suazo & Stone-Romero, 2011). Understanding how POS and psychological

contracts interact is crucial for enhancing employee performance and retention (Justin & Eisenberger, 2003).

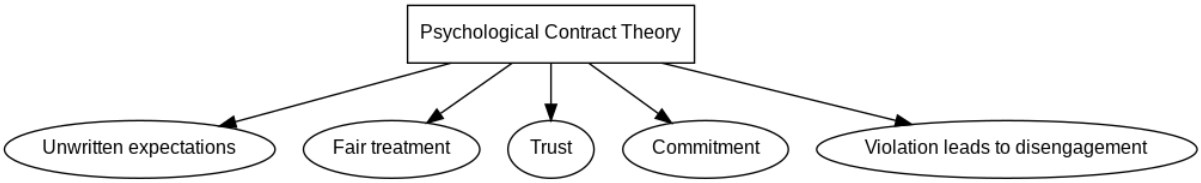


Figure 2-13: Psychological Contact Theory

2.4.3 Measurement of organisational support

Researchers measure perceived organisational support with validated instruments. The Survey of Perceived Organisational Support asks whether employees feel valued and cared for by the organisation (Caesens & Stinglhamber, 2020). Responses offer a direct view of support in daily practice.

Other measures complement this focus. The Organisational Commitment Questionnaire assesses attachment to the organisation (Mowday *et al.*, 1979). Sector-specific tools capture context, including healthcare assessments that map support within clinical settings (Scott *et al.*, 2003). Some scales target support for employee health (Golaszewski *et al.*, 2003). Others examine nursing well-being in depth (Gioiello *et al.*, 2024).

Evidence links perceived support to core outcomes. A large meta-analysis reports strong effects on motivation and retention (Kurtessis *et al.*, 2017). Broader diagnostics now track overall organisational health and performance, showing support as a multi-level phenomenon with cultural, relational, and structural facets (Sethibe & Steyn, 2016).

This study applied the eight-item POS scale developed by Eisenberger and colleagues to engineers in South Africa (Eisenberger *et al.*, 1990). The scale provides a concise and reliable indicator of perceived value and care.

2.4.4 Organisational support in the engineering sector

Perceived organisational support enhances well-being, commitment, and readiness for change among engineers. Employees who feel valued and cared for report higher affective commitment, better psychological health, and greater openness to change

(Mercurio, 2015). Yet many organisations underinvest in supporting engineers as they transition into supervisory and managerial roles, constraining development pathways and retention (Seethamraju *et al.*, 1997). Success in areas such as asset management depends on adapting and utilising proven methods (Mercurio, 2015). Organisational structures that support collaboration, like concurrent engineering, can reduce industry fragmentation (Anumba *et al.*, 2002). Informal support systems often lower stress more effectively than formal ones, especially among cost engineers (Leung *et al.*, 2008). The industry is also undergoing rapid changes, with significant shifts in structure and technology. These changes require more flexibility and diversity (Hoffman, 1989). Engineers need a solid understanding of organisational behaviour to stay competitive, particularly when preparing for leadership roles (Kitchin, 2017). As a result, organisational engineering has become a field focused on managing complex operations across the product life cycle (Ortiz, 2016; Zhang & Zhang, 2014).

Singh *et al.* (2018) examined women engineers in the United States. Their findings showed a mean POS score of 4.41 with a standard deviation of 1.41 on a seven-point scale, based on a sample of 245 engineers. The reported means found by Singh *et al.* (2018) fall slightly above the midpoint of the seven-point scale, indicating that engineers tend to perceive their organisations as moderately supportive. Yet the relatively large standard deviations (1.18–1.41) show considerable variability in experiences. This variability suggests that while some engineers feel well-supported, others perceive weaker support, which has implications for their retention and well-being.

Similarly, Jawahar *et al.* (2007) analysed a sample of technology professionals, including software and hardware engineers. They reported a mean POS of 4.51 with a standard deviation of 1.18 on the same seven-point scale, using data from 120 participants. This showed moderate perceived organisational support levels.

2.4.5 Organisational support in South Africa

Research in South Africa has examined how organisational support affects employee well-being and performance across different sectors. Perceived organisational support improves job satisfaction and work performance among teachers (Chinomona & Sandada, 2014) and helps reduce the impact of workplace bullying on turnover intention (Van Schalkwyk *et al.*, 2011). Work engagement increases when organisations support

employees using their strengths (Botha & Mostert, 2014). For academic staff, support is linked to higher job satisfaction and organisational commitment (Mabasa & Ngirande, 2015). Other studies have evaluated the reliability of job demand-resources scales used in local organisations (Rothmann *et al.*, 2006) and reviewed broader research trends in the field (Schreuder & Coetzee, 2010). Perceived support among nurses and university support staff enhances work engagement and organisational citizenship behaviour (Field & Buitendach, 2011; Mathumbu & Dodd, 2013). Together, these findings confirm that organisational support consistently and positively influences employee experiences in South Africa.

2.4.6 Benefits of POS for organisations and employees

Perceived organisational support (POS) is the degree to which employees believe their organisation values their input and supports their well-being (Eisenberger & Stinglhamber, 2011). High POS leads to stronger job satisfaction, engagement, and organisational citizenship behaviour (Ahmed *et al.*, 2011; Rhoades & Eisenberger, 2002). It also lowers absenteeism and turnover (Sun, 2019). POS depends on organisational fairness, quality of leadership, communication, and Human Resource (HR) practices (Hakeem & Nisa, 2016; Sun, 2019). Supportive leadership, fair processes, and employee empowerment all contribute to higher POS. According to organisational support theory, when employees feel supported, they reciprocate with loyalty and commitment (Beheshtifar & Herat, 2013; Rhoades & Eisenberger, 2002). Strengthening POS is essential to building a resilient and productive workforce.

2.5 Job demand

The discussion begins with the definition and theoretical conceptualisation of job demands, moves to its foundational models, examines various measurement instruments, contextualises job demands within the engineering and South African environments, and ends by highlighting the dual impact of demands on organisational outcomes and employee well-being.

2.5.1 Definition and conceptualisation

Job demand refers to the pressures and requirements placed on employees in the workplace. These include the amount of work required, the speed at which it must be

completed, and the complexity or difficulty of the tasks involved (Van Veldhoven, 2013). The Job Demands-Resources (JD-R) model posits that high demands increase strain, while adequate resources enhance motivation (Schaufeli & Taris, 2013). Workplaces now expect employees to work faster, assume greater responsibility, and learn new skills with increasing overall job demands (Kubicek & Korunka, 2015). Not all demands are harmful; when they are meaningful or achievable, they can contribute to satisfaction and growth (Payne *et al.*, 1988).

The Job Demands-Resources (JD-R) model offers a suitable lens for these dynamics and has been applied across diverse domains, including innovation at work and policing (Hernandez, 2018; Schaufeli & Taris, 2013). Demands, control, and support shape well-being, yet evidence on the effects of their interaction remains mixed, pointing to unresolved questions about combined influences on strain and engagement (Häusser *et al.*, 2010). As work changes, so do the content and intensity of job demands, prompting calls for sharper definitions and improved measurement to sustain valid inference across contexts (Fila, 2016).

2.5.2 Theoretical frameworks

This study's theoretical foundations of job demands are the Job Demands-Resources (JD-R) theory and the Demand-Control-Support (DCS) model.

2.5.2.1 Job Demands-Resources (JD-R) Theory

Job Demands-Resources theory explains how the balance between job demands and job resources drives strain and motivation at work (Bakker & Demerouti, 2014). Building on earlier job design and stress models, JD-R specifies two linked processes—health-impairment under excessive demands and a motivational pathway under adequate resources—to account for employee well-being and performance (Bakker & Demerouti, 2007). Compared with the Job Demand-Control-Support tradition, JD-R offers a broader and more adaptable framework that accommodates diverse occupations and contexts (Bakker & Demerouti, 2007; Hur *et al.*, 2013; Ibrahim & Ohtsuka, 2014). In this model, demands are aspects of work that require sustained effort and can produce strain, whereas resources are features that enable goal attainment, learning, and growth; together they shape both exhaustion and motivation (Demerouti *et al.*, 2001). Recent work extends JD-R by modelling personal resources alongside job resources, testing

multilevel effects at team and organisational levels, and examining how employees actively manage or craft their demands and resources (Tummers & Bakker, 2021). JD-R also aligns with the Conservation of Resources theory, which views people as striving to protect and build resource reservoirs over time (Bon & Shire, 2022). Its flexibility and evidence base have made JD-R a leading approach for supporting employee health and organisational outcomes in contemporary workplaces (Bakker *et al.*, 2023).

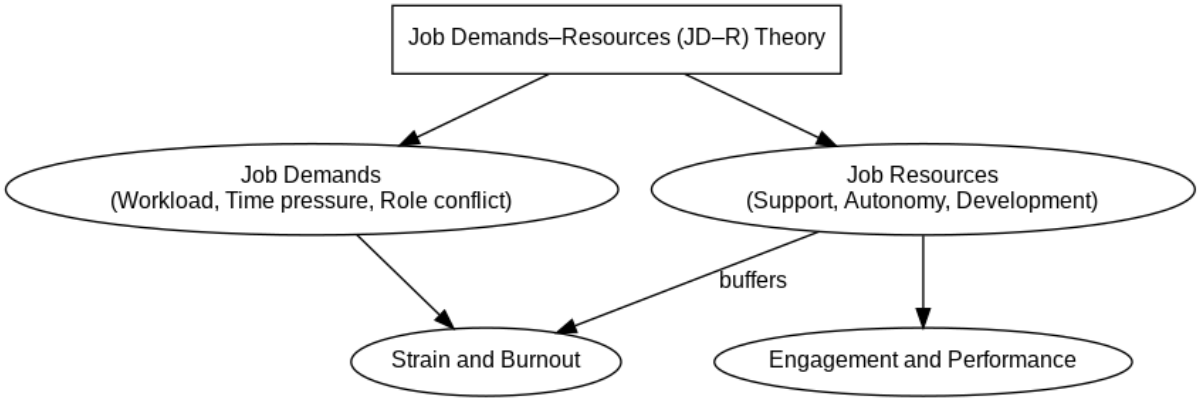


Figure 2-14: Job Demand-Resource Theory

2.5.2.2 Demand-Control-Support (DCS) Model

The Demand-Control-Support model, introduced by Karasek (1979) and further developed by Johnson and Hall (1988), posits that job stress increases when demands are high but control and support are low (Kain & Jex, 2010; McClenahan *et al.*, 2007). This model is commonly used in workplace stress research, although findings vary (Häusser *et al.*, 2010; Van der Doef & Maes, 1999). Most studies confirm that demands, control, and support each have an impact on well-being. However, their interaction is less consistent (Häusser *et al.*, 2010; Luchman & González-Morales, 2013). Methodological problems, including reliance on self-reports, use of cross-sectional designs, and different definitions of concepts, have limited the results (Fila, 2016; Kristensen, 1995).

To enhance future research, scholars recommend employing long-term studies, collecting objective data, and tailoring the model to specific job contexts (Kain & Jex, 2010; McClenahan *et al.*, 2007). Despite these challenges, the DCS model remains a key framework for understanding job stress (De Jonge *et al.*, 2000; Fila, 2016).

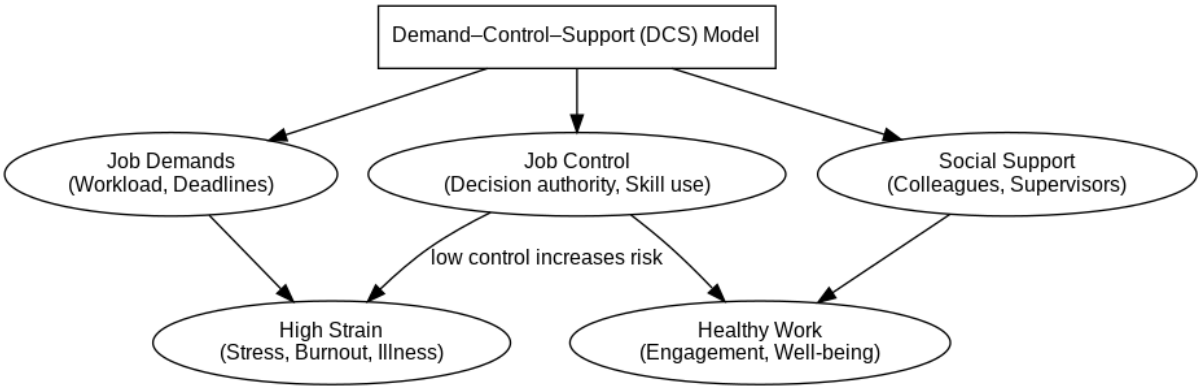


Figure 2-15: Demand-Control-Support model

2.5.3 Measurement of job demands

Researchers use a diverse toolkit to assess job demands and resources across occupations. Widely adopted measures include the Job Characteristics Questionnaire, which captures job and organisational attributes (Popov *et al.*, 2025), and the Intensification of Job Demands Scale, which indexes pressures arising from rapid change (Kubicek *et al.*, 2015). Profession-specific instruments extend this base: physical education teachers employ a tailored scale for their domain (Zhang & Chen, 2017), and healthcare studies apply JD-R-aligned tools to evaluate the well-being of nurses and physicians (Boskma *et al.*, 2024). Emerging methods now incorporate wearable sensors to quantify physical demands in real time with minimal disruption (Stirling *et al.*, 2024).

Broader frameworks such as Person-Environment Fit and the Demand-Control model continue to inform stress research in varied contexts (Abbas *et al.*, 2013). Methodologically, scholars advocate objective indicators, triangulated data sources, and critical construct reviews to strengthen validity and practical relevance (Hurrell Jr *et al.*, 1998a). Consistent with these principles, the present study employed the Job Demand Scale from the Brief Job Stress Questionnaire (BJSQ), developed and validated by Kawada and Otsuka (2011).

2.5.4 Job demands in the engineering sector

Studies across various sectors indicate that job demands have a significant impact on employee well-being. Research in Malaysia has found that high job demands increase stress and lower psychological health among engineers (Amin *et al.*, 2024; Rahim & Siti-Rohaida, 2015). Young engineers who changed jobs experienced fewer demands and

less strain (Newton & Keenan, 1990). The Job Demands-Resources (JD-R) model has been confirmed in multiple fields, including industry (Bakker & Demerouti, 2007). In nursing, emotional demands shaped work engagement (Patience *et al.*, 2024). In technology, the Triple-Match Principle suggests that job demands must align with available resources to minimise strain (Van de Ven & Vlerick, 2013). Janssen (2000) found that job demands increased innovative behaviour when rewards were considered fair.

Bowen *et al.* (2014a) examined job demands among construction project consultants, including civil engineers, architects, and project managers. Using the Job Demand-Control-Support framework, they reported mean scores of 19.77 with a standard deviation of 3.49 for men and 19.21 with a standard deviation of 4.05 for women, on a scale ranging from 5 to 27. These values place engineers in the upper midrange of the scale. This suggests frequent exposure to time pressure, long hours, and pressure to demonstrate competence. The consistency between male and female averages indicates that both groups face comparable levels of demand.

2.5.5 Job demands in South Africa

South African research has explored job demands in the mining, agriculture, and higher education sectors. The JD-R model was tested locally, identifying job insecurity, support, overload, and advancement as key factors (De Beer, 2012; Rothmann *et al.*, 2006). Job resources, such as growth opportunities and support, helped academics stay motivated (Rothmann & Jordaan, 2006): academics faced high job demands but often lacked matching resources (Barkhuizen *et al.*, 2014). For workers with hearing impairments, communication demands and sensory distractions were significant challenges (Chelius *et al.*, 2022). In farming, physical resources were the most important (Asiwe *et al.*, 2015). Among mineworkers, personal and job resources shaped the link between demands and engagement (Kotzé & Nel, 2019). Self-directed learning has been shown to improve job satisfaction among South African women (De Bruin & Yiannakis, 2012).

2.5.6 Benefits for organisations and employees

Job demands encompass the physical, emotional, and cognitive efforts required to fulfil work responsibilities. If supported by adequate job resources, high demands can lead to motivation, enjoyment, and commitment (Bakker & Demerouti, 2007). However, when

demands outweigh resources, employees face stress, emotional strain, and reduced performance (Nauman *et al.*, 2021). Emotional intelligence can mitigate these effects, but persistent overwork without support increases risk. Job resources—such as autonomy, support, and development opportunities—strengthen engagement and reduce the adverse impact of workload (Wagh, 2025). Perceived organisational and family support also help manage job demands and reduce work-life conflict (Nasurdin & O'Driscoll, 2012; Owolabi & Olowodunoye, 2019). During remote work periods, such as the COVID-19 pandemic, clear communication from managers helped reduce stress associated with role ambiguity and conflicting priorities (Shin *et al.*, 2025). Organisations that balance workload with meaningful resources protect employee well-being and improve productivity.

2.6 Relationship between work-life balance and occupational stress

Research indicates that as the balance between work and life improves, job satisfaction becomes more positive, and conversely, as the balance becomes unhealthy, stress worsens (Pretorius, 2022). A recent study quantified the relationship between occupational stress and work-life balance among employees working from home and the office (Vispute & Kothari, 2023). The research revealed an elevated level of occupational stress among office employees. The relationship results indicate a substantial relationship between contact relationship and occupational stress, as well as between work and work achievement and occupational stress. The results indicated that occupational stress has a considerable influence on the balance between work and life among employees (Thilagavathy & Geetha, 2021). Fisher (2001) defines “imbalance” as occupational stress, including a lack of time and energy for off-work activities after long working hours, and the feelings towards work and personal life (Irfan *et al.*, 2023:3). This statement by Fisher also lends meaning to the items, “I come home from work too tired to do things I would like to do”, and “My job makes it difficult to maintain the kind of personal life I would like.”

The relationship between work-life balance and occupational stress is essential in understanding employees’ productivity and well-being. Occupational stress negatively affects both personal and professional life, impacting work-life balance. Previous studies have demonstrated that occupational stress is linked to high absenteeism, low productivity, and poor work performance (Manivannan *et al.*, 2022). Stress can have a

negative influence on mental and physical health (Irfan *et al.*, 2023:2). High demand in work and private life, and long working hours increase the risk of developing depression, anxiety or sleep disorder (insomnia) by 60%, a lack of support by 38%, limited growth opportunity or feeling valued by 49%, and having little control in everyday life by 42%. These stressors can have a significant impact on mental health (Sutton, 2023:22).

A poor work-life balance can lead to increased stress levels among employees. Stress levels may rise when individuals struggle to balance job demands with their personal and family responsibilities. Chronic stress, worry, depression, sadness, anxiety, and irritability have an opposing effect on creativity, and engineers need to be creative in their daily work to solve problems (Sutton, 2023:194). A study done on construction workers in India shows that occupational stress might be linked to interpersonal conflict, organisational culture, work environment, and personal characteristics and that high levels of occupational stress are observed among construction engineers (Manivannan *et al.*, 2022). There is limited research available to understand the relationship between work-life balance and occupational stress among engineers, particularly in South Africa.

Occupational stress is a harmful physical state of worry and emotional responses or mental tension caused by difficult situations when the job requirements do not match the employee's abilities, resources, or requirements (Manivannan *et al.*, 2022:29; World Health Organisation, 2020). Work stress has been linked with adverse effects on employees' psychological and physical well-being in many occupations. How a person responds to stress makes a big difference in their overall well-being (World Health Organisation, 2023).

Engineers require specific skills, including problem-solving, creativity, stress management, teamwork, communication, attention to detail, leadership, critical thinking, adaptability, resilience, ethical judgment, and social awareness (IET, 2023; Indeed, Editorial Team, 2024b). . High stress levels and job demands can influence how an engineer applies the required skills. Research indicates that engineers must develop resilience in addressing the challenges and stress mentioned above, as resilience can foster positive psychological well-being among employees. Resilience has a positive impact on work outcomes, including satisfaction, engagement, and performance (Ibrahim & Hussein, 2024:2).

Employees who have a better balance between work and life are often more satisfied with their jobs. Job satisfaction can act as a buffer against occupational stress. Conversely, those who face difficulty balancing work and personal life may experience reduced job satisfaction, which can contribute to stress (Fisher *et al.*, 2009; Manivannan *et al.*, 2022). Pressure at the workplace is inevitable in today's busy working life, where time is seen as a commodity. Not all stress is bad, and sometimes it can motivate and keep workers alert, enabling them to cope with stress, learn, and perform their tasks effectively, depending on the resources available and individual characteristics. However, when the job demands and pressure become too much or unmanageable, it can lead to stress. Unwanted stress can have a negative impact on both employees and employers (World Health Organisation, 2020). A balanced approach to work and life helps prevent burnout, a state of chronic physical, psychological, and emotional exhaustion. Burnout is often associated with prolonged exposure to high levels of occupational stress, and maintaining a proper work-life balance can be a protective factor (Infinite Potential, 2023; Psychology Today, 2023).

Extended exposure to occupational stress due to an imbalance between work and personal life can have harmful effects on physical and mental health. The imbalance includes an increased risk of conditions such as psychological anxiety, distress, depression, burnout, and cardiovascular problems. Occupational stressors linked with psychological disorders include job strain, effort-reward imbalance, jobs with high demands and low resources, job insecurity, organisational injustice, bullying, harassment, mandatory overtime, and work-life conflict. Job strains occur when the job has high demand but low control or reward (Landsbergis *et al.*, 2017:15). If one considers the JDC model and Karasek's (1979) research, it becomes clear that when demand is high, the control is low, one can perceive the job as a high-demand job, and the same with the effort-reward imbalance theory or model, where the model can also be considered, where the work effort is more significant than the reward (Siegrist *et al.*, 2004b; Stanhope, 2017).

Organisations can implement interventions and support programmes to promote work-life balance and reduce occupational stress. These programmes may include employee assistance programmes, stress management workshops, and policies that encourage a healthy work-life balance. Understanding and addressing the relationship between work-life balance and occupational stress is vital for employers and employees. Striking a

balance contributes to a healthier and more satisfied workforce, leading to increased productivity and organisational success.

2.7 Mediator role of organisational support

Organisational support is crucial in mediating the balance between work and life, as well as occupational stress, specifically where work-life balance is negatively related to job stress and positively related to job satisfaction and commitment (Aruldoss *et al.*, 2022:240). When employees perceive elevated levels of support from their organisation, it can help alleviate the stress they experience, as they believe the organisation can mitigate stressors such as work overload, burnout, role ambiguity, and role conflict, among others. Research also indicates that reduced support from the organisation increases job-related stress levels because the support fails to fulfil employees' socio-emotional needs (Xu & Yang, 2021:403). By providing the necessary support, organisations can help employees manage their work and personal responsibilities more effectively, reducing the stress of balancing the two. Reducing job stress can lead to improved job satisfaction and overall well-being. Organisational support can also help shield the adverse effects of job stress, lowering feelings of exhaustion and inefficacy (Xu & Yang, 2021).

Empirical evidence supports the idea that organisational support mediates between work-life balance and occupational stress. Several studies show that Perceived Organisational Support (POS) mediates essential relationships in the workplace. During the COVID-19 pandemic, POS reduced the effect of occupational stressors on frontline nurses' compassion fatigue (Liu *et al.*, 2024b). In another study, POS influenced work-life balance through felt obligation and organisational engagement among academics in China and Malaysia (Tan *et al.*, 2024). These results suggest that when employees feel supported, they are more engaged and motivated to maintain a balance between work and life.

High-performance work systems also rely on POS to boost creativity. In Chinese chemical firms, POS explained how supportive HR practices led to creative behaviours (Tang *et al.*, 2017). In Jordanian banks, POS mediated the effect of transformational leadership on creativity (Suifan *et al.*, 2018). A study found that transformational and transactional leadership styles affected organisational citizenship behaviour through POS (Asgari *et al.*, 2020). POS also shapes how employees respond to talent management strategies.

In Ghana's banking sector, POS influenced affective commitment and reduced the intention to quit (Mensah, 2019). Supervisor support has a similar impact. Khan *et al.* (2015) found that POS partially explained how supervisor behaviour affected workplace deviance. Cultural factors also matter. In a study across cultures, POS mediated the effect of cultural values on job satisfaction and commitment. Collectivist values strengthened POS, leading to more positive outcomes (Foley *et al.*, 2006).

Job design and fairness also interact with POS. Among Italian teachers, POS fully explained the link between job crafting and job satisfaction (Ingusci *et al.*, 2016). In pharmaceutical sales, POS fully mediated the impact of procedural and distributive justice on affective commitment (Ravi Kumar *et al.*, 2001). Other studies confirmed similar patterns. POS strengthened the link between justice and satisfaction (Nazir *et al.*, 2019), particularly when employees felt a strong commitment to their work groups.

Leadership style further enhances this dynamic. POS helped explain how authentic leadership increased engagement (Vermeulen & Scheepers, 2020) and how servant leadership influenced creativity by boosting perceived competence (Thao & Kang, 2018). Ultimately, POS plays a crucial role in determining readiness for change. When employees viewed organisational practices as fair, POS helped them feel more open to change (Kebede & Wang, 2022). Together, these studies confirm that POS is a powerful mechanism through which workplace factors shape attitudes, behaviours, and outcomes. This relationship is particularly salient in public sector organisations where resistance to change is a significant barrier. POS is central to explaining how motivation impacts employee retention. Shah and Asad (2018) found that intrinsic and extrinsic motivation predicted retention through POS in Pakistani banks. Their study confirmed that POS strengthens the motivational mechanism by enhancing employees' belief that their efforts are recognised and rewarded, which increases their likelihood of staying with the organisation. Foley *et al.* (2006) illustrated how POS mediates the effect of justice perceptions on organisational commitment and turnover intention. They reported that procedural and distributive justice enhance POS, strengthen commitment, and reduce intent to leave. Their study emphasised the integrative role of POS in the justice-commitment-turnover pathway, confirming its relevance in contexts such as professional services, including law firms.

Sihag (2021) examined the relationship between psychological capital and employee engagement, finding that psychological capital fully mediated its influence on employee engagement. This suggests that positive psychological states (hope, optimism, self-efficacy, resilience) only translate into engagement when employees also perceive organisational support. The study underlines the synergistic value of psychological resources and structural support in sustaining engagement.

2.8 Mediator role of job demand

Gan and Kee (2024) investigated the effect of psychosocial safety climate (PSC) on the work engagement and job satisfaction of young academics. They found that job demands mediated this relationship. A supportive PSC reduced job demands, which improved engagement and satisfaction. Kloutsiniotis and Mihail (2020) employed the JD-R model to investigate the impact of high-performance work systems (HPWS) on emotional exhaustion. Their results showed that job demands partially mediated the link between HPWS and emotional exhaustion. Poorly managed high-performance systems increased job demands and harmed employee well-being.

Hessels *et al.* (2017) compared stress levels between self-employed individuals and wage workers. Their findings showed that job demands partly mediated the relationship between self-employment and stress. Self-employed individuals with employees experienced higher job demands and stress levels compared to those without employees. Kim *et al.* (2020) found that supervisors' workaholism increased subordinates' turnover intentions by exacerbating job demands, such as workload and interpersonal conflict. Job demands are thus linked to supervisors' behaviours, which in turn are associated with employee exhaustion and turnover.

An *et al.* (2021) explored the link between core self-evaluations (CSEs) and workaholism. They found that individuals with lower emotional stability and higher self-efficacy perceived more job demands, which led to higher workaholism. Wood *et al.* (2020) demonstrated that work-nonwork supports influence well-being by modifying job demands. Although these supports were tied to increased demands, their impact was weaker than job control and supportive management.

Maas *et al.* (2022) investigated social support from school principals and teachers about their basic psychological needs. Their research showed that "unclear organisational

conditions" mediated the relationship between support and need satisfaction. This highlighted the key role of job demands in the school setting. Atiku and Van Wyk (2024) examined leadership practices and work engagement in Namibian higher education. They found that job demands fully mediated the relationship between leadership and engagement. Finally, Van De Voorde *et al.* (2016) studied healthcare employees and found that job demands negatively mediated the relationship between labour productivity and work engagement. Higher productivity expectations increased job demands and reduced engagement.

2.9 Conceptual framework

The conceptual framework positions work-life balance as the independent variable and occupational stress as the dependent variable, with organisational support and job demands as mediators. The framework integrates several theories to explain how these constructs interact in shaping engineers' experiences of stress.

Work–life balance has a direct influence on occupational stress. Role theory suggests that conflicting or unclear role expectations contribute to strain when individuals are unable to meet competing demands across work and family domains (Kahn *et al.*, 1964). In line with the Conservation of Resources (COR) theory, stress arises when valuable resources, such as time, energy, or emotional capacity, are threatened or depleted (Hobfoll, 1989; Hobfoll, 2001). Poor work-life balance therefore increases stress, while a stronger balance preserves resources and lowers strain. Organisational support is positioned as a central mediator of strain and performance. Organisational Support theory proposes that employees form global beliefs about whether the organisation values their contribution and cares for their well-being; higher perceived support strengthens commitment, satisfaction, and discretionary effort (Eisenberger *et al.*, 1986; Rhoades & Eisenberger, 2002). Supportive practices—flexible scheduling, credible recognition, fair procedures—buffer the effects of poor balance by expanding coping resources and signalling care (Rhoades & Eisenberger, 2002).

Job demands operate as a second mediator. The Job Demands-Resources model links heavy workloads, time pressure, and role overload to energy depletion and strain, while adequate resources promote engagement and resilience (Bakker & Demerouti, 2007). The Demand-Control-Support model reaches a similar conclusion: stress rises when high

demands coincide with low control and weak support (Karasek, 1990). These dynamics explain why employees may experience stress even when personal work-life balance practices are strong, if task loads remain unmanageable.

Taken together, occupational stress reflects the joint effects of balance, support, and demands. An effective framework, therefore, targets more than individual time management. It builds supportive organisational practices and calibrates job demands to sustainable levels to reduce strain and protect performance in engineering settings (Bakker & Demerouti, 2007; Karasek, 1990; Rhoades & Eisenberger, 2002; Theorell, 1992).

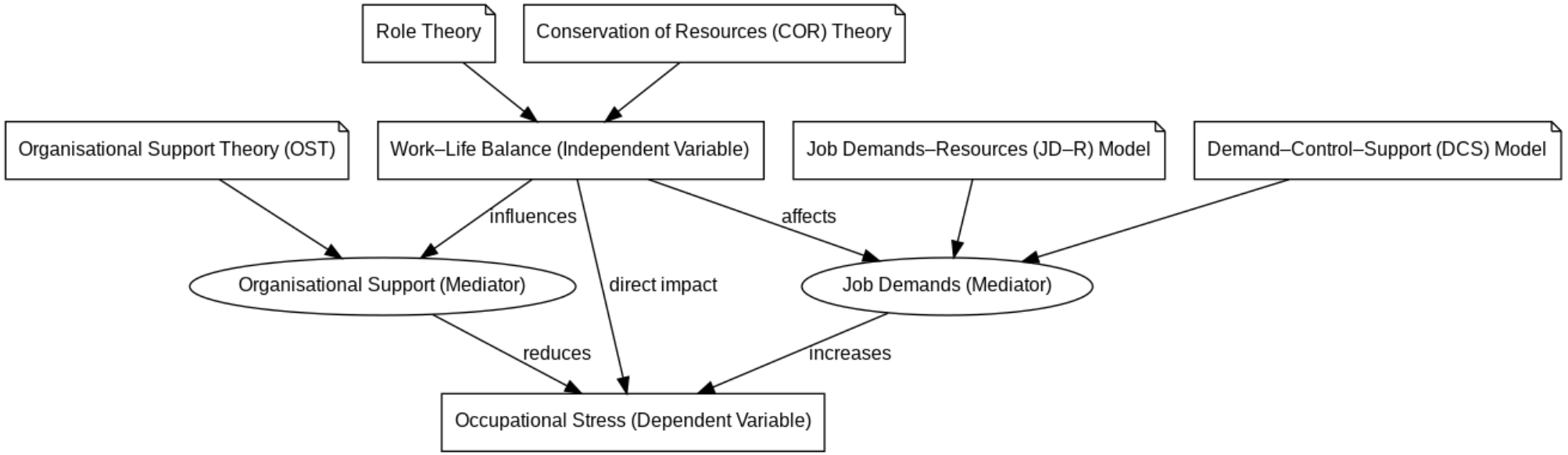


Figure 2-16: Conceptual framework

2.10 Gaps in the current research

Current research on work-life balance (WLB) in engineering is limited in both scope and depth. Many studies apply rigid, one-size-fits-all definitions that overlook cultural and personal differences. These studies often fail to examine how WLB needs shift over a professional career or how digital technologies and remote work reshape boundaries (Khadgi & Tamang, 2024). Most investigations use cross-sectional designs, which do not show how WLB patterns evolve over time (Chen *et al.*, 2024). Gender-specific experiences, particularly among women in male-dominated environments, remain underexplored or superficially addressed (Francis, 2004; Purang *et al.*, 2024).

Research on occupational stress in engineering faces both conceptual and methodological issues. The tools used are rarely designed for engineering contexts, which limits their ability to capture unique job-related pressures (Gajjar & Amarnath, 2021). There is also a lack of comparative studies across engineering fields, meaning sector-specific stressors are poorly understood. Few studies assess the physical effects of long-term stress, such as burnout or musculoskeletal problems (Rothmann & Malan, 2006). Although coping strategies are sometimes discussed, they are not analysed systematically. Likewise, the role of the organisation in managing stress is largely ignored.

Perceived organisational support (POS) is an understudied and underresearched concept in engineering. While some research links POS to job performance, there is a lack of focus on how engineers perceive support and its impact on their stress levels and work-life balance (WLB) (Desa & Asaari, 2020). Most studies generalise across engineering fields, ignoring differences in work demands or gender. The role of remote work in shaping support perceptions is also missing. Studies rarely distinguish between formal support policies and their effectiveness or accessibility. There is a need for longitudinal and mixed-method approaches to understand the development of support perceptions over time.

Research on job demands tends to treat them uniformly across engineering roles, limiting our understanding of how technical, emotional, and cognitive demands interact. Few studies distinguish between long-term job demands and short-term project stressors (Atiku & Van Wyk, 2024). The models used are often outdated and do not reflect current

workplace realities. Most findings come from cross-sectional studies, which offer limited insight into how job demands, and stress interact over time.

While it is generally accepted that poor work-life balance (WLB) increases stress, this relationship has not been adequately investigated in the engineering field. Studies often treat work-life balance (WLB) and stress as separate variables without examining their interaction and mutual influence. Longitudinal research is lacking, making it challenging to understand how this relationship unfolds over time (Cheung *et al.*, 2022). Studies also fail to consider how different engineering sectors or gender dynamics shape this connection.

POS has not been studied as a mediator between work-life balance (WLB) and stress in the engineering field. Although it is linked to performance outcomes, there is no evidence to suggest whether POS helps buffer the adverse effects of poor work-life balance (WLB) on stress (Desa & Asaari, 2020). This is a key gap, especially as organisations seek to improve employee well-being through support initiatives. Without mediation models, it is challenging to understand how and when support is effective.

The role of job demands in the WLB-stress link is also unexplored. Although job demands are often considered stressors, few studies explain how they mediate work-life balance (WLB) outcomes. There is a lack of clarity regarding which types of job demands are most significant and how their intensity evolves (Farhan *et al.*, 2019). The lack of detailed models means organisations have little guidance for managing the workload in a way that supports well-being.

2.11 Summary

This chapter synthesised current theoretical and empirical literature on the four primary constructs central to the study. Work-life balance was examined through Role theory and COR theory, highlighting how individuals strive to manage conflicting demands of their roles. The discussion on occupational stress drew on multiple established models, including the Job Demand-Control model, the Effort-Reward Imbalance model, and the Transactional model of Stress and Coping, to explain how environmental demands and limited resources contribute to elevated stress levels among professionals.

Organisational support was conceptualised using Organisational Support theory and Social Exchange theory, clarifying the reciprocal relationship between perceived support and employee outcomes. Similarly, job demands were theorised using the JD-R and DCS models, which revealed that unmoderated demands undermine motivation and health, particularly in engineering environments.

The review highlighted substantial empirical evidence supporting the mediating roles of organisational support and job demands in the relationship between work-life balance and occupational stress. While numerous studies explore these constructs independently, fewer integrate them within a unified framework, especially in the engineering sector and the South African context. This gap highlights the relevance of the current study, which proposes an integrated framework to investigate how perceived support and workload pressures mediate the relationship between work-life balance and occupational stress. The framework aims to contribute theoretically to existing models and offer practical insights for organisational policy and wellness interventions.

CHAPTER 3 RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

Professionals in the complex and demanding engineering field face significant challenges in maintaining a healthy balance between work and private life while managing occupational stress. Factors such as immense pressure from demanding workloads, technical complexity, and inflexible deadlines create an unstable balance between personal and work life, thereby increasing occupational stress. Constant stress negatively impacts an individual's well-being and job performance. Therefore, this study aims to develop a framework that examines the relationship between work-life balance and occupational stress among engineers in South Africa.

The mediator roles of organisational support and job demand in this relationship are also reviewed to indicate whether they positively or negatively affect the relationship. To achieve this, the following research objectives were formulated:

- to assess the levels of work-life balance among engineers in South Africa
- to evaluate the occupational stress levels experienced by engineers in South Africa
- to investigate the organisational support levels of engineers in South Africa
- to determine the job demand levels faced by engineers in South Africa
- to examine the impact of work-life balance on occupational stress among engineers in South Africa
- to explore the mediating role of organisational support in the relationship between work-life balance and occupational stress among engineers in South Africa

Engineering is characterised by high job demand, complex projects, and strict deadlines, which can increase stress and decrease work-life balance (Indeed Editorial Team, 2022a; Malan & Rothmann, 2003; Staff Writer, 2022). Rapid technological advancements and the constant pressure to innovate and meet project deadlines intensify these stressors. Consequently, understanding the factors that can alleviate this stress, such as organisational support, is crucial for individual well-being and organisational efficiency.

In this context, organisational support refers to the resources, assistance, and policies the employer provides to help employees manage their work and personal lives. Organisational support can significantly impact an engineer's ability to balance work and life demands and reduce occupational stress (Indeed Editorial Team, 2024a; Irfan *et al.*, 2023; Xu & Yang, 2021). Organisational support and support from family or friends are crucial for an engineer's well-being (Sun, 2019; Xu & Yang, 2021:403). High job demands, workloads, time constraints, and task complexity influence how engineers experience stress and balance their work with their personal lives. These demands are not just circumstantial factors; they directly affect how engineers perform and feel at work.

The study employs a structured data-driven method to examine the mediating effect of organisational support and job demand on an engineer's work-life balance and occupational stress levels. In this study, IBM SPSS version 30 is used to analyse the data and evaluate the hypothesised relationships, and IBM AMOS version 30 is used for Structural Equation Modelling (SEM).

The goal is to establish a clear framework that explains the relationship between work-life balance, occupational stress, organisational support, and job demand among engineers in South Africa. These understandings and findings can influence organisational policies and practices, creating a more supportive and balanced work environment for engineering professionals.

The following sections focus on the analytical techniques and methods used to achieve the research objectives.

3.2 Research philosophy

Researchers need to understand the epistemological philosophies that inform their choice of theoretical approaches, data interpretation instruments, and data collection methods. Two significant research approaches are available in research: qualitative and quantitative (Bryman *et al.*, 2019:31). This study employs a post-positivist research philosophy, together with a quantitative research approach.

Post-positivism in human resource management and organisational behaviour research assumes that social reality is measurable and knowable, although challenging to access (Bisel & Adame, 2017). Post-positivism tries to find common ground and balance between

positivist and interpretivist approaches (Panhwar *et al.*, 2017:253). The post-positivist approach is growing its influence in a broader field, with positivist studies still dominant in major journals (Primecz, 2020:124). However, critics argue that positivism alone is insufficient for understanding twenty-first-century organisations, as it neglects human experiences and subjective influences (Uduma & Sylva, 2015). Post-positivistic philosophy focuses on interpreting lived experiences rather than predict or control them (Gale & Beeftink, 2006). Some researchers advocate for a mixed-method approach, combining positivist and interpretive perspectives (Uduma & Sylva, 2015:44). However, this study will adopt a post-positivist metatheoretical perspective with a quantitative research approach. When conducting cross-cultural research, grounded theory methods are proposed as an alternative to traditional positivist and post-positivist approaches, as they consider both culture and language (Gales, 2003). There is a growing call for more paradigm reflexivity, non-mainstream research, and new paradigmatic directions in international human resource management (Primecz, 2020; Reissner & Whittle, 2021).

A post-positivist metatheoretical philosophy supports this study because it brings a balance between empirical analysis and recognition of the limits of objectivity. This study only considers quantitative methods to examine the relationships among work-life balance, occupational stress, perceived organisational support, and job demands. Post-positivism recognises that the different work-life balance theories are subject to favouritism in forming data. The influence of the context of engineers in South Africa, particularly cultural and South African engineering history, is acknowledged by post-positivism and continues to enable complex analysis in the research. Post-positivism, together with the quantitative approach, supports advanced statistical analysis methods, such as SEM, without assuming absolute certainty, thereby providing a more realistic foundation for social research in the South African engineering context.

3.3 Research methodology

The following section examines the research methodology, which employs a systematic and scientific approach, including techniques and procedures used to analyse and identify information on engineers' work-life balance and organisational stress in South Africa (Bryman *et al.*, 2019:283). Qualitative and quantitative research methods have merit. Qualitative research is inductive, generating theories from data, and has become more persuasive since 1980 (Bryman *et al.*, 2019:30). This study employs a quantitative

approach to test the hypotheses related to work-life balance, occupational stress, organisational support, and job demand. Quantitative research has an epistemological orientation with a natural science model and extensive positivism, but also post-positivism with an objective approach (Bryman *et al.*, 2019:31).

The quantitative research methodology was employed to investigate the effect of a low balance between work and life on engineers, the influence of occupational stress, and how organisational support and job demands affect this relationship. This study uses numerical values to present its findings, assigning a numerical value to each question. The results are quantifiable, achieved through the collection and analysis of numerical data. Quantitative research measures the differences in results and develops a dependable device to measure and evaluate the relationships between the constructs (Whitley & Kite, 2013:33). Quantitative research is deductive and objective, utilising natural science and empirical tests to evaluate theories. It underlines and quantifies collected data, analysing the influence of occupational stress on a balanced lifestyle and how organisational support and job demand can positively influence this relationship (Bryman *et al.*, 2019:41).

Over time, quantitative HR research has expanded its focus, methods, and data sources (Coron, 2022). However, treating it purely as a measurement tool risks overlooking key issues such as bias, subjectivity, and workplace conflict. Experts argue that the organisational and cultural context must always be a part of the analysis (Sanders *et al.*, 2014).

This approach suits the current study. It helps measure how job demands, occupational stress, work-life balance, and organisational support relate to each other among engineers in South Africa. The study employs structured surveys and statistical tools, including Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM), to test the model and assess its accuracy. These methods offer consistency, make the study easy to repeat, and handle large amounts of data efficiently. The focus on measurable variables supports findings that can inform more effective company policies and workplace changes.

As mentioned earlier, quantitative research has been used to investigate the balance between work and life, occupational stress, organisational support, and job demand in various fields and topics globally; however, these variables have not been examined

together, specifically in the context of engineers in South Africa. This study will test specific theories and utilise other studies on this subject to investigate the work-life balance of South African engineers, focusing on local and global projects. (Bowen, Edwards*, et al.*, 2014b).

The goal of the research is to test the different WLB, OS, POS, and JD theories and provide evidence-based insights. The quantitative design aligns with the research questions and the practical needs of the engineering field.

3.4 Research design

This section refers to the research design, which includes the research plan, framework or structure, outlining the methods, processes, and procedures used to collect and analyse data. The design consists of questions, sampling procedures, data collection methods, and a statistical analysis procedure. The research design is a structured approach that addresses the research questions, ensuring that the research goals are met reliably and are valid. Research design is vital for research that wants to add value, as it directly impacts the study's credibility, quality, and outcomes (Bryman *et al.*, 2019:382; Hassan, 2024a).

This study answers the questions using a cross-sectional, correlational survey design (Bryman *et al.*, 2019:106). The data is collected at a single point in time. In this case, the data was collected over ten months; therefore, it is a cross-sectional correlation design and not a longitudinal study (Bryman *et al.*, 2019:105; Trochim & Donnelly, 2001:6). A cross-sectional correlational survey design is considered the synchronisation of two or more variables, meaning that a high workload will increase occupational job stress. However, organisational support can buffer this increase in stress (Trochim & Donnelly, 2001:6). It also avoids complications associated with tracking changes over time, which helps isolate the associations between constructs such as work-life balance, stress, job demands, and support (Trochim & Donnelly, 2001).

The focus of the research is to identify relationships, not proving connectedness. A correlational design tests the statistical relationship between variables (Bryman *et al.*, 2019:376). It helps determine whether factors like perceived organisational support or job demand affect the work-life balance or occupational stress of engineers in South Africa.

To validate and strengthen the relationship between the variables, the research employs correlation coefficients and Structural Equation Modelling (SEM). This correlation design fits well with a quantitative, post-positivist approach. The study depends on standard tools, precise measurements, and structured data analysis. The correlation design helps keep the results consistent, objective, and generalisable (Bryman *et al.*, 2019). The goal is to test theories in a structured way, and a cross-sectional, correlational design supports that goal.

3.5 Target population and sampling strategy

The population of interest in this study was all engineers registered with the Engineering Council of South Africa (ECSA). According to the 2022/2023 ECSA Annual Report, this included 18,939 professional engineers (ECSA, 2023). These professionals are affiliated with fifty-one voluntary associations formally recognised under ECSA's Board Notice 60 of 2017, which sets the rules and requirements for recognition (ECSA, 2025). The voluntary associations were identified as the most appropriate clusters for accessing the target population.

The initial plan was to distribute the questionnaire through all associations. This would have provided proportionate coverage of the engineering population and allowed for a probability-based sample. A probability-based design would have made it possible to generalise findings statistically to the entire ECSA population.

Recruitment through voluntary associations presented significant challenges. Each association served as a gatekeeper to its members, holding strict control over its membership databases. Despite repeated efforts to contact all fifty-one associations, most refused to distribute the questionnaire electronically. Associations provided several reasons for their refusal. These included internal communication restrictions, concerns about survey fatigue, and issues relating to confidentiality. In addition, associations declined to disclose the number of members or their demographic profiles. This made it impossible to apply stratified or proportionally allocated sampling. Ultimately, only eight associations agreed to distribute the questionnaire to their members. The sample was therefore limited to the portion of the engineering population accessible through these associations. This outcome eliminated the possibility of applying a probability-based design. These eight participative associations are illustrated in Table 3.1.

Table 3-1: Responding associations

Institute of Municipal Engineering of Southern Africa (IMESA) – 12 Feb. 2024
Society for Automation, Instrumentation, Measurement, and Control (SAIMC) – 11 Feb. 2024
South African Institute of Chemical Engineers (SAIChE) – 14 Feb. 2024
South African Institute of Electrical Engineers (SAIEE) – 09 Feb. 2024
Southern African Institute for Industrial Engineering (SAIIE) – 12 Feb. 2024
Institution of Certificated Mechanical and Electrical Engineers of South Africa (ICMEESA) – 12 Feb. 2024
South African Institution of Mechanical Engineering (SAIMechE) – 12 Feb. 2024
Consulting Engineers South Africa (CESA) – 14 Feb. 2024

The study adopted a non-probability, cluster-based sampling method. The voluntary associations were treated as clusters. The eight cooperating associations served as the distribution channels. Within each cluster, participation was voluntary and based on self-selection by individual members who completed the questionnaire. This approach unfolded in three stages. First, associations were identified as clusters. Second, associations willing to serve as gatekeepers were recruited. Third, respondents within those associations self-selected into the sample.

Non-probability sampling is widely used when access to the entire population is blocked or when a complete sampling frame does not exist. Probability methods are preferred when representativeness is required, but they are costly and often not feasible (Khan, 2020). Research has shown that non-probability cluster approaches can produce reliable findings when applied transparently. They have been used to address imbalanced data distributions (Tahfim & Chen, 2024; Yen *et al.*, 2006). Cluster-based methods are also valuable for analysing parametric and non-parametric profiles, providing robust classification performance and parameter estimation (Chen *et al.*, 2015). In engineering, clustering techniques have wide applications, including design, system modelling, and process control (Pham & Afify, 2007). Non-probabilistic, multi-cluster models have been applied successfully in structural reliability analysis, especially when sample sizes are limited (Li & Liu, 2022). At the same time, studies in software engineering research warn that representative samples are rare, leading to risks for generalisability. This calls for greater attention to how researchers present non-probability designs (Baltes & Ralph, 2022; Reddy & Ramasamy, 2016).

The decision to use a non-probability, cluster-based sample in this study is justified on methodological and ethical grounds. First, associations acted as the formal gatekeepers of the membership data. Direct access to individual members was not permitted, in line with the Protection of Personal Information Act (Act 4 of 2013). Second, this method ensured that the privacy of engineers was protected, since data were collected only through approved organisational channels. Third, the recruitment process was carefully documented, including the number of associations contacted, the eight that responded, and the reasons given by those who declined. This record provides transparency and strengthens the credibility of the approach. Finally, the study aims to test theoretical relationships between work-life balance, occupational stress, organisational support, and job demand. The validity of these relationships depends on the strength of associations within the sample rather than on statistical representativeness.

The use of non-probability sampling has implications for inference. The findings cannot be generalised statistically to all 19,003 engineers registered with ECSA (ECSA, 2024b). Instead, they apply directly to engineers who are members of the eight participating associations. The study, therefore, emphasises analytic generalisation, where the results are interpreted in relation to theoretical models rather than as representative population estimates.

Despite these limits, the sample retains academic and practical value. The participating associations represent a range of engineering disciplines, which broadens the relevance of the findings. The data support the testing of theoretically grounded relationships using quantitative methods such as structural equation modelling. Documenting the barriers to access also provides a methodological insight into the challenges of conducting research with professional populations in South Africa.

The final sample is therefore best described as a non-probability, gatekeeper-mediated, cluster-based sample. While this restricts statistical generalisability, it provides an ethically sound and methodologically transparent way to address the research problem within the constraints imposed by the associations. The study contributes through analytic generalisation, offering insights into the relationships among work-life balance, occupational stress, organisational support, and job demand.

3.6 Measuring instruments

The questionnaire consists of five sections. The first section covers demographic information with six items, the second focuses on work-life balance, the third on occupational stress, the fourth on perceived organisational support, and the fifth on job demand.

The first section, which considers the demographic of the participants, includes the participants' age group, gender, years in their current position, whether the current position is a supervisory role, the highest qualification held, and the type of engineering discipline the participant belongs to. Under question six, an option can be selected if the participant is not an engineer.

The second section presents a survey of work-life balance, encompassing both work and nonwork interference and enhancement, as assessed through a validated questionnaire by Fisher *et al*. (2009:451; Manivannan *et al.*, 2022:39). The questionnaire consists of seventeen items and is divided into four factors as follows:

- work interference with personal life (WIPL) – 5 items
- personal life interference with work (PLIW) – 6 items
- work enhancement of personal life (WEPL) – 3 items
- personal life enhancement of work (PLEW) – 3 items

A five-point Likert scale was used to measure the items in the various areas. The question utilised a Likert scale, ranging from 1 ("Not at all") to 5 ("Almost all the time"), to gather responses.

The Work and Nonwork Interference Enhancement Questionnaire is an assessment instrument designed to increase awareness of individual behaviours concerning the balance between work and life. The survey allows the researcher to rate the participant's collective behaviour and present a score that can give an understanding of the individual's success in achieving work-life balance (Fisher *et al.*, 2009:451).

The third section is the Work-Stress Questionnaire (WSQ), which measures work-related stress. The WSQ was developed as a self-administered tool to identify individuals at risk of stress-related illnesses or absenteeism due to these stress-related illnesses.

The 21 questions of the WSQ are grouped into four categories:

- what influence the participant has in their position – 4 items
- perceived stress due to indistinct organisation and conflicts – 7 items
- perceived stress due to individual commitment and demands – 7 items
- time interference of work-to-leisure – 3 items

A four-point Likert scale, ranging from 1 (“yes, always”) to 4 (“no, never”), was used to measure the influence the participant has at work. A three-point Likert scale was used with the options of “yes”, “partly”, or “no” for indistinct organisation, conflicts, individual demands, and commitment. A four-point Likert scale was used to measure work to leisure, ranging from 1 ("No interference") to 4 ("Always interference").

Each question in the categories of indistinct organisation, individual demands, conflicts, and commitment has a supplementary question, namely, “Do you perceive that as stressful?”. The questions are answered as “Not stressful”, “Less stressful”, “Stressful”, or “Very stressful”. In so doing, two additional categories are formed with seven items each:

- perceived stress due to indistinct conflict or the organisation
- perceived stress due to individual commitment and demands

The fourth section consists of the Perceived Organisational Support (POS) questionnaire, which measures perceived organisational support. The independent Perceived Organisational Support eight-item survey was derived from a thirty-six-item study developed by Eisenberger (Cherubin, 2011:59; Eisenberger *et al.*, 1986). The POS questionnaire is widely used in organisational research due to its strong psychometric properties. The eight-item survey also formed part of other research that considers perceived organisational support and employee diligence, discretion, treatment, and commitment (Eisenberger *et al.*, 1990; Eisenberger *et al.*, 1997; Rhoades *et al.*, 2001).

This eight-item survey does not explicitly include sub-factors; it is treated as a unidimensional measure of perceived organisational support.

According to Worley *et al*. (2009), the questionnaire demonstrated high reliability, with Cronbach's Alpha (α) values typically exceeding 0.80, indicating excellent internal consistency. The Cronbach's alpha value of 0.93 means that the items are reliable, surpassing those of thirty-six- and sixteen-item surveys.

The eight-item scale measures employees' perceptions of how much their organisation values their contributions and cares about their well-being. This shortened version of the original thirty-six-item survey focuses on the most significant items loaded highest in factor analyses. This reliability ensures that the questionnaire consistently measures the construct of perceived organisational support across different contexts and populations. The questionnaire consists of statements that represent possible opinions one may have about one's current working environment. Then, the participant indicates how they agree or disagree with each statement. A seven-point Likert scale, ranging from 0 (strongly disagree), to 1 (moderately disagree), 2 (slightly disagree), 3 (neither agree nor disagree), 4 (slightly agree), 5 (moderately agree), 6 (strongly agree), is used to measure the organisation's support experience in the participant's current position.

The fifth section considers job demand in the engineering sector. Job demands are the physical or emotional stressors in an employee's current position. These stressors include a demanding workload, time pressures, a hectic working environment, job ambiguity, emotional labour, and poor relationships. The job demands question measures the level of demands or workload an individual experiences. Kawada and Otsuka (2011) used a measuring instrument for job demand that consisted of six items in their research on the relationship between job stress, occupational position, and job satisfaction. These items originated from the Brief Job Stress Questionnaire (BJSQ), which evaluates work-related stress. The items measured both the quantity of work employees had (quantitative demand) and the complexity or difficulty of the tasks (qualitative demand). Together, these indicators helped demonstrate job demand.

The 4-point Likert-type scale used in the questionnaire allowed participants to express the degree of job demand they experienced, ranging from 4 ("agree") to 1 ("disagree") (Kawada & Otsuka, 2011). This allowed the researchers to identify patterns in job pressure across different roles and their relationship to stress and satisfaction. Higher job

demand was associated with lower job satisfaction, highlighting the need for improved stress management in the workplace.

3.7 Reliability and validity of measuring instruments

Reliability refers to the consistency of a measurement over time. It tells us whether the same questionnaire produces similar results when used under similar conditions. In quantitative research, reliability is key. It confirms whether the instrument measures what it is meant to and whether it does so in a stable and repeatable way (Bryman *et al.*, 2019:24). When a questionnaire and its underlying factors consistently reflect their intended measurement, it is said to be reliable. In simple terms, if a person completes the same questionnaire on two separate occasions and their situation remains unchanged, they should receive identical scores. Likewise, if two individuals with the same characteristics complete the questionnaire, they should get similar results. This reflects both temporal stability and measurement accuracy.

The Internal Consistency method evaluates the consistency of responses across items within the same questionnaire section. Cronbach's Alpha is the most common measure of internal consistency. The Cronbach's Alpha coefficient measures the reliability or consistency of the items measured in the questionnaire. A Cronbach's Alpha value works on a scale from 0 to 1, and an α of 0.70 or higher is usually considered acceptable, indicative of the items within the section measuring the same underlying construct (Pallant & Manual, 2010). This research considered Cronbach's alpha value for each factor.

Fisher et al. (2009) developed the Work-Life Balance (WLB) scale that assesses the bidirectional interactions between work and personal life across four distinct factors (Smeltzer *et al.*, 2016:8). Each factor addresses either enhancement or interference between the work and private or nonwork domains. The reliability and validity evidence for each factor is summarised in Table 3.2.

The internal consistency and reliability were of each factor were evaluated using Cronbach's Alpha coefficients, which ranged from acceptable to excellent levels. Specifically, Work Interference with Personal Life (WIPL) demonstrated excellent internal consistency reliability, with an α of 0.91, indicating high homogeneity among its items. Similarly, Personal Life Interference with Work (PLIW) also displayed strong Reliability (α = 0.85). The enhancement-related factors, Work Enhancement of Personal Life (WEPL)

and Personal Life Enhancement of Work (PLEW), demonstrated reliabilities of α = 0.75 and α = 0.90, respectively, indicating satisfactory internal consistency for WEPL and excellent consistency for PLEW.

The scale's convergent validity was established through correlations with theoretically related constructs. WIPL and WEPL demonstrated significant relationships with overall job stress, aligning with theoretical expectations that interference would increase stress while enhancement would reduce it (Fisher *et al.*, 2009). The scale's criterion-related validity was confirmed through significant correlations between the factors and both job satisfaction and life satisfaction. Specifically, WIPL and PLIW demonstrated negative correlations with job and life satisfaction, indicating that greater interference was associated with lower satisfaction in both domains. In contrast, WEPL and PLEW were positively linked with job and life satisfaction, supporting that enhancement from either domain contributes positively to overall well-being (Fisher *et al.*, 2009).

Discriminant validity was evaluated by matching the WLB factors to measures of work-family conflict. Confirmatory factor analysis (CFA) demonstrated that the WLB factors were statistically distinguishable from work-family conflict factors, supporting the contention that work/nonwork interference and enhancement are conceptually distinct constructs (Fisher *et al.*, 2009). Although Reliability was assessed at the factor level, CFA results supported the scale's four-factor structure, with acceptable model fit indices (CFI = 0.97, NFI = 0.94, RMSEA = 0.056), confirming its multidimensionality and structural integrity (Fisher *et al.*, 2009).

Table 3-2: Validity and Reliability of the Work-Life Balance Scale and Factors

Factor	Cronbach's Alpha (Reliability)	Validity Evidence	Authors
Work Interference with Personal Life (WIPL)	0.91	Validity was confirmed through convergent validity (positive correlation with job stress) and criterion-related validity (negative correlation with job and life satisfaction).	Fisher, Bulger & Smith (2009)
Personal Life Interference with Work (PLIW)	0.82	Validity was confirmed through criterion-related validity, as evidenced by a negative correlation between job and life satisfaction.	

Factor	Cronbach's Alpha (Reliability)	Validity Evidence	Authors
Work Enhancement of Personal Life (WEPL)	0.70	Validity was confirmed through convergent validity (negative correlation with job stress) and criterion-related validity (positive correlation with job and life satisfaction).	
Personal Life Enhancement of Work (PLEW)	0.81	Validity was confirmed through criterion-related validity, which shows a positive correlation between job and life satisfaction.	
Overall Work-Life Balance Scale	Not explicitly reported (each factor assessed separately)	Confirmatory Factor Analysis (CFA) demonstrated a good fit for the four-factor model. Confirmed discriminant validity (distinction from work-family conflict scales) and convergent validity (correlations with job satisfaction, job stress, and life satisfaction).	

Other research also shows that Cronbach's alpha coefficients for the WLB self-assessment scale were 0.885 for the total scale, 0.924 for the WIPL subscale, 0.815 for the PLIW subscale, and 0.661 for the WPLE subscale (Smeltzer *et al.*, 2016:10).

Suzanne *et al*. (2016:5) also used the research of Fisher *et al*. (2009) as the basis. However, they only used three-factor WIPL with an α of 0.93, PLIW with an α of 0.85, and WPLE with an α of 0.69. The overall Cronbach's Alpha coefficient for the reliability of the WLB scale for the three constructs was α = 0.88. They combine WEPL and PLEW for work/personal life enhancement (WPLE) (Smeltzer *et al.*, 2016:5).

Research by Pretorius (2022) on a similar topic that considers automation engineers, shows that the descriptive statistics are sound and show the instrument's reliability.

Table 3-3: Work-Life Balance Descriptive Statistics

	Factor /Theme	Cronbach's Alpha	Mean Item Correlation (Inter-Item Correlations)	Interpretation
Work-life balance	Work interference with personal life	0.910	0.668	Excellent reliability
	Personal life interference with work	0.725	0.327	Acceptable reliability
	Work enhancement of personal life	0.811	0.592	Good reliability
	Personal life enhancement of work	0.832	0.624	Good reliability

(Pretorius, 2022)

Frantz and Holmgren (Frantz & Holmgren, 2019:2) use test-retest stability rather than internal consistency. Cronbach's Alpha measures internal consistency or reliability. The WSQ takes into consideration the interaction between environmental and personal factors. Across the twenty-one items, the mean Percentage Agreement (PA) was 77%, demonstrating good test-retest stability over a two-week interval. Items showed low individual disagreement. The Relative Rank Variance (RV) (a measure of errors) is nearly zero, indicating consistent administration responses. Only one item, *"Supervisor considers one's views"*, demonstrated significant systematic change, where the relative position (RP) RP = 0.10, indicating that participants tended to rate this item as more stressful at retesting (Frantz & Holmgren, 2019:5).

The face validity of the WSQ was evaluated through feedback from a pilot group of male workers who completed the questionnaire and provided oral and written comments. The pilot participants confirmed that the items were relevant to their experiences of work-related stress and found the response scales easy to understand. The WSQ has been used in longitudinal studies to predict sick leave and work absenteeism. Prior studies using the WSQ have found that high work stress (especially from a lack of clarity in organisations, conflicts, and high individual demands) significantly increases the risk of future sick leave, even up to eight years later (Frantz & Holmgren, 2019). The finding of the WSQ provides evidence for the predictive validity of the instrument, particularly in identifying employees at considerable risk of sickness absence due to job-related stress. The absence of Cronbach's Alpha estimates limits the direct assessment of internal consistency reliability. However, test-retest stability is a suitable alternative reliability

indicator for questionnaires that measure stress experiences, particularly those using categorical response scales. The authors emphasise that the WSQ's purpose is early identification rather than diagnostic precision, making stability over time a particularly relevant criterion for reliability (Frantz & Holmgren, 2019).

Table 3-4: Reliability and Validity of the WSQ and Factors

Factor/Theme	Reliability (Cronbach's Alpha)	Reliability Evidence	Validity Evidence	Authors
Indistinct Organisation and Conflicts	Not reported	Test-retest: High Percentage Agreement (PA) (range: 56%–98% for items). Low individual disagreement (RV close to 0).	Face validity was confirmed through participant feedback, which indicated that the items were relevant to work stress.	Frantz & Holmgren (2019)
Individual Demands and Commitment	Not reported	Test-retest: PA ranged from 63% to 98%, indicating moderate to high stability.	Face validity was confirmed through the evaluation of the pilot group, as the items were relevant and easy to answer.	
Influence at Work	Not reported	Test-retest: Mostly high PA, except for *"Supervisor considers one's views",* which showed a systematic shift towards higher stressfulness ratings (RP = 0.10, CI 0.02–0.18).	The pilot review confirmed face validity, indicating that the items were understood and relevant to work stress.	
Work to Leisure Time Interference	Not reported	Test-retest: High PA (above 80%), indicating strong stability across items.	Face validity was confirmed through participant review, which affirmed the relevance of the items to personal time interference.	
Overall Work Stress Questionnaire (WSQ)	Not reported	Median Percentage Agreement (PA) = 77% across all items; low individual variation and minimal systematic	Face validity was confirmed through pilot testing as participants found the items reflective of their	

Factor/Theme	Reliability (Cronbach's Alpha)	Reliability Evidence	Validity Evidence	Authors
		disagreement across items.	work stress experiences.	

Research done by Pretorius (2022), who takes the WLB and OWS of automation engineers into account, indicates that the descriptive statistics are sound and show the instrument's reliability, as seen in the table below.

Table 3-5: Reliability for Work Stress Questionnaire (WSQ) Subscale

	Factor /Theme	Cronbach's Alpha	Mean Item Correlation (Inter-Item Correlations)	Interpretation
Work stress	Influence at work	0.735	0.399	Acceptable reliability. Low perceived influence suggests reduced autonomy and control.
	Indistinct organisation and conflicts	1.000	1.000	Anomalously perfect reliability. This may reflect redundancy or data inconsistency.
	Individual demands and commitment	0.906	0.605	Excellent reliability. Indicates high stress due to workload and over-commitment.
	Work-to-leisure time interference	0.931	0.820	Excellent reliability. Suggests frequent spillover of work into personal time.

(Pretorius, 2022)

The Job Demands items form part of the Brief Job Stress Questionnaire (BJSQ), designed to measure job satisfaction and stress factors in the working environment. (Karasek Jr, 1979; Mulder, 2017). The model also considers labour intensity and health promotion in the workplace (Mulder, 2017). The Job Demands Factor precisely captures the quantitative and qualitative workload experienced by employees. Kawada and Otsuka (2011) evaluated the scale's psychometric properties, demonstrating its reliability and validity in assessing job demand and control and supporting indications of job satisfaction. This study only considers the job demand. The Job Demands presented an acceptable Cronbach's Alpha, reflecting high internal consistency with an alpha of 0.855 (Kawada & Otsuka, 2011:393). The reliability indicates that the items measuring job demands

demonstrated high internal consistency and reliable performance (Kawada & Otsuka, 2011).

Principal axis factor analysis was conducted on the three primary factors: demands, control, and job support. The results indicate that dissatisfied participants were more likely to experience high job demands, poor support, and low job control (Kawada & Otsuka, 2011:393). Job demand consisted of six items that account for 21.2%, support 22.3%, and job control 9% total variation; together, the three factors accounted for 52.5% of the total variance, providing robust support for the construct validity of the BJSQ and confirming that the job demands items represent a coherent and distinct dimension of occupational stress (Kawada & Otsuka, 2011:395). The Job Demands-verification validity was established by associating it with job satisfaction. Participants who reported higher job demands consistently reported lower job satisfaction ($p < .05$). This result aligns with the demand-control-support model, which suggests that high job demands are associated with increased strain and reduced well-being (Kawada & Otsuka, 2011).

Table 3-6: Reliability and Validity of the Job Demands Factor from the Brief Job Stress Questionnaire (BJSQ)

Factor	Cronbach's Alpha (Reliability) Validity Evidence	Validity Evidence	Authors
Job Demands	0.855	Validity was confirmed through principal axis factor analysis, which identified Job Demands as a distinct factor. Higher job demands were significantly associated with lower job satisfaction ($p < .05$), supporting criterion-related validity.	Kawada & Otsuka (2011)

The Perceived Organisational Support (POS) Scale is a well-established instrument developed by Eisenberger *et al*. (Eisenberger *et al.*, 1986). It is widely used to measure employees' perception regarding the level of their organisation's care about their well-being and if it values their contributions. In the study by Cherubin (2011:33), an 8-item condensed version developed by Rhoades *et al*. (2001) was used to assess POS. This study used the same version. The POS Scale demonstrated excellent internal reliability, with a Cronbach's Alpha of 0.90, indicating that the scale items capture the intended construct, effectively measuring perceived organisational support (Cherubin, 2011).

The structure of the POS Scale has been proven in prior research and was further validated in Cherubin (2011), where the POS items are loaded onto a single distinct factor, consistent with organisational support theory (Eisenberger *et al.*, 1986). The POS Scale was shown to have a strong positive correlation with employee engagement ($r = 0.615$, $p < 0.001$) (Cherubin, 2011:39). The criterion-related validity that evaluates how accurately the test measurement result is designed to measure, indicates that higher perceived organisational support is associated with higher levels of employee engagement. Regression analysis shows that POS significantly predicted employee engagement, explaining approximately 37.9% of the variance in engagement scores ($R^2 = 0.379$, $p < 0.001$) (Cherubin, 2011:43). This result demonstrates convincing evidence for predictive validity, indicating that perceived organisational support is a critical driver of engagement.

Table 3-7: Reliability and Validity of the Perceived Organisational Support (POS) Scale

Factor	Cronbach's Alpha (Reliability)	Validity Evidence	Authors
Perceived Organisational Support (POS)	0.90	Construct validity was confirmed through factor analysis, demonstrating that POS is a distinct factor. Criterion-related validity is supported by a significant positive correlation with employee engagement ($r = 0.615$, $p < 0.001$). Predictive validity was supported via regression analysis, with POS explaining 37.9% of the variance in employee engagement ($R^2 = 0.379$).	Cherubin (2011); Rhoades et al. (2001)

3.8 Data collection procedures

This cross-sectional study collects data from engineers at a single point in time (Ibrahim & Hussein, 2024:2). Microsoft Forms was used to design and host the online questionnaire.

The gatekeepers played an essential role in facilitating data collection, enhancing response rates, and ensuring the ethical conduct of the research. The gatekeepers, representatives within the ECSA voluntary associations, facilitated access to a broad and

diverse group of engineers, thereby enhancing the representativeness of the sample. The research gained credibility by distributing the questionnaire through trusted associations. Participants were more likely to engage with the survey, knowing their professional organisation endorsed it. The eight participant associations used established communication channels to disseminate the Microsoft Forms link quickly and effectively to their members. The associations, functioning as gatekeepers, helped ensure that the research adhered to ethical standards and intermediaries, safeguarding the interests of its members and ensuring that participation was voluntary and informed.

A cross-sectional study method is beneficial for assessing the prevalence of characteristics or outcomes within a population and identifying associations between variables. This approach examines work-life balance, occupational stress levels, and the mediating roles of organisational support and job demand. Using this method, one can identify patterns and correlations that may inform strategies to improve work-life balance and reduce job-related stress in the engineering sector.

Utilising the Microsoft Forms questionnaire means that the data is stored in the cloud and made available through a link that Microsoft Forms produces. Using Microsoft Forms offers several advantages. Microsoft Forms is user-friendly, making it easy for researchers to create questionnaires and for participants to complete them. The online Microsoft Forms allow participants to access the questionnaire from any device, increasing the likelihood of participation. Responses were collected in real-time, enabling the continuous monitoring of progress and response rates. The response rate is documented in a graph in Chapter 4. Microsoft Forms automatically organises responses into a structured format and can be downloaded in an Excel spreadsheet, simplifying data analysis and reducing the risk of data entry errors. The Excel file with the results was sent to the North-West University Statistical Consultation Services (SCS) for analysis and reporting. Microsoft Forms offers various customisation options, allowing researchers to tailor the questionnaire to their needs, including branching logic and different question types. Microsoft Forms provides secure data storage, ensuring the privacy and safeguarding of participants' information. Since the link was not sent directly from the online form, there is no traceability for any participant with an email or name.

The questionnaire was distributed to the Voluntary Associations recognised by the Engineering Council of South Africa (ECSA). They function as gatekeepers, sending their members the link or QR code. Link: https://forms.office.com/r/WK3W6B0m42

QR Code:

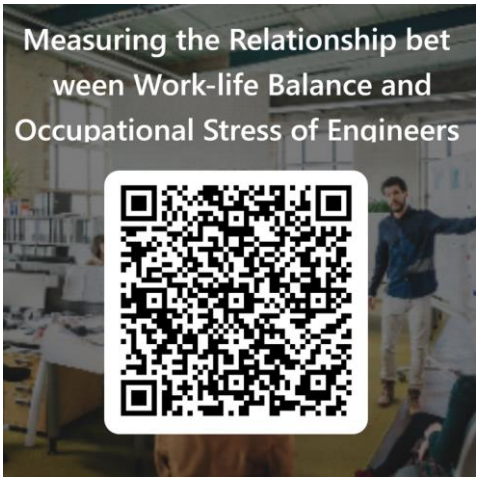


Figure 3-1: QR Code for Microsoft Form Questionnaire

Engineers affiliated with recognised associations of ECSA were asked to complete the questionnaire, utilising the recognised ECSA association to distribute the questions among their members. A post with a link to the Microsoft Form was also placed on LinkedIn to invite more engineers across various sectors to participate in the research. The questionnaire distribution and data collection timeline span from April 2024 to January 2025, allowing ample time to gather comprehensive data and ensure robust analysis.

Graph 4.1 in Chapter 4 shows the return rate of the questions on Microsoft Forms, as well as when the questions were sent to recognised associations and posted on LinkedIn.

3.9 Data analysis

The following statistical techniques were employed to address the research questions and achieve the research objectives: descriptive statistics, confirmatory factor analysis, Spearman's rank correlation coefficient, and mediation analysis using Structural Equation Modelling (SEM). The SEM helps to investigate the relationship between variables and their contribution to the research results. SEM offers flexibility in testing complex

mediation models with multiple variables, including latent constructs and longitudinal data (Akinremi, 2024).

Descriptive statistics is a basic informational coefficient summarising and analysing data representing the whole or part of the studied population (Hassan, 2024b; Hayes, 2023). Descriptive statistics organise the data into charts, tables, and numerical summaries, making it easier to identify trends, anomalies, and patterns (Hassan, 2024b). Descriptive statistics comprise two key measures: measures of central tendency, including the mean, median, mode, and measures of variability, including standard deviation, minimum and maximum values, skewness, variance, and kurtosis (Hassan, 2024b; Hayes, 2023).

In confirmatory factor analysis (CFA), one or more models are generated to underlie the explanatory structure, a construct that can be expressed graphically. The models are evaluated by comparing how well they fit the data (Bryman *et al*., 2019:328).

Spearman's rank correlation coefficient is used to analyse the relationship between the strength and direction of two continuous variables. The attributes are ranked or put in order of preference and symbolised by "rho" (ρ) (Bryman *et al.*, 2019:321). A positive ρ value indicates a positive relationship between the two variables, whereas a negative value indicates a negative relationship. If the ρ value is zero, it means no association between the two variables (Bryman *et al.*, 2019:324).

Mediation analysis examines and explains how or why an independent variable influences an outcome through an intermediate variable. A mediating variable transfers the effect of an independent variable on a dependent variable. Mediation analysis is a statistical method that explores the underlying instruments through which an independent variable affects a dependent variable, often examining indirect, total, and direct effects within a specified statistical model, such as linear regression (Bonte, 2023:3; Jung, 2021).

Table 3-8: Research objectives and statistical techniques used

No	Research Objectives	Statistical Techniques
1	To assess the levels of work-life balance among engineers in South Africa.	Descriptive statistics were used to measure and summarise the levels of work-life balance. (Mean, Standard Deviation, Frequency, Percentage) Confirmatory Factor Analysis (CFA) validated the WLB measurement scale.
2	To evaluate the occupational stress levels experienced by engineers in South Africa.	Descriptive statistics were used to summarise occupational stress levels. (Mean, Standard Deviation, Frequency, Percentage) Confirmatory Factor Analysis (CFA) validated the occupational stress measurement scale.
3	To investigate the organisational support levels of engineers in South Africa.	Descriptive Statistics were used to measure organisational support levels. (Mean, Standard Deviation, Frequency, Percentage) Confirmatory Factor Analysis (CFA) validated the organisational support measurement scale.
4	To determine the job demand levels faced by engineers in South Africa.	Descriptive Statistics were used to summarise the job demand levels (Mean, Standard Deviation, Frequency, and Percentage) Confirmatory Factor Analysis (CFA) validated the job demand measurement scale.
5	To examine the impact of work-life balance on occupational stress among engineers in South Africa.	Spearman's Rank-Order Correlation Analysis
6	To explore the mediating role of organisational support in the relationship between work-life balance and occupational stress among engineers in South Africa.	Mediation Analysis (Using Structural Equation Modelling [SEM])
7	To analyse the mediating role of job demands in the relationship between work-life balance and occupational stress among engineers in South Africa.	Mediation Analysis (Using Structural Equation Modelling [SEM])

The statistical software SPSS was used to perform the analyses, ensuring robust and accurate results. The NWU's SCS will do the data analysis. The summary report from

Microsoft Forms will summarise the demographic information and zoom in on a specific question where required.

This comprehensive approach allowed the researchers to draw meaningful conclusions about the factors influencing work-life balance and occupational stress among engineers in South Africa.

3.10 Ethical considerations

To gather information about engineers' everyday experiences related to the research topic, a cover letter with a link to an online survey was sent to each participant through the ECSA voluntary association. The link, along with the letter, was also placed on LinkedIn. Participation in this research is voluntary, and participants can withdraw at any time. The participants could also choose not to answer questions they see as private or not applicable. The survey requested necessary demographic information, including age group, gender, years of work experience, and qualifications but did not collect any personal information to identify the participants. The data was kept confidential, and only the combined results would be used for research and publication. All information provided by the participants was anonymous and treated with the highest standard of privacy and confidentiality. The survey comprised five divisions and took participants between 20 and 30 minutes to complete.

To participate in the survey, individuals had to meet two criteria: they had to be at least 18 years old and currently employed by a South African engineering organisation. As willing participants, they were only required to complete the survey as honestly as possible. It is worth noting that participants faced negative consequences if they chose not to complete the survey. Additionally, any information provided by the participants remained confidential, and personal identifying information, such as demographics, was handled in accordance with the rules of the Protection of Personal Information Act (Act 4 of 2013). The Act also stated that participants were not obligated to provide personal information, such as demographics. However, there would have been no negative consequences if they had not offered it. The answer sheets were securely stored at the university for five years. Only the student and their supervisor could access the data after that. It is worth noting that the data did not extend beyond the borders of South Africa. Results from the total sample would only be used and presented anonymously. The results would not be released because no reference was made to email, telephone

number, or name. By completing the survey, the participants agreed that the information could be used for research purposes. It was essential to remember that there were no correct or incorrect answers to any of the questions.

3.11 Summary

This chapter examined the method used to study the integrated relationship between engineers' work-life balance and occupational stress in South Africa. The chapter supports the theoretical framework discussed in the previous chapter, which measures these variables, emphasising the importance of organisational support and job demand as mediating factors.

The chapter discussed the research methodology, design, population, sampling techniques, measuring instruments, and data collection methods for gathering and analysing the results from Microsoft Forms. Data were collected using a structured questionnaire on Microsoft Forms and sent to engineers via a gatekeeper. This quantitative research enabled the analysis of work-life balance and organisational stress, with a focus on the mediating role of organisational support and job demand.

The chapter discussed the statistical tools and techniques used to analyse the collected data, such as correlation, factor analysis, and structural equation modelling. These methods are essential in identifying the direct and indirect effects of organisational support and job demand on the relationship between work-life balance and occupational stress.

By providing a clear and systematic approach to the research, this chapter lays the foundation for understanding how various organisational factors can mitigate or exacerbate stress among engineers, thereby contributing to the development of strategies to improve their overall well-being and productivity.

CHAPTER 4 RESULTS, DISCUSSION, AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents the study's findings on the relationship between work-life balance and occupational stress among engineers in South Africa, focusing on the mediating roles of organisational support and job demand. The results are analysed and discussed in the context of existing literature, providing a comprehensive understanding of the empirical framework constructed in this research.

The research objective is to assess the balance between work and life, as well as the occupational stress levels of engineers in South Africa. This aims to understand how organisational support can assist engineers in achieving this balance, and to determine the role of job demand in influencing an engineer's work-life balance and stress levels.

The chapter considers and evaluates the actual feedback of the participants, using their demographic profiles, work-life balance, occupational stress, perceived organisational support, and job demand. The primary research analyses utilise frequency, descriptive statistics (minimum, maximum, mean, and standard deviation), exploratory factor analyses (EFA), and test the reliability of each instrument and the correlation coefficient between factors. The demographic frequency results provide context on the age, gender, and type of engineer participating in this research. The study further examines the mediating effects of organisational support and job demand, as well as highlighting their significance in the connection between work-life balance and occupational stress.

- After documenting the results, the findings were interpreted in relation to the research questions, objectives, and hypotheses that support the newly developed theoretical framework. This section examines the implications of the results for both theory and practice, taking into account the unique context of the engineering profession in South Africa.

The result will assist organisations employing engineers in gaining a better understanding of the relationship between work-life balance and organisational stress and how they can provide the correct support and manage job demands. The results also indicate a need for further studies and guidance in this area.

4.2 Sample pool and research timeline

Engineers affiliated with recognised associations of ECSA (Engineering Council of South Africa) completed the questionnaire, utilising the recognised ECSA association to distribute the questions among their members. A post with a link to the Microsoft Form was also placed on LinkedIn to invite more engineers across various sectors to participate in the research. The questionnaire distribution and data collection timeline span from April 2024 to January 2025, allowing ample time to gather comprehensive data and ensure robust analysis.

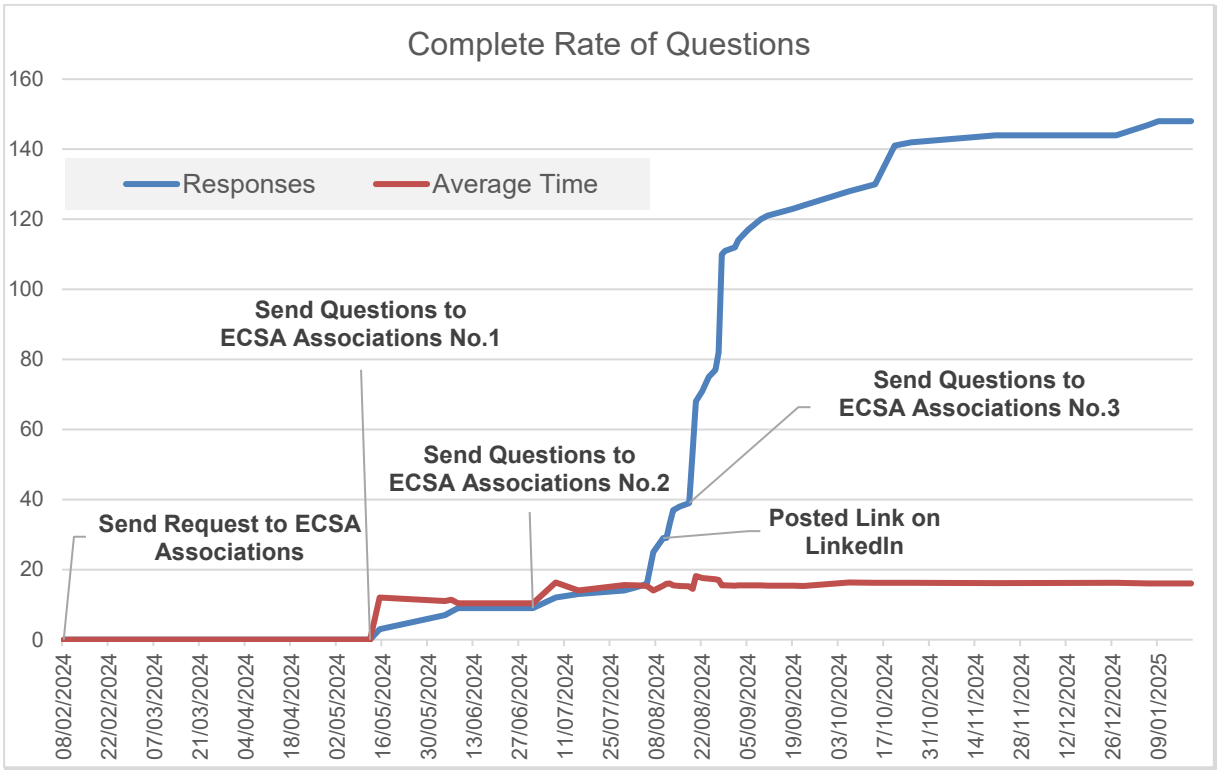
A non-probability, cluster-based sample was used in this study, which is justified on both methodological and ethical grounds. First, associations functioned as the formal gatekeepers of membership data. Direct access to individual members was not permitted, in line with the Protection of Personal Information Act (Act 4 of 2013). Second, this method ensured the privacy of the engineers since data were collected only through approved organisational channels. Third, the recruitment process was carefully documented, including the number of associations contacted, the eight that responded, and the reasons given by those who declined. This record provides transparency and strengthens the credibility of the approach. Finally, the study aims to test theoretical relationships between work-life balance, occupational stress, organisational support, and job demand. The validity of these relationships depends on the strength of associations within the sample rather than on statistical representativeness.

The use of non-probability sampling has implications for inference. The findings cannot be generalised statistically to all 18,019 professional engineers and 964 professional certified engineers registered with ECSA (ECSA, 2024b:24). Instead, they apply directly to engineers who are members of the eight participating associations. The study, therefore, emphasises analytic generalisation, where the results are interpreted in relation to theoretical models rather than as representative population estimates.

Despite these limits, the sample retains academic and practical value. The participating associations represent a range of engineering disciplines, which broadens the relevance of the findings. The data support the testing of theoretically grounded relationships using quantitative methods such as structural equation modelling. Documenting the barriers to access also provides a methodological insight into the challenges of conducting research with professional populations in South Africa.

The final sample, therefore, is best described as a non-probability, gatekeeper-mediated, cluster-based sample. While this restricts statistical generalisability, it provides an ethically sound and methodologically transparent way to address the research problem within the constraints imposed by the associations. The study contributes through analytic generalisation, offering insights into the relationships between work-life balance, occupational stress, organisational support, and job demand.

The graph below shows the return rate of the questions on Microsoft Forms, as well as the time when the questions were sent to recognised associations and posted on LinkedIn. The orange line represents the average time it took to complete a questionnaire.



Graph 4-1: The rate questions were completed

4.3 Demographic profile of respondents

This section discusses the participants' demographics and individual characteristics, including age, gender, years of experience in their current position, supervisory role, qualifications, and engineering discipline. The information will provide the background of the sample population.

The sampling pool consists of engineers working in South Africa. ECSA was asked to send the questions to their members, but they replied that they were not in a position to assist. However, they provided a list of ECSA-recognised, voluntary associations (ECSA, 2025).

The list was used, and the questionnaire was sent to all the voluntary associations. Some replied that they would assist, while others stated they lacked the resources to do so. The number of members within these associations is unknown to non-members, therefore, it is impossible to evaluate the success rate of the questionnaire distribution.

Questions 1 to 6 of the questionnaire provide insight into the demographics of the volunteers who completed the questionnaires. These details provided a profile of respondents, helping readers understand the context in which the study was conducted and the diversity of the sample. The demographic information is crucial for understanding the characteristics of the sample to contextualise the findings, as it provides a clear picture of the respondents' demographic profile.

A total of 148 questionnaires were completed, of which 143 selected a specific engineering discipline, and five people were not engineers. Of the five persons who are not engineers, three are female. One individual between 30 and 39 years old, two between 40 and 49 years old, and two males between 50 and 59 years old. The feedback from the non-engineers was omitted from further analyses and will not be discussed when formulating the results.

The age distribution was as follows: 10% were aged 20–29 years, 24% were aged 30–39 years, 18% were aged 40–49 years, 31% were aged 50–59 years, and 17% were aged 60 years or older.

The sample was predominantly male (86%), with females comprising 14% of the respondents. In terms of work experience in their current position, 41% of participants had 0–9 years, 28% had 10–19 years, 10% had 20–29 years, another 10% had 30–39 years, and 10% had over 40 years of experience.

A large majority (91%) reported occupying a supervisory role, while 9% did not.

Regarding educational qualifications, 3% held a diploma, 24% a BTech or BEng degree, 5% a postgraduate diploma, 15% an honours degree, 28% a master's degree, 9% a PhD, and 1% reported another or unspecified qualification.

Participants represented various engineering disciplines, with the most common being civil engineering (30%), followed by mechanical (19%), electrical (16%), and mining engineering (11%). Smaller proportions reported working in chemical (5%), automation/instrumentation (7%), industrial (3%), process (2%), software (3%), and agricultural engineering (1%), while 3% fell into other or unspecified categories.

Table 4-1: Demographic profile of the respondents

Variable	Category	Frequency	Percentage (%)
Age group			
	20–29	14	10
	30–39	35	24
	40–49	25	18
	50–59	45	31
	60+	24	17
Gender			
	Male	123	86
	Female	20	14
Experience (years)			
	0–9	59	41
	10–19	40	28
	20–29	15	10
	30–39	15	10
	40+	14	10
Supervisory role			
	Yes	130	91
	No	13	9
Highest qualification			
	Diploma	5	3
	BTech/BEng	34	24
	Postgraduate Diploma	7	5
	Honours	22	15
	Master's	40	28
	PhD	13	9
	Other	1	1
Discipline			
	Agriculture Engineer	1	1
	Automation Engineer (Instrumentation)	10	7
	Chemical Engineering	7	5
	Civil Engineering	43	30
	Electrical Engineering	23	16
	Industrial Engineering	4	3
	Mechanical Engineering	27	19
	Mining Engineering	16	11

Variable	Category	Frequency	Percentage (%)
	Process Engineering	3	2
	Software Engineering	5	3
	Other not specified	4	3

Note. Percentages are rounded off to whole numbers and may not total 100 within sections.

4.4 Descriptive statistics of work-life balance, occupational stress, organisational support, and job demand

Descriptive statistics summarise and describe the key features of the dataset of work-life balance, occupational stress, organisational support, and job demand, within a sample of the engineering population in South Africa. Descriptive statistics encompass measures of central tendency, variability, and frequency distribution, aiming to represent the data as it is (Hassan, 2024b; Hayes, 2023). Central tendency encompasses the median (middle value), mean (average), and mode (most frequently occurring value), as well as range, variance, standard deviation (SD), minimum and maximum values, and frequency (measures of distribution). Additionally, it includes skewness and kurtosis (Hassan, 2024b). In this research, frequency, mean, and standard deviation were used to analyse the data and report on findings.

Descriptive statistics can be easily visualised using histograms, bar charts, pie charts, or scatter plots, to name a few; descriptive statistics form the foundation for understanding the data more easily and for future analysis. Descriptive statistics also help to identify patterns and trends (Hassan, 2024b; Hayes, 2023). The results of WLB for frequency, means, and standard deviation are summarised in Table 4.2.

Descriptive statistics do not make predictions or generalise findings beyond the represented dataset and fail to explore relationships between the objects.

Descriptive statistics is used to interpret and summarise the collected data. Using central tendency refers to a measurement that identifies a value, the mean value of a question, which represents the average answer, as well as variability and frequency. Descriptive statistics transform raw data into understandable information, serving as a foundation for further statistical analysis and decision-making (Hayes, 2023)

4.4.1 Work-life balance descriptive statistics

This section reviews WLB (Questions 7 to 23) using descriptive statistics, including the frequency, means, and standard deviations. Table 4.2 presents the results of the instrument used for the work-life balance section of the questionnaire, with a sample size of n = 143. The work-life balance section consists of 17 questions. The work-life balance instrument uses a Likert scale that consists of “1 = Not at all”, “2 = Rarely”, “3 = Sometimes”, “4 = Often”, and “5 = Almost all the time”.

Considering the questions of WLB, the lowest mean was reported for questions 15 and 17. For question 15, “I am too tired to be effective at work because of the things I have going on in my personal life”, the mean = 1.59 and the SD = 0.64, indicating that respondents’ average answer was leaning toward “Rarely”. For question 17, “I have difficulty getting my work done because I am preoccupied with personal matters at work”, the mean = 1.59 and SD = 0.61, indicating that respondents” average answer is also leaning toward "Rarely".

The highest mean was reported for question 23, “My personal life helps me relax and feel ready for the next day’s work”, where the mean = 3.71 and the SD = 0.94, indicating that respondents’ average response was “Often”.

If one considers only questions 15, 17, and 23, one can conclude that the respondents’ personal lives do not negatively affect their work.

Table 4-2: Descriptive Statistics of WLB items

Item	Statement	% Not at all	% Rarely	% Sometimes	% Often	% Almost all the time	M	SD
7	I come home from work too tired to do things I would like to do	2.8	18.18	30.77	37.76	10.49	3.35	0.99
8	My job makes it difficult to maintain the kind of personal life I would like	3.5	22.38	32.87	31.47	9.79	3.22	1.01
9	I often neglect my personal needs because of the demands of work	4.9	18.88	27.27	34.97	13.99	3.34	1.09
10	My personal life suffers because of my work	6.99	23.78	37.06	20.98	11.19	3.06	1.09
11	I have to miss out on important personal activities due to the amount of time I spend doing work	9.79	29.37	32.17	23.08	5.59	2.85	1.06
12	My personal life drains me of the energy I need to do my job	36.36	49.65	10.49	3.5	0.0	1.81	0.76
13	My work suffers because of everything going on in my personal life	43.36	43.36	11.19	2.1	0.0	1.72	0.74
14	I would devote more time to work if it were not for everything, I have going on in my personal life	36.36	50.35	9.79	2.8	0.7	1.81	0.78
15	I am too tired to be effective at work because of the things I have going on in my personal life	47.55	46.85	4.2	1.4	0.0	**1.59**	0.64
16	When I am at work, I worry about things I need to do outside work	16.78	48.25	30.07	4.2	0.7	2.24	0.8
17	I have difficulty getting my work done because I am preoccupied with personal matters at work	46.85	46.85	6.29	0.0	0.0	**1.59**	0.61
18	My job gives me the energy to pursue activities outside of work that are important to me	10.49	28.67	34.27	21.68	4.9	2.82	1.05
19	Because of my job, I am in a better mood at home	9.79	20.28	33.57	27.97	8.39	3.05	1.1
20	The things I do at work help me deal with personal and practical issues at home	9.79	23.78	34.97	26.57	4.9	2.93	1.05

Item	Statement	% Not at all	% Rarely	% Sometimes	% Often	% Almost all the time	M	SD
21	I am in a better mood at work because of everything I have going for me in my personal life	8.39	15.38	22.38	40.56	13.29	3.35	1.15
22	My personal life gives me the energy to do my job	3.5	10.49	19.58	46.15	20.28	3.69	1.02
23	My personal life helps me relax and feel ready for the next day's work	1.4	9.79	25.17	44.06	19.58	**3.71**	0.94

4.4.2 Occupational stress descriptive statistics

This section will review OS (Questions 24 to 58) using descriptive statistics, including the frequency, means, and standard deviations. Table 4.3 presents the results of the instrument used for the occupational stress section of the questionnaire, with a sample size of n = 143. The occupational stress section consists of 35 questions, of which six questions do not have a mean value because they only have “Yes” or “No” answers. The Occupational Stress Instrument uses a Likert scale to assess the perceived stressfulness of a situation or how others perceive it as stressful.

Considering the OS questions, the lowest mean was reported for question 34. For question 34, “Do you know who is making decisions concerning your workplace?”, the mean = 1.19 and the SD = 0.427, indicating that respondents’ average answer was “Yes”. For question 46, “Do you think about work after your working day?”, the mean = 1.26 and the SD = 0.527, indicating that respondents’ average answer was also “Yes”.

The highest mean was reported for question 33; however, respondents were only allowed to continue to question 33 if question 32, “Do you perceive not knowing which assignment your work task includes as stressful?” was answered as “Partly” or “No”. Thus, the mean of question 33 = 3.71 and the SD = 0.94 indicating that respodents who answered the question did indicate that not knowing their assignment are very stressful.

Table 4-3: Descriptive statistics for OS items

Question No.	Statement	Frequency					Descriptive Statistics	
		% Yes, always	% Yes, rather often	% No, seldom	%No, never	Notes	Mean	Standard Deviation
24	Do you have time to finish your assignments?	16.10	52.40	29.40	2.10		2.17	0.715
25	Do you have the possibility to influence decisions at work?	46.15	44.06	6.99	2.80		1.66	0.731
26	Does your supervisor consider your views?	44.06	46.15	8.39	1.40		1.67	0.690
27	Can you decide on your work pace?	30.77	40.56	23.08	5.59		2.03	0.875
29	If your answer to question 28 was yes, Do you perceive your increased workload as stressful?	Not stressful 7.69	Less stressful 6.99	Stressful 58.74	Very stressful 10.49	23% indicates in Q28 that the workload did not increase	2.86	0.748
30	Are the goals for your workplace clear?	Yes – Go to question 32 64.34	Partly 30.07	No 5.59			1.41	0.597
31	If question 30 is partly or no: Do you perceive unclear goals as stressful?	Not stressful 2.80	Less stressful 1.40	Stressful 20.98	Very stressful 10.49		3.10	0.806
32	Do you know which assignments your work tasks include?	Yes – Go to question 34 76.92	Partly 19.58	No 3.50			1.27	0.517
33	If question 32 is partly or no: Do you perceive not knowing which assignment your work task includes as stressful?	Not Stressful 1.40	Less Stressful 1.40	Stressful 2.80	Very Stressful 17.48	Notes Missing 76.9%	**3.58**	0.867
34	Do you know who is making decisions concerning your workplace?	Yes – Go to question 36 82.52	Partly 16.08	No 1.40			**1.19**	0.427
35	If question 34 is partly or no: Do you perceive not knowing who is making decisions concerning your workplace as stressful?	Not Stressful 1.40	Less Stressful 4.20	Stressful 9.79	Very Stressful 2.10	Notes Missing 82.5%	2.72	0.792
37	If question 36 is yes: Do you perceive conflict at work as stressful?	Not Stressful 3.50	Less Stressful 12.59	Stressful 39.86	Very Stressful 9.79	Notes Missing 34.3%	2.85	0.733

Question No.	Statement	Frequency					Descriptive Statistics	
		% Yes, always	% Yes, rather often	% No, seldom	%No, never	Notes	Mean	Standard Deviation
39	If question 38 is yes: Do you perceive involvement in conflict at work as stressful?	Not Stressful 4.90	Less Stressful 6.99	Stressful 28.67	Very Stressful 9.09	Notes Missing 50.3%	2.85	0.839
40	Have your supervisor done anything to solve the conflicts?	Yes – Go to question 42 48.95	Partly 34.27	No 16.78			1.68	0.747
41	If question 40 is partly or no: Do you perceive not solving conflict as stressful?	Not Stressful 3.50	Less Stressful 5.59	Stressful 30.07	Very Stressful 11.89		2.99	0.790
43	If question 42 is yes: Do you perceive putting high demands on yourself as stressful?	Not Stressful 8.39	Less Stressful 18.18	Stressful 60.14	Very Stressful 10.49		2.75	0.762
45	If question 44 is yes: Do you perceive engagement in your work as stressful?	Not Stressful 20.28	Less Stressful 44.76	Stressful 30.77	Very Stressful 2.10		2.15	0.767
46	Do you think about work after your working day?	Yes 78.32	Partly 17.48	No – Go to question 48 4.20			**1.26**	0.527
47	If question 46 is yes or partly: Do you perceive thinking of work after a workday as stressful?	Not Stressful 14.69	Less Stressful 27.97	Stressful 44.06	Very Stressful 9.09		2.50	0.867
48	Do you find it hard to set a limit to work assignments, although you have a lot to do?	Yes 51.75	Partly 20.98	No – Go to question 50 27.27			1.76	0.858
49	If question 48 is yes or partly: Do you perceive not setting limits to assignments as stressful?	Not Stressful 2.10	Less Stressful 16.78	Stressful 45.45	Very Stressful 8.39		2.83	0.660
51	If question 50 is yes: Do you perceive taking on more responsibility as stressful?	Not Stressful 8.39	Less Stressful 13.99	Stressful 52.45	Very Stressful 9.79		2.75	0.788
52	Do you work after ordinary working hours to finish your assignments?	Yes 65.03	Partly 25.17	No – Go to question 54 9.79			1.45	0.668
53		Not Stressful	Less Stressful	Stressful	Very Stressful		2.57	0.828

Question No.	Statement	Frequency					Descriptive Statistics	
		% Yes, always	% Yes, rather often	% No, seldom	%No, never	Notes	Mean	Standard Deviation
	If question 52 is yes or partly: Do you perceive working after hours as stressful?	9.09	31.47	39.16	10.49			
54	Do you find it hard to sleep because your mind is occupied with work?	Yes	Partly	No – Go to question 56			2.01	0.835
		34.27	30.77	34.97				
55	If question 54 is yes or partly: Do you perceive hard to sleep as stressful?	Not Stressful	Less Stressful	Stressful	Very Stressful		3.02	0.722
		1.40	11.89	35.66	16.08			
56	Due to work, do you find it hard to find time to be with your nearest?	Yes, always	Yes, rather often	No, seldom	No, newer		2.48	0.749
		8.39	42.66	41.96	6.99			
57	Due to work, do you find it hard to find time to be with your friends?	Yes, always	Yes, rather often	No, seldom	No, newer		2.43	0.708
		9.09	41.96	45.45	3.50			
58	Due to work, do you find it hard to find time for your recreational activities?	Yes, always	Yes, rather often	No, seldom	No, newer		2.37	0.719
		9.09	49.65	36.36	4.90			

4.4.3 Perceived organisational support descriptive statistics

This section reviews POS (Questions 59 to 66) using descriptive statistics, including the frequency, means, and standard deviations. Table 4.4 shows the results of the instrument used for the perceived organisational support section of the questionnaire and consists of 8 questions. The perceived organisational support instrument uses a Likert scale that consists of “1 = Strongly Disagree”, “2 = Moderately Disagree”, 3 = “Slightly Disagree”, “4 = Neither agree nor disagree”, “5 = Slightly Agree”, “6 = Moderately Agree”, and “7 = Strongly Agree”.

Considering the POS questions, the lowest mean was reported for question 63. For question 63, “Even if I did the best job possible, the organisation would fail to notice”, the mean = 2.77 and the SD = 0.192, indicating that respondents’ average answer was “Slightly disagree”.

The highest mean was reported for question 59, "The organisation values my contribution to its well-being", where the mean = 5.60 and the SD = 1.53, indicating that respondents’ average response was “Moderately agree”.

If one considers only questions 59 and 63, one can conclude that the respondents believe the company they work for appreciates their effort.

Table 4-4: Descriptive statistics of POS items

Question No.	Statement	Frequency							Descriptive Statistics	
		Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree	Mean	Standard Deviation
59	The organisation values my contribution to its well-being.	3.5	4.2	2.1	7.0	16.8	35.0	31.5	**5.60**	1.534
60	The organisation fails to appreciate any extra effort from me.	18.9	25.2	14.0	7.0	16.8	11.2	7.0	3.39	1.936
61	The organisation would ignore any complaint from me.	35.0	21.7	11.9	10.5	9.1	5.6	6.3	2.79	1.891
62	The organisation really cares about my well-being.	9.8	4.9	9.1	12.6	16.8	27.3	19.6	4.82	1.883
63	Even if I did the best job possible, the organisation would fail to notice.	35.0	25.9	7.0	10.5	9.8	4.9	7.0	**2.77**	1.920
64	The organisation cares about my general satisfaction at work.	7.7	8.4	9.8	9.8	16.1	29.4	18.9	4.82	1.875
65	The organisation shows very little concern for me.	33.6	21.7	15.4	7.7	6.3	9.1	6.3	2.84	1.927
66	The organisation takes pride in my accomplishments at work.	4.2	7.7	5.6	7.7	18.2	29.4	27.3	5.25	1.734

4.4.4 Job demand descriptive statistics

This section reviews the JD (Questions 67 to 72) using descriptive statistics, including the frequency, means, and standard deviations. Table 4.5 shows the results of the instrument used for the job demand section of the questionnaire. The JD section consists of 6 questions. The work-life balance instrument uses a Likert scale that consists of “1 = Disagree”, “2 = Somewhat Disagree”, “3 = Somewhat Agree”, and “4 = Agree”.

Considering the questions of JD, the lowest mean was reported for question 68. For question 68, “You cannot complete all your work in the allocated time.”, the mean = 2.93 and the SD = 0.92, indicating that respondents’ average answer was “Rarely”. For question 17, “I have difficulty getting my work done because I am preoccupied with personal matters at work”, the mean = 1.59 and SD = 0.61, indicating that respondents” average answer is "Somewhat agree".

The highest mean was reported for question 71, “You do a difficult job that requires a high level of knowledge and skill”, where the mean = 3.73 and the SD = 0.49, indicating that respondents” average response was “Agree”.

Table 4-5: Descriptive statistics of JD items

Question No.	Statement	Frequency				Descriptive Statistics	
		Disagree	Somewhat disagree	Somewhat agree	Agree	Mean	Standard Deviation
67	You have to do an enormous amount of work.	2.8	7.7	42.7	46.9	3.34	0.741
68	You cannot complete all your work in the allocated time.	10.5	14.7	46.2	28.7	2.93	0.924
69	You have to work very hard.	1.4	7.7	38.5	52.4	3.42	0.696
70	You have to focus your attention quite a lot.		3.5	24.5	72.0	3.69	0.536
71	You do a difficult job that requires a high level of knowledge and skill.		2.1	23.1	74.8	3.73	0.492
72	You have to constantly think about your work during working hours.	1.4	4.2	16.8	77.6	3.71	0.615

4.4.5 Descriptive statistics of the primary constructs

To achieve the first four study objectives, namely, to assess the levels of work-life balance, evaluate occupational stress, and perceived organisational support and job demand levels among engineers in South Africa, descriptive statistics were used.

The descriptive findings for work-life balance reflect the experiences of engineers who participated in this study. Work-life balance was measured using seventeen items on a five-point Likert scale, where 1 represented “not at all” and 5 represented “almost all the time”. The analysis produced a mean score of 3.16 with a standard deviation of 0.91 for WIPL, a mean of 1.79 with a standard deviation of 0.52 for PLIW, a mean of 2.92 with a standard deviation of 0.92 for WEPL, and a mean of 3.58 and a standard deviation of 0.89 for PLEW. This indicates that respondents tended to position their answers between “sometimes” and “often” for work interference with private life. The average, therefore, suggests a moderate level of balance between work and personal responsibilities. The variation around the mean is modest, which shows that while the majority of participants report moderate balance, there are still respondents who experience either low or high levels of balance.

The construct of occupational stress (OS) was measured using 21 items on two 4-point ordinal scales: a stress perception scale ranging from “Not stressful” (1) to “Very stressful” (4), and a frequency-based scale ranging from “Yes, always” (1) to “No, never” (4). The absence of a neutral midpoint on both scales required respondents to lean toward either a low-stress or high-stress orientation. The descriptive statistics for OS are shown for all four factors in Table 4.6. The descriptive results show a mean score of 3.75 with a standard deviation of 0.54 for the influence the participant has at work. The remaining value falls between the second and third response categories, suggesting that engineers often experience stress at a moderate level. The spread of responses, as indicated by the standard deviation, shows that while some participants reported low stress levels, others consistently reported higher stress levels. From an interpretive perspective, the mean score suggests a workforce that experiences noticeable stress, but not at the most severe levels.

The construct of perceived organisational support (POS) was measured with 8 items on a 7-point Likert scale, ranging from “Strongly disagree” (1) to “Strongly agree” (7). The descriptive results produced a mean score of 4.04 with a standard deviation of 0.46. The

mean of 4.04 lies between “Slightly disagree” and “Slightly agree”. This shows that respondents generally perceive their organisations as supportive. The low variability, as reflected in the standard deviation of 0.46, suggests that most participants consistently chose the lower range of the scale. The responses, therefore, cluster toward “disagreement” to “slightly agree”, with a few outliers reporting higher levels of perceived support. The results provide clear evidence that engineers in this study perceive some support from their organisations.

Job demands were assessed using 6 items on a four-point Likert-type scale ranging from “Disagree” (1) to “Agree” (4) (Kawada & Otsuka, 2011). The results indicated that participants reported a relatively high level of job demand with a mean of 3.47 and a standard deviation of 0.45, suggesting that respondents generally agreed with the presence of demanding job characteristics in their work environment.

Table 4-6: Descriptive statistics of study constructs (n = 143)

Construct	No. of items	Mean (M)	Std. Dev. (SD)
Work–Life Balance - WIPL	5	3.16	0.91
Work–Life Balance - PLIW	6	1.79	0.53
Work–Life Balance - WEPL	3	2.93	0.92
Work–Life Balance - PLEW	3	3.58	0.89
Occupational Stress – IW	4	1.89	0.54
Occupational Stress – IOC	7	2.82	0.73
Occupational Stress – IDC	7	2.56	0.66
Occupational Stress - WLTI	3	2.43	0.66
Organisational Support (POS)	8	4.04	0.46
Job Demands (JD)	6	3.47	0.45

4.5 Reliability and validity constructs

The reliability of the questionnaires was measured through Cronbach’s alphas, while validity was established by performing an Exploratory Factor Analysis (EFA).

4.5.1 Reliability of the scales and factors

Reliability measures whether a questionnaire and its underlying factors consistently reflect what it is measuring (Bryman *et al.*, 2019). This means that a person completing

the questionnaire at two different points in time should receive the same score for each factor each time, all other things being equal. Two people who are the same in terms of the factor being measured by the questionnaire should both get the same scores for these factors.

One only needs to report the Cronbach's Alpha value for each factor, which measures the degree to which a set of items is closely related. Pallant (2010) recommends Cronbach's Alpha coefficients above 0.7. If the value is equal to or greater than 0.7, it indicates that the item is consistent and reliable. Values of 0.5 and above can also be used, but interpretation should be done with caution.

To assess the internal consistency of the instruments used in the study, Cronbach's alpha (α) coefficients were calculated for each scale. The results demonstrated acceptable to excellent reliability across the majority of constructs. The Work Interference with Personal Life (WIPL) scale demonstrated excellent internal consistency, with an α value of 0.92. At the same time, the Personal Life Interference with Work (PLIW) scale also exhibited good reliability, with an α value of 0.82. Similarly, the Work Enhancement of Personal Life (WEPL) and Personal Life Enhancement of Work Life (PLEW) scales yielded reliability coefficients of α = 0.83 and α = 0.82, respectively, indicating good internal consistency. The OS Influence at Work (IW) scale had a lower reliability coefficient, where α = 0.67, which suggests questionable internal consistency and may require further refinement. The OS Indistinct Organisation and Conflicts (IOC) scale demonstrated acceptable reliability, with an α value of 0.70. The OS Individual Demand and Commitment (IDC) scale indicated strong reliability, with α = 0.86. At the same time, the OS Work-to-Leisure Time Interference (WLTI) scale also demonstrated high internal consistency, with an α value of 0.89. The Perceived Organisational Support (POS) scale demonstrated excellent reliability, with an α value of 0.94, making it the most internally consistent scale in the study. Finally, the Job Demand (JD) scale demonstrated acceptable reliability, with an α value of 0.74. Overall, these results suggest that most of the scales used in the study possess satisfactory to excellent internal consistency, supporting their use in further analyses.

Table 4-7: Cronbach's alpha coefficients for the study instruments

Scale	Abbreviation	Item Numbers	Cronbach's α
Work Interface with Personal Life	WIPL	7–11	0.92
Personal Life Interface with Work	PLIW	12–17	0.82
Work Enhancement of Personal Life	WEPL	18–20	0.83
Personal Life Enhancement of Work Life	PLEW	21–23	0.82
Influence at Work	IW	24–27	0.67
Indistinct Organisation and Conflicts	IOC	28–42	0.70
Individual Demand and Commitment	IDC	43–55	0.86
Work-to-Leisure Time Interference	WLTI	56–58	0.89
Perceived Organisational Support	POS	59–66	0.94
Job Demand	JD	67–72	0.74

Note. Cronbach's alpha values (α) represent the internal consistency and reliability of each scale. All values are rounded off to two decimal places.

4.5.2 Validity of the constructs

Exploratory Factor Analysis (EFA) was done to establish the validity of the scales used in this study. A correlation matrix displays the correlation coefficient between a set of variables. The reliability of factor analysis depends on sample size. If correlations are too high or too low, the variables should be removed from the analysis. Test if correlations are too high and if the determinant is greater than 0.00001; this indicates no severe multicollinearity. The determinant indicates whether the correlation matrix is singular, meaning that all variables are entirely unrelated to each other. The determinant should be larger than 0.00001 (SPSS, 2025).

The Kaiser-Meyer-Olkin (KMO) measures sample size suitability.

The Kaiser-Meyer Olkin returns values between 0 and 1:

- < 0.5: not acceptable
- 0.5–0.7: medium
- 0.7–0.8: good
- 0.8–0.9: very good
- >0.9: superb

According to Field (2024), the Kaiser-Meyer-Olkin measure is used to assess sample adequacy, which refers to whether a sample is sufficiently large and of high quality to represent the population being studied accurately. A value above 0,7 indicates acceptable sample adequacy.

The factor analysis communalities represent or indicate the proportion of each variable's variance, which is explained by the extraction factor (UCLA, 2024). The extracted factors should explain at least 30% of the variance of each item.

Bartlett's Test of Sphericity was used to determine whether the variables in the dataset are correlated between items and the correlation is sufficient to justify the use of factor analysis or Principal Component Analysis (PCA). The Bartlett test assesses the null hypothesis that the correlation matrix is an identity matrix, meaning variables are uncorrelated. A significant result ($p < 0.05$) indicates that the variables are correlated and suitable for dimensionality reduction techniques (Bobbitt, 2021).

The Determinant of WIPL is equal to 0.025, a value close to zero, indicating that the variables are highly correlated. Thus, the five items measure the exact dimension of work interference with personal life. The reported Kaiser-Meyer-Olkin value of 0.869 indicates that the sample size was indeed sufficient to perform factor analyses on the data. The Bartlett's Test of Sphericity is usually reported alongside the KMO Measure of Sampling Adequacy.

The p-value indicates whether the correlations between items are statistically significant. If $p < 0.05$, the correlations are considered sufficiently high. Given the reported value of

$p < 0.0001$, the correlations among the items are deemed to be sufficiently high. The communalities of the extraction are evident in Table 4.8.

The five items all exceed the 0.30 threshold in terms of communalities. The lowest communality for WLB is question 7, with a value of 0.598, while the highest is for question 10, with a value of 0.844. Thus, the extracted factor explains 59.8% to 84.4% of the variance in the individual items, and the items are strongly related to the underlying latent constructs.

The extracted factor should explain at least 50% of the total variance, and in this research, the total variance explained is 75.068% for WIPL. The result is excellent and meaningful, with only 25% of the variance left unexplained, which is acceptable for social or behavioural research. The result supports the validity of the factor structure and justifies using the one component or factor in future analysis. The results indicated that all five items measure the same underlying construct, namely, work interference with private life. Only one factor has been extracted; therefore, the results cannot be rotated.

The determinant of PLIW is 0.115, which exceeds the guideline value of 0.0001. The correlations amongst the individual items aren't too high. The Kaiser-Meyer-Olkin (KMO) value of PILW is 0.857, indicating that the sample size was indeed sufficient to perform factor analyses on the data. The p-value of the Bartlett test is significant at $p < 0.0001$, indicating a high enough correlation among the items.

The communalities after the extraction of the six items ranged from 0.275 to 0.719. The five items (Questions 12 to 15 and 17) had communalities above the recommended threshold of 0.30, indicating that the extracted factor explained a substantial proportion of their variances. However, question 16 had a communality of 0.275, indicating that the factor may not represent it well enough and may require further investigation or revision. The inclusion of this question will be reconsidered once reliability has been assessed.

The total variance explained by the extracted factor is 54.73% for PLIW. The result is acceptable for social or behavioural research. The result shows that the extracted components represent the items (Questions 12 to 17) and support the validity of the factor structure. Only one factor has been extracted; therefore, the results cannot be rotated.

The Determinant of WEPL is equal to 0.331, which is larger than the guideline value of 0.0001. The correlations amongst the individual items aren't too high. The Kaiser-Meyer-Olkin (KMO) value of WEPL is 0.717, indicating that the sample size was indeed sufficient to perform a factor analysis on the data. The p-value of Bartlett's test, where $p < 0.0001$, suggests that the correlations between variables are high enough. The extracted communalities for the three items ranged from 0.722 to 0.772. The lowest communality is for question 20, at 0.722, while the highest is for question 19, at 0.772. This indicates that the extracted factor accounts for a substantial portion of the item's variance.

The total variance explained by the extracted factor is 74.17% for WEPL. Therefore, only 26% of the variance is left unexplained, which is acceptable for social or behavioural research. The results show that the extracted components represent the items well (Questions 18-20). The results show that all three items are measuring the same underlying construct: work enhancement of private life. Only one factor has been extracted, and the results cannot be rotated.

The Determinant of WEPL is equal to 0.295, indicating moderate to low multicollinearity among the variables. The Kaiser-Meyer-Olkin (KMO) value of PLEW is 0.669, and a value between 0.60 and 0.69 indicates an average sample size. Thus, the reported value of 0.669 indicates that the sample size is adequate, although not as good as those of WIPL, PLIW, and WEPL.

The reported p-value of Bartlett's test, being $p < 0.05$, indicates that the correlation among the variables is sufficiently high. The extracted communalities for the three items ranged from 0.698 to 0.836. The lowest communality is for question 23, at 0.698, while the highest is for question 22, at 0.836. The extracted factor accounts for a considerable portion of the individual variances of the items. The extracted factor is 74.43% for PLEW, which is acceptable for social or behavioural research. The result suggests that the extracted components represent the items well (Questions 21 to 23) and support the validity of the factor structure, as only one factor was extracted, and justify using these components in future analysis.

Table 4-8: Exploratory factor analysis of WLB

Question Number	Determinant	KMO Measure	Bartlett's Test (p-value)	Communalities	Total Variance Explained	Results
7				0.598	75.068	
8				0.823		Only one component extracted.
9	0.025	0.869	< .0001	0.775		
10				0.844		
11				0.713		
12				0.558	54.727	
13				0.471		
14	0.115	0.857	< .0001	0.714		Only one component extracted.
15				0.275		
16				0.345		
17				0.545		
18				0.731	74.170	Only one component extracted.
19	0.331	0.717	< .0001	0.772		
20				0.772		
21				0.699	74.430	Only one component extracted.
22	0.295	0.669	< .0001	0.836		
23				0.698		

Note. KMO = Kaiser-Meyer-Olkin Measure of Sampling Adequacy. Communalities indicate the proportion of variance explained by the extracted components.

No factor analysis was conducted on occupational stress due to the exclusion of some questions, which allowed respondents to skip them if the situation was not stressful, resulting in too small sample sizes. Below is an example. Question 28: “Has your workload increased?” With the option “Yes” or “No” – “Go to Question 30”. Question 29: “If your answer to question 28 was yes.” “Do you perceive your increased workload as stressful?” With the option “Not stressful”, “Less stressful”, “Stressful”, or “Very stressful”.

All the items of perceived organisational support were considered as one factor and not divided into subcategories as WLB. The Determinant of POS is equal to 0.002, and this value is nearlyequal to zero, indicating weak multicollinearity among the variables. The Kaiser-Meyer-Olkin (KMO) value of POS is 0.938, and a value above 0.90 is superb. Thus, the reported value of 0.938 indicates an outstanding sample size for performing

factor analyses on the data. The p-value of the Bartlett test, at $p < 0.05$, suggests that the correlations between the variables are high and that a one-factor model is appropriate.

The communalities of the eight items all exceed the 0.30 threshold, indicating that they are represented well by the extracted factor. The lowest communality for POS is question 62, with a value of 0.532, while the highest is for question 64, with a value of 0.829. This item indicates that the factor explains a considerable portion of the items' variance. The result suggests that the items are strongly related to the underlying latent constructs.

The total variance of the extracted factor is 69.62% for POS. The result shows that only 30.38% of the variance is left unexplained, which is acceptable for social or behavioural research. The results suggest that the extracted components represent the items well (Questions 59 to 66), supporting the validity of the factor structure and justifying the use of a single component in future analyses.

Table 4-9: Exploratory factor analysis of POS

Question Number	Determinant	KMO Measure	Bartlett's Test (p-value)	Communalities	Total Variance Explained	Results
59	0.002	0.938	0.0001	0.583	69.627	Only one component was extracted.
60				0.643		
61				0.782		
62				0.532		
63				0.756		
64				0.829		
65				0.746		
66				0.698		

All POS items were considered as a whole, not being divided into subcategories like WLB.

The Determinant of JD is equal to 0.203, which is larger than the guideline value of 0.0001. The correlations amongst the individual items aren't too high. The Kaiser-Meyer-Olkin (KMO) value of JD is 0.760, indicating that the sample size was indeed sufficient to perform a factor analysis on the data. The p-value of the Bartlett test at $p < 0.05$ suggests that the variable correlations are high and the one-factor model is appropriate.

The extracted communalities for the six items ranged from 0.576 to 0.731. The lowest communality is for question 71, at 0.578, and still indicates a strong fit, while the highest

is for question 67, at 0.731. This item suggests that the factor model accounts for a considerable portion of the item's variance. The result indicates that the factor solution is robust, and the items are strongly related to the underlying latent constructs. The total variance of the extracted factor is 46.10% for JD. The results are moderate with a value of 46.10%. Two extracted components record the response for questions 67 to 72. A factor extracted between 40% to 60% is considered acceptable in psychological or behavioural constructs.

This pattern matrix indicates that the factor should be split into two (Questions 67 to 69 and Questions 70 to 72). However, it was chosen to use the factor as per the literature. It is noted here that the pattern matrix suggests the presence of two factors, which will be further investigated during the reliability tests. Questions 70 to 72 are positively and strongly related to component one, suggesting that these questions measure a common underlying factor, such as workload and job demand. In contrast, questions 67 to 69 are negatively related to component two and can measure different dimensions, such as psychological demand.

The result shows that only 26% of the variance is left unexplained, which is acceptable for social or behavioural research. The results suggest that the extracted components represent the items well (Questions 21 to 23) and support the validity of the factor structure, justifying their use in future analyses.

The results suggest that the six items reflect two distinct but related dimensions of job demand. Two factors were extracted and rotated to improve interpretability.

Table 4-10: Exploratory factor analysis of JD

Question Number	Determinant	KMO Measure	Bartlett's Test (p-value)	Communalities	Total Variance Explained	Results	
						1	2
67	0.203	0.760	0.0001	0.731	46.100		-0.753
68				0.672			-0.862
69				0.704			-0.731
70				0.578		0.736	
71				0.651		0.835	
72				0.576		0.714	

4.6 Correlation analysis

The fifth research objective was to examine the impact of work-life balance on occupational stress among engineers in South Africa. Spearman's rank-order correlation was conducted to investigate the relationships among the measured constructs, including work-life balance, occupational stress, job demands, and related factors. The correlation between the variables was measured in this research using Spearman's rho (ρ). Spearman's ρ measures the strength and direction of the relationship between two variables (Bryman *et al.*, 2019:384).

The correlation coefficient indicates the significance of the relationship as well as the effect size, and the guideline values are as follows:

- ~0.1, small (weak), no practically significant correlation
- ~0.3, medium (moderate), practically visible correlation
- ~0.5, large, practically significant correlation

The p-value indicates whether there is a statistically significant relationship, where a p-value of less than 0.05 indicates a statistically significant relationship. The results revealed several statistically significant correlations, many of which were of practical importance. This study employed a non-probability, cluster-based sampling method. As such, the reported p-values should be interpreted with caution. They are presented to illustrate relationships observed within the sample and do not imply statistical inference to a larger population. Emphasis should be placed on the effect sizes (correlation coefficients), which provide meaningful insight into the strength and direction of relationships regardless of sampling method.

The current study examined the relationships between work-life balance (WLB), occupational stress (OS), and related constructs using Spearman's rank-order correlations. Given the use of a non-probability, cluster-based sampling method, the reported *p*-values should be interpreted cautiously and not as inferential evidence for the broader population. Instead, emphasis is placed on effect sizes (correlation coefficients), which indicate the practical significance and direction of observed relationships.

Work-life balance demonstrated a significant and strong negative correlation with occupational stress caused by workload and time imbalance (OS_WLTI), $r_s = -0.568$, $p < 0.001$. This indicates that individuals reporting higher levels of WLB tend to experience lower levels of stress related to workload and time pressures. The strength of this association reflects a large effect size, suggesting practical significance.

Conversely, WLB showed a significant positive correlation with occupational stress from interpersonal and administrative work factors (OS_IAW), $r_s = 0.482$, $p < 0.001$. Although seemingly counterintuitive, this may suggest that individuals with higher WLB are often more engaged in collaborative or leadership roles, which may expose them to increased interpersonal or administrative stressors. This effect size is also considered large.

Further significant correlations included:

- WLB and Work Interference with Personal Life (WIPL): $r_s = 0.765$, $p < 0.0001$ – very strong positive correlation, large effect size
- WLB and Personal Life Interference with Work (PLIW): $r_s = 0.507$, $p < 0.0001$ – strong positive correlation, large effect size
- WLB and Work Enhancement of Personal Life (WEPL): $r_s = -0.725$, $p < 0.0001$ – very strong negative correlation, large effect size
- WLB and Personal Life Enhancement of Work (PLEW): $r_s = -0.657$, $p < 0.0001$ – strong negative correlation, large effect size

In each of these cases, the correlations are both statistically and practically significant, reinforcing the influence of work-life balance across various life domains.

WLB also demonstrated a moderate positive correlation with job demands (JD), $r_s = 0.254$, $p = 0.002$. Although this may initially appear unexpected, it suggests that individuals with higher WLB may still perceive their jobs as demanding, potentially due to role complexity or responsibility, but are still able to maintain balance.

However, WLB did not demonstrate a statistically or practically significant relationship with perceived organisational support (POS), with a weak correlation of $r = 0.100$, $p = 0.233$. This suggests that organisational support, as measured in this study, may not play

a prominent role in shaping perceptions of work-life balance within the sampled population

Table 4-11: Spearman's correlation matrix among study variables

Variable	WIPL	PLIW	WEPL	PLEW	WLB	JD	POS	OS_IAW	OS_WLTI
WIPL	1.000	0.083	-0.503	-0.245	0.765	0.384	0.125	0.346	-0.669
		(0.322)	(0.000)	(0.003)	(0.000)	(0.000)	(0.138)	(0.000)	(0.000)
PLIW		1.000	-0.158	-0.348	0.507	0.008	0.169	0.189	-0.043
			(.059)	(0.000)	(0.000)	(0.922)	(0.044)	(0.024)	(0.610)
WEPL			1.000	0.412	-0.725	-0.085	-0.021	-0.505	0.433
				(0.000)	(0.000)	(0.315)	(0.800)	(0.000)	(0.000)
PLEW				1.000	-0.657	-0.034	0.026	-0.309	0.266
					(0.000)	(0.688)	(0.762)	(0.000)	(0.001)
WLB					1.000	0.254	00.100	0.482	-0.568
						(0.002)	(0.233)	(0.000)	(0.000)
JD						1.000	0.012	-0.019	-0.264
							(0.891)	(0.821)	(0.001)
POS							1.000	0.157	-0.059
								(0.061)	(0.481)
OS_IAW								1.000	-0.371
									(0.000)
OS_WLTI									1.000

Note. Values represent Spearman's *rho* correlation coefficients. *p*-values are shown in parentheses. WIPL = Work Interference with Personal Life; PLIW = Personal Life Interference with Work; WEPL = Work Enhancement of Personal Life; PLEW = Personal Life Enhancement of Work; WLB = Work-Life Balance; JD = Job Demands; POS = Perceived Organisational Support; OS_IAW = Organisational Support for Individual and Work; OS_WLTI = Organisational Support for Work-Life Tension Integration. *p* < .05 considered significant.

4.7 Mediating role of organisational support and job demand in the relationship between work-life balance and occupational stress

The sixth and seventh research objectives were to investigate the mediator role of organisational support and job demands in the relationship between work-life balance and occupational stress. To attain these objectives, a mediation analysis was conducted using structural equation modelling.

Structural Equation Modelling (SEM) is a multivariate statistical technique used to analyse complex relationships between the variables. It integrates confirmatory factor analysis and path analysis, allowing researchers to test theoretical models by estimating

multiple interrelated regression equations simultaneously, as seen in Figures 4.1 and 4.2. SEM is particularly valuable in fields such as psychology and the social sciences, where constructs are often abstract and measured indirectly through indicators. Interpretation of SEM involves assessing model fit indices, Standard Regression Weights, Standard Total Effect, Standardised Indirect Effect, SMIN, Baseline Comparison, and RMSEA (Root Mean Square Error of Approximation ≤ 0.08). These reference values help determine how well the proposed model fits the observed data, guiding acceptance or revision of the theoretical framework (Akinremi, 2024; Bonte, 2023).

Table 4-12: Terms used in regression analysis

Term	Decription
Estimate	The regression coefficient or effect size. The estimate indicates the direction and strength of the relationship between the variables (Steyn & Ellis, 2003).
S.E. (Standard Error)	The S.E. measures the variability or vagueness of the estimate. Smaller values of S.E. mean a more precise or greater confidence in the estimate.
C.R. (Critical Ratio)	The C.R. is a calculation of the estimate divided by the S.E. It is like a t-value in regression. C.R. helps determine and indicate that the results are significant.
P (p-value)	P-value is the probability that the observed effect is due to chance. A value smaller than 0.05 is typically considered statistically significant (Steyn & Ellis, 2003).
LV	Latent Variable. The latent variable is a variable that is not directly observed, but inferred from various measured (observed) indicators and is used in Structural Equation Modelling (SEM) or Path Analysis.

The interpretation of JD to WLB is indicated in Table 4.13 below. Only the relationship between JD and WLB will be explained; subsequently, as we progress, specific values will be described in more detail.

- Estimate = -0.182 is the regression coefficient, indicating the direction and strength of the relationship. A negative value means that higher Job Demand is associated with lower Work-Life Balance. However, the effect is relatively small.
- Standard Error = 0.144 measures the variability or uncertainty of the estimate. A smaller S.E. means more confidence in the estimate.

- Critical Ratio = -1.261 is the estimate divided by the S.E., similar to a t-statistic. It helps determine statistical significance.

- p-value = 0.207 tells us whether the relationship is statistically significant. Since this value is greater than 0.05, the result is not statistically significant. That means we cannot confidently say that Job Demand has a meaningful impact on Work-Life Balance in this model.

The model assessing the relationships between Work-Life Balance (WLB) and Occupational Stress Influence at Work mediated (OS_IAW) by Job Demand (JD) is illustrated in Figure 4.1.

The SEM results indicated that although the paths from WLB directly to OS_IAW (p-value = 0.015) as well as from JD to OS _IAW (p-value = 0.047) are statistically significant, the path from WLB to JD isn't (p-value = 0.207). This is also confirmed by the standardised regression weights WLB to OS_IAW (coefficient = -0.680), JD to OS_IAW (coefficient = -0.262) but WLB to JD (coefficient = -0.133). The standardised total effect of the model is -0.262, and the standardised indirect effect is 0. The model's percentage mediation is also 0%. Considering the fit indices, the CMIN/DF measured 3.254, which isn't close to 1. The CFI was reported at 0.71, which also indicates a weak fit. Last, the RMSEA at 0.126, with a confidence interval of 90% (0.108; 0.144), is also higher than the value recommended for a good fit. Thus, it can be concluded that the model doesn't fit the data well, and JD doesn't mediate between WLB and OS_IAW.

To note the null hypothesis tests that the parameter is 0, *** means that the p-value is less than 0.001 (as AMOS cannot express numbers smaller than this)

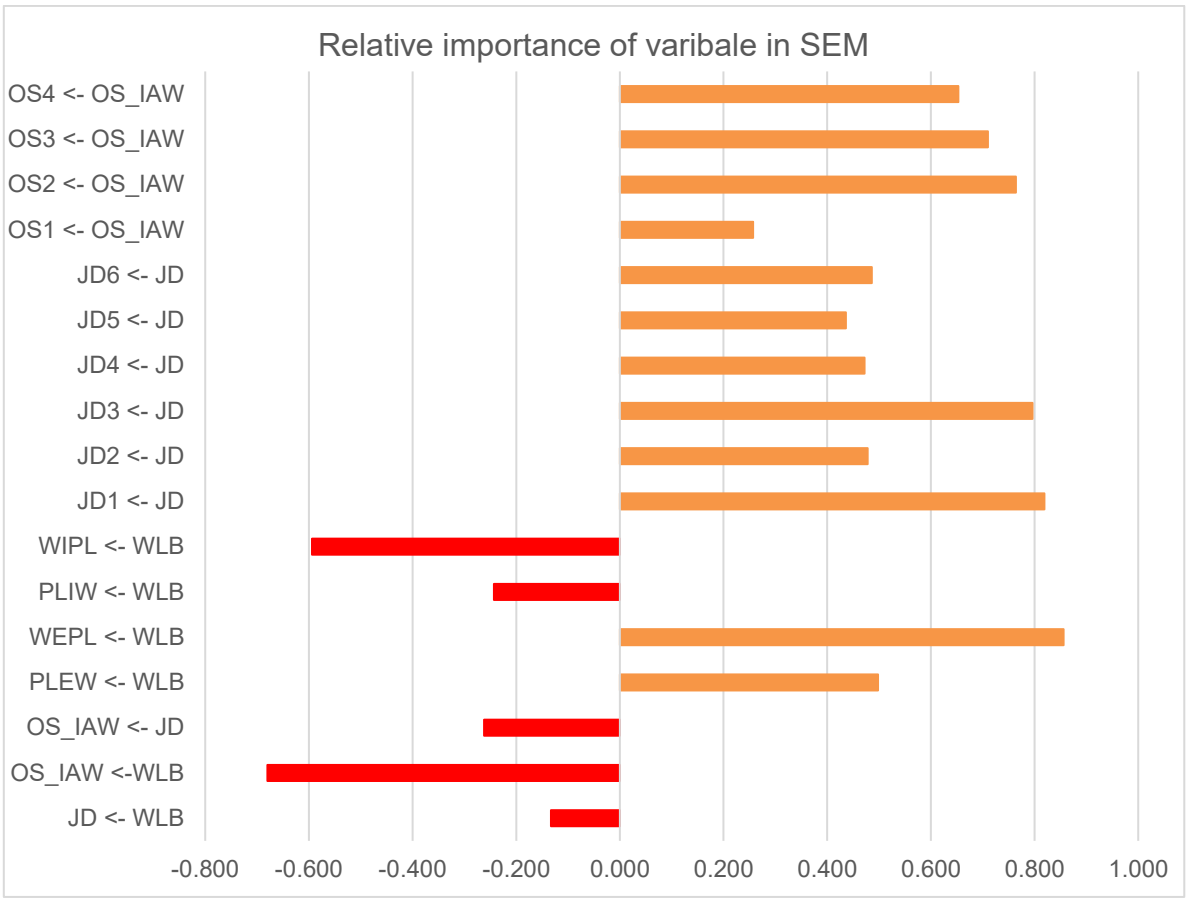
If $p < 0.05$ (or ***, which means p is smaller than 0.001), the coefficient of the variable is not equal to 0, and thus the variable contributes significantly to the model.

Table 4-13: Regression Weights for the Predictive Model

Path	Estimate	S.E.	C.R.	P	Interpretation
JD_LV ← WLB_LV	–0.182	0.144	–1.261	0.207	Not significant. Work-life balance does not significantly predict job demand.
OS_IAW_LV ← WLB_LV	–0.281	0.116	–2.431	0.015	Significant. A better work-life balance is associated with lower occupational stress.
OS_IAW_LV ← JD_LV	–0.079	0.040	–1.989	0.047	Significant. Higher job demand is associated with lower influence at work, resulting in increased stress levels.

Note. LV = Latent Variable; JD = Job Demand; WLB = Work-Life Balance; OS_IAW = Organisational Support for Individual and Work. *p* < .05 indicates statistical significance.

Graph 4.2 indicates that the higher the bar, the stronger the relationship, and the more influence the variable has on the other. The graph also shows positive and negative values, with the sign indicating the direction of the relationship.



Graph 4-2: Standardised regression weight

The figure below examines the relationship between work-life balance (WLB) and organisational stress influence at work (OS_IAW), with Job Demand (JD) in the mediating role.

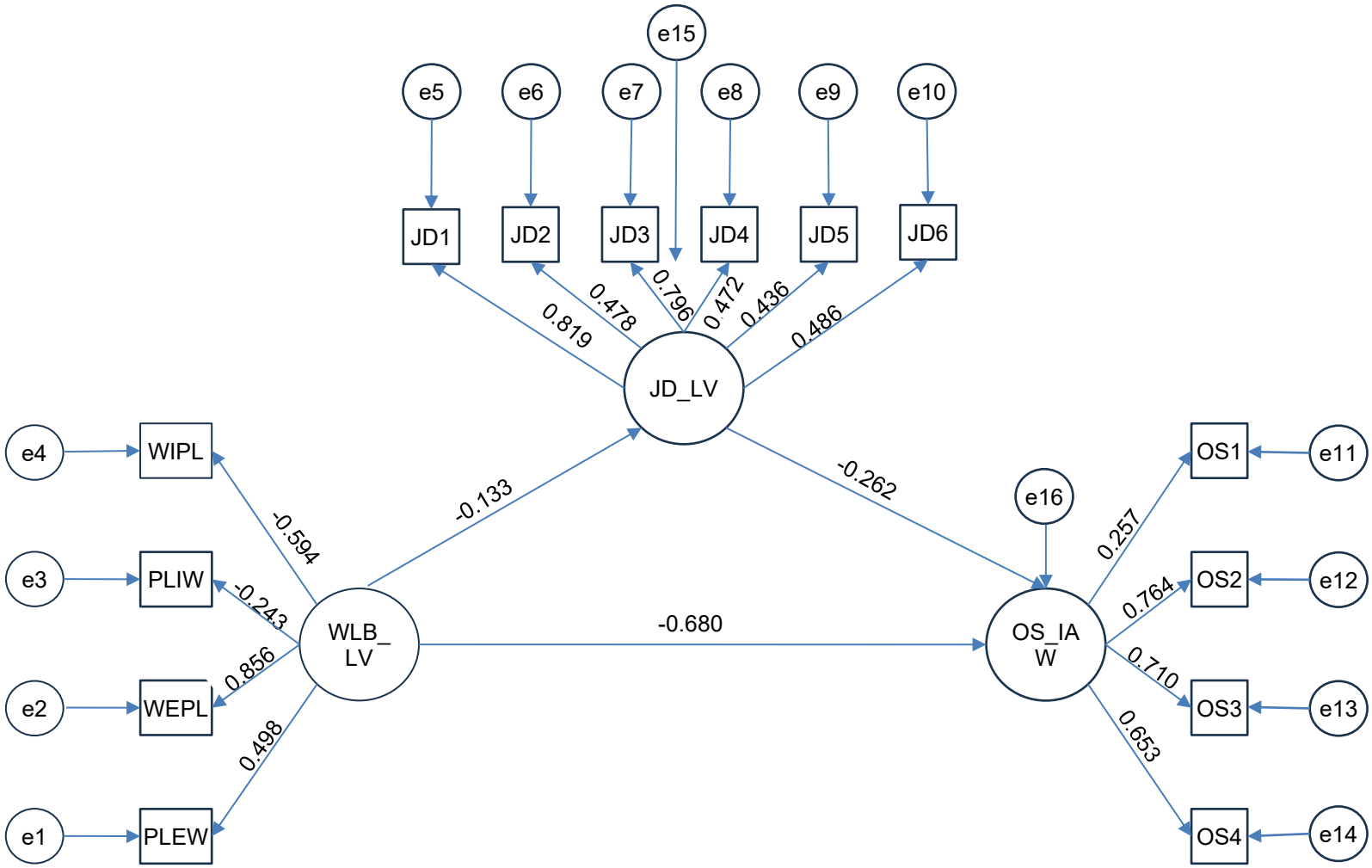


Figure 4-1: WLB and OS_IAW mediating role of JD

Table 4.14 presents the standard total effect, which represents the overall influence of one variable on another, combining the direct and indirect effects through the mediator. The variable is standardised and measured in standard deviation units, making it compatible across all variables.

Each cell shows the total effect of the variable in the column on the variable in the row.

Example:

- Compare WLB to occupation stress item two (OS2 - “Do you have the possibility to influence decisions at work”). A standard deviation unit of “1” increase in WLB leads to a 0.493 standard deviation decrease in the OS2 item.
- Compare JD to JD3 (“You have to work very hard”). The positive value of 0.796 indicates a strong effect, suggesting that JB has a strong influence on JD3.
- Organisational stress, influence at work, compared to the JD, has a value equal to -0.262, which indicates that a higher job demand reduces the impact an individual has at work, and this can lead to an increase in occupational stress.

WLB has a substantial adverse effect on OS2, OS3, and OS4 and a positive effect on WEPL, where JD has a considerable impact on JD1 to JD6 and a moderate effect on OS1 to OS4; OS_IAW directly affects OS1 to OS4, with the most potent effect on OS2, which is equal to 0.764.

Table 4-14: Standardised regression weights across constructs

Indicator	WLB	JD	OS_IWS
JD	–0.133	0.000	0.000
OS_IAW	–0.645	**–0.262**	0.000
OS4	–0.421	–0.171	0.653
OS3	–0.458	–0.186	0.710
OS2	**–0.493**	–0.200	0.764
OS1	–0.166	–0.067	0.257
JD6	–0.065	0.486	0.000
JD5	–0.058	0.436	0.000
JD4	–0.063	0.472	0.000
JD3	–0.106	**0.796**	0.000

Indicator	WLB	JD	OS_IWS
JD2	–0.064	0.478	0.000
JD1	–0.109	0.819	0.000
WLB _WIPL	–0.594	0.000	0.000
WLB_PLIW	–0.243	0.000	0.000
WLB_WEPL	0.856	0.000	0.000
WLB_PLEW	0.498	0.000	0.000

Note. Bold or highlighted values in the original table (e.g., JD3 → JD = 0.796) indicate stronger standardised regression weights within each construct. WLB = Work-Life Balance; JD = Job Demand; OS_IWS = Organisational Support for Individual Work Support.

4.7.1 Model fit summary

The model fit summary indicates how well the data fit the theoretical constructs.

Table 4.15 indicates the CMIN (Chi-square Minimum Discrepancy), where the value of CMIN/DF (DF is the degree of freedom) equals 3.254. The value of 3.254 indicates the model has a satisfactory to average fit. The model fits better than the independence model, but not perfectly, and can be accepted with room for improvement.

Table 4-15: Model fit summary - CMIN

Model	NPAR	CMIN	DF	p	CMIN/DF
Default model	45	240.788	74	0.000	**3.254**
Saturated model	119	0.000	0	—	—
Independence model	28	666.631	91	0.000	7.326

Note. CMIN = Chi-square Minimum Discrepancy; DF = Degrees of Freedom; NPAR = Number of Parameters. CMIN/DF values between 2 and 5 indicate an acceptable fit; values under 3 are considered good.

The CFI (Comparative Fit Index) is important because it adjusts the model complexity and sample size, making it more reliable than the chi-square alone. The CFI compares how well the default model fits compared to the baseline model (usually an independent model). In Table 4.16, the value of CFI = 0.710, which is below the threshold of 0.90. The CFI indicates a poor fit and does not align well with the data, and one needs to consider revising the model structure.

Table 4-16: Model fit summary - Baseline comparison

Model	NFI Delta 1	RFI rho 1	IFI Delta 2	TLI rho 2	CFI
Default model	0.639	0.556	0.719	0.644	0.710
Saturated model	1.000	1.000	1.000	1.000	1.000
Independence model	0.000	0.000	0.000	0.000	0.000

Note. NFI = Normed Fit Index; RFI = Relative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index. Values closer to 1.000 indicate a better fit. A CFI value above .90 is typically considered acceptable.

In Table 4.17, the RMSEA (Root Mean Square Error of Approximation) measures the model's fit to the population covariance matrix, taking into account model complexity. The confidence level indicates that with 90% confidence, the "true" RMSEA lies between 0.108 and 0.144. Since the entire interval is above 0.10, it reinforces that the model fit is poor and unlikely to improve solely due to sampling error.

In summary, the default model has a poor fit to the database, as indicated by the RMSEA.

Table 4-17: Model fit summary - RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.126	0.108	0.144	0.000
Independence model	0.211	0.196	0.226	0.000

Note. RMSEA = Root Mean Square Error of Approximation; LO 90/HI 90 = lower/upper bound of the 90% confidence interval; PCLOSE = probability of close fit.

The model assessing the relationships between Work-Life Balance (WLB) and Occupational Stress's Work to Leisure Time Interference (OS_WLTI) mediated by Job Demand (JD) is illustrated in Figure 4.2.

The SEM results indicated that the paths between Work-Life Balance and OS_WLTI (p-value < 0.05) as well as WLB and JD (p-value = 0.004) are statistically significant. However, the path from JD to OS_WLTI is not significant (p-value = 0.875). This is also confirmed by the standardised regression weights, WLB to OS_WLTI (coefficient = 0.811), WLB to JD (coefficient = -0.384), but JD to OS_WLTI (coefficient = 0.013). The standardised total effect of the model is 0.013, and the standardised indirect effect is 0. The model's percentage mediation is also 0%. Considering the fit indices, the CMIN/DF measured 2.444, which is not close to 1. The CFI was reported at 0.871, which also does not indicate a good fit. Lastly, the RMSEA at 0.101, with a confidence interval of

90% (0.081; 0.121), is also higher than the value recommended for a good fit. Thus, it can be concluded that although this model fits the data slightly better, it is still not a good fit, and JD also does not mediate between WLB and OS_WLTI.

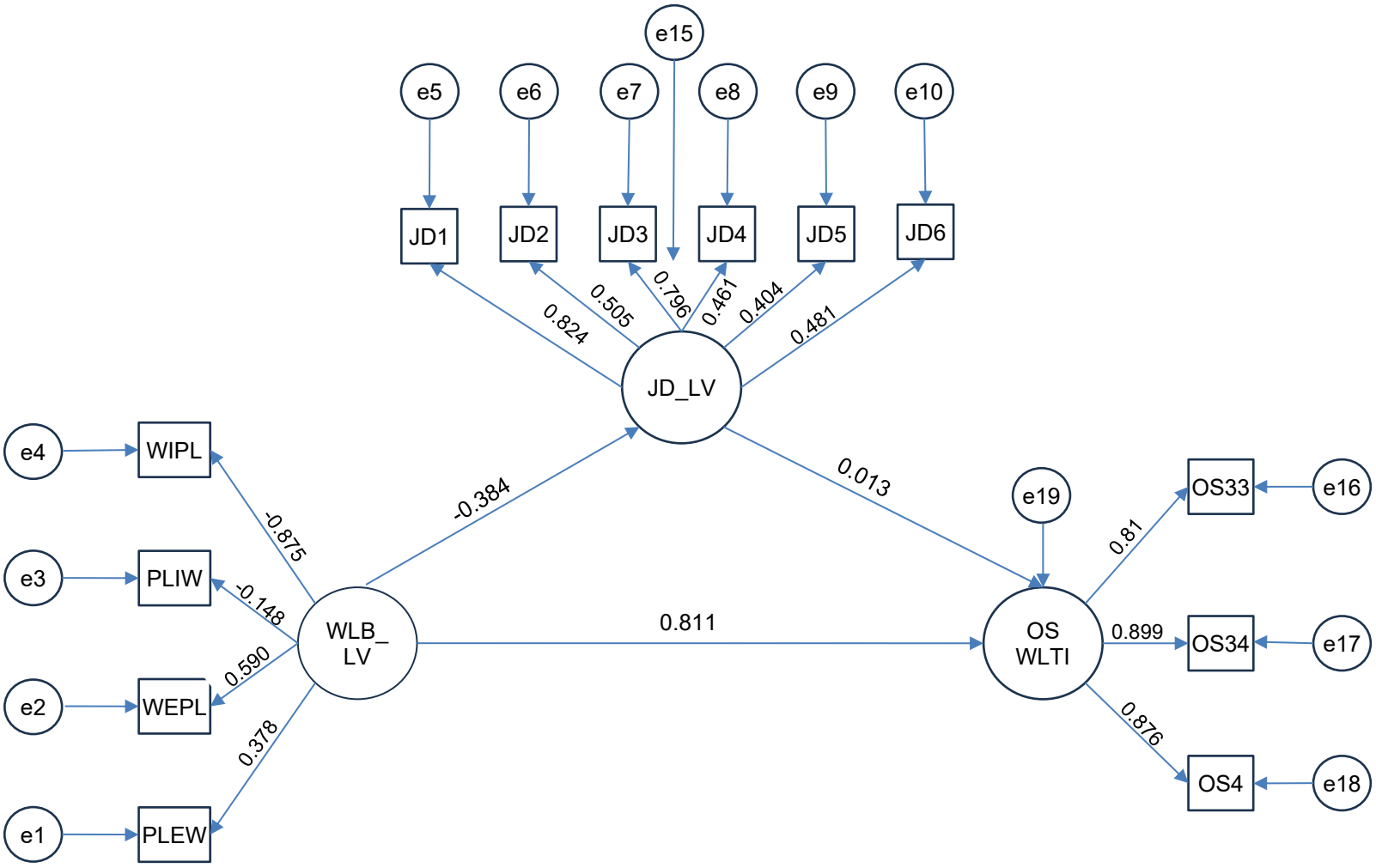


Figure 4-2: WLB and OS_WLTI Mediating role of JD

Structural Equation Modelling (SEM) is used to test the effect of the mediator, as it allows for evaluating the direct and indirect relationships among latent constructs. For Perceived Organisation Support (POS) to be a valid mediator, it needs to demonstrate statistically significant associations with both the independent variable (Work-Life Balance, WLB) and the dependent variable (Occupational Stress, OS). However, the reported correlation coefficients between POS, WLB, and OS were weak (r values close to zero), which undermines the prerequisite conditions for a meaningful mediation pathway. This weak association already signals a limited likelihood of significant mediation.

A correlation of 0.1 to 0.3 is small and has no statistically significant correlation.

Table 4-18: Correlation matrix for relationships between WLB, OS, and POS

Relationship	Correlation Coefficient (r)	Interpretation
WLB ↔ POS	−0.021 to 0.169	Weak to negligible
OS ↔ POS	−0.059 to 0.157	Weak to negligible

Note. WLB = Work–Life Balance; OS = Organisational Support; POS = Perceived Organisational Support. Correlation coefficients indicate weak to negligible relationships.

Direct Effect (WLB → OS)

Consider the correlation between work-life balance and occupational stress, influence-at-work, and work-to-leisure-time-interference latent variable path with an estimated value = -0.281 and p = 0.015 for WLB to OS_IAW and an estimate = 0.013 and p = 0.875.

There is a significant negative direct effect of WLB on OS_IAW. Better WLB is associated with lower stress levels.

The direct path from WLB to OS reflects the extent to which engineers' ability to balance work and personal life reduces their experienced stress levels. Regardless of mediation, if WLB has a significant adverse direct effect on OS, this supports the theory that improving balance can reduce stress. If this path is found to be statistically significant, it indicates that WLB remains an essential predictor of OS even in the absence of mediation.

Indirect Effect (WLB → POS → OS)

The indirect effect represents whether WLB influences OS through POS. The correlation is weak and non-significant, and the correlations between WLB and POS, as well as

between POS and OS, suggest that the indirect pathway does not hold. Since POS is not meaningfully associated with either WLB or OS, the mediation pathway fails to meet statistical requirements for inclusion. Thus, the indirect effect is negligible and non-significant.

4.8 Hypothesis testing results

This study tested seven hypotheses to evaluate the relationships between work–life balance (WLB), occupational stress (OS), perceived organisational support (POS), and job demands (JD) among engineers in South Africa. Both null (H_0) and alternative (H_a) hypotheses were considered for each proposed relationship or condition. The analysis incorporated descriptive statistics, correlation coefficients, and structural equation modelling (SEM), where applicable.

For H_{01} and H_{a1}, the hypothesis proposed that there would be no statistically significant deviation from a neutral or mid-point level of WLB. The mean WLB score was 3.16 (SD = 0.91) on a 5-point Likert scale for WIPL and 3.58 (SD = 0.89) for PLEW, statistically above the neutral midpoint of 3. This supports H_{a1} and leads to the rejection of H_{01}.

H_{02} and H_{a2} examined whether occupational stress significantly deviated from neutrality. The mean OS_IAW score was 1.89 (SD = 0.54) on a 4-point scale, indicating moderate stress. This meaningful deviation from the midpoint supports H_{a2} and leads to the rejection of H_{02}.

H_{03} and H_{a3} tested the level of POS. Participants reported a low POS mean score of 4.03 (SD = 0.46) on a 7-point scale. The individual mean value of the items is significantly above or below the neutral midpoint of 4. This finding supports H_{a3} and justifies rejecting H_{03}.

H_{04} and H_{a4} evaluated job demands. The mean job demand score was 3.46 (SD = 0.45) on a 4-point scale, suggesting high perceived demands and a significant deviation from neutrality. Thus, H_{a4} is supported, and H_{04} is rejected.

To test H_{05} and H_{a5}, the study used Spearman's *rho* to assess the influence of WLB on OS. A significant negative correlation was found ($r_s = -0.568$ for OS_IAW and $r_s = 0.482$

for OS_WLTI, $p < .001$), confirming that higher WLB is associated with lower OS. H_{a5} is therefore supported, and H_{05} is rejected.

H_{06} and H_{a6} proposed that POS mediates the relationship between WLB and OS. However, the correlations between POS and both WLB and OS were weak to negligible ($r = -0.021$ to 0.169), failing to meet the prerequisite conditions for mediation. As such, POS was not tested as a mediator using SEM, and H_{a6} is not supported. H_{06} is accepted.

Finally, H_{07} and H_{a7} considered whether job demand mediates the relationship between WLB and OS. SEM analysis showed that in both tested models (WLB → JD → OS_IAW and WLB → JD → OS_WLTI), one leg of the mediation path was non-significant, resulting in no indirect effect. Therefore, H_{a7} is not supported, and H_{07} is accepted.

The following table summarises the results of both null and alternative hypotheses:

Table 4-19: Summary of the results

Hypothesis	Null Hypothesis (H_0)	Alternative Hypothesis (H_a)	Decision
H_{01} / H_{a1}	No significant deviation from mid-point WLB	Significant deviation from mid-point WLB	Reject H_{01} / Support H_{a1}
H_{02} / H_{a2}	No significant deviation from mid-point OS	Significant deviation from the mid-point OS	Reject H_{02} / Support H_{a2}
H_{03} / H_{a3}	No significant deviation from mid-point POS	Significant deviation from mid-point POS	Reject H_{03} / Support H_{a3}
H_{04} / H_{a4}	No significant deviation from the mid-point job demand	Significant deviation from the mid-point job demand	Reject H_{04} / Support H_{a4}
H_{05} / H_{a5}	WLB does not influence OS	WLB significantly influences OS	Reject H_{05} / Support H_{a5}
H_{06} / H_{a6}	POS does not mediate WLB → OS	POS significantly mediates WLB → OS	Accept H_{06} / Reject H_{a6}
H_{07} / H_{a7}	Job demand does not mediate WLB → OS	Job demand significantly mediates WLB → OS	Accept H_{07} / Reject H_{a7}

4.9 Summary

This chapter presents the empirical findings regarding work-life balance and organisational stress, with perceived organisational support and job demand analysed as mediating variables. From a sample of engineers across different disciplines, the results

reveal that while work often interferes with personal life, personal life hardly disrupts work performance, but can enhance one's work-life.

Descriptive statistics and exploratory factor analysis are used to explain and support the reliability and validity of the four instruments, with high Cronbach's alpha values across the constructs. The data indicate that more than half of the engineers believe their job demand is high and that their workload has increased, making it challenging to set boundaries. They also agree that a lack of setting boundaries contributes to elevated stress levels.

Organisational support is perceived positively, mitigating some of the adverse effects of occupational stress. Structural equation modelling was not done on POS because it does not meaningfully mediate the relationship between work-life balance and occupational stress. At the same time, job demand shows a weaker, non-significant mediation effect. These findings underscore the importance of supportive environments within an organisation, helping employees manage stress and promote a work-life balance among engineers

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter 5 integrates the empirical results with the study's objectives and evaluates the core constructs of work-life balance, occupational stress, perceived organisational support, and job demands among engineers in South Africa. The chapter first reports observed levels and assesses each against the relevant scale midpoint to support clear hypothesis decisions. It then examines two theoretically motivated mediation pathways: perceived organisational support as a mediator between work-life balance and occupational stress, and job demands as a mediator between work-life balance and occupational stress. In doing so, the chapter identifies where the evidence converges with and diverges from the literature reviewed earlier and presents a refined framework that follows from the findings.

The results reveal four consistent signals. Work-life balance is slightly above the midpoint, occupational stress is above neutral, perceived organisational support is low relative to its midpoint, and job demands are high relative to theirs. A direct, stress-reducing association exists between work-life balance and occupational stress. By contrast, neither perceived organisational support nor job demands carries (mediates) this effect in the tested models. These outcomes provide the basis for the managerial guidance and future research agenda that concludes the chapter.

5.2 Discussion of the levels of work-life balance, occupational stress, organisational support, and job demand among engineers in South Africa

The first four study objectives were to assess the levels of work-life balance, evaluate occupational stress, perceived organisational support, and job demand levels among engineers in South Africa.

The sample reports a moderate level of work-life balance. The construct mean for work interference with private life is 3.16, with a standard deviation of 0.91 on a five-point Likert scale. Items show a dominant work-to-life direction. Respondents often come home too tired to engage in their desired activities (mean = 3.35). Respondents find it challenging to balance their personal lives with their professional responsibilities. Personal to work strain is low. For example, being too tired at work due to personal life issues sits near the

bottom of the scale (means = 1.59). These scores sit slightly above the midpoint of the scale, at 3.00. A one-sample test would reject H01 in favour of Ha1. The deviation is small and reports the exact test statistic and a confidence interval in the results table

This profile is consistent with engineering research that links long hours and project cycles to a spillover into personal time (Lingard & Sublet, 2002). The South African evidence also highlights structural and cultural factors that contribute to a lack of balance, especially for women in male-dominated teams (Malherbe, 2020; Naong & Naong, 2023; Shadrack & Pillay, 2023). Supportive supervision and flexible scheduling help improve balance in technical teams, which matches this study's implications (Brega *et al.*, 2023; Franco *et al.*, 2020b). The direction of effects aligns with work-family conflict models in which work demands drive interference with recovery and home roles (Fisher *et al.*, 2009; Rhoades & Eisenberger, 2002).

Decision for H_{01}. Reject the null. The mean sits above the midpoint.

The sample reports a moderate level of occupational stress. The central tendency, for example, "Indistinct organisation and conflict" is 2.82 with a standard deviation of 0.73 on the study formats. Respondents report frequent after-hours thinking about work. Many work beyond ordinary hours. Many struggle with sleep because work occupies their mind. These indicators point to recurrent strain. Relative to each scale midpoint, the pattern leans above neutral. Therefore, reject H_{02} in favour of H_{a2}.

This finding is consistent with research on engineers that identifies overload, time pressure, and role demands as chronic stressors (D'Souza *et al.*, 2003; Rothmann & Malan, 2006; Saleh & Desai, 1986). The Job Demand-Control and Effort-Reward Imbalance models explain the mechanism. High demands with low decision latitude and constrained support are associated with increased strain and spillover. Rewards that do not match effort also sustain stress responses (Karasek, 1990; Siegrist *et al.*, 2004b). South African studies report similar patterns across technical occupations, with workload and insufficient support as primary triggers (Mayer & Oosthuizen, 2021; Rothmann *et al.*, 2006).

Decision for H_{02}. Reject the null. The construct sits above a neutral midpoint.

Perceived organisational support is low on average. The construct mean ranges from 2.77 to 5.60 with a standard deviation of between 1.53 and 1.93 on a seven-point metric with a neutral midpoint of 4.00. This suggests a typical disagreement that the organisation values contributions and cares about its employees' well-being. Some items score higher, such as recognition for contributions; yet the construct-level mean remains low. Therefore, H_{a3} is supported

This result mirrors the Organisational Support Theory. Fairness, recognition, and supportive HR practices enhance perceived support, which in turn drives engagement and retention of employees (Kurtessis *et al.*, 2017; Rhoades & Eisenberger, 2002). South African studies also link higher perceived support with job satisfaction, commitment, and lower turnover intentions among technical staff (Botha & Mostert, 2014; Chinomona & Sandada, 2014; Field & Buitendach, 2011). The current low average indicates scope for improvement in supervisory credibility, procedural justice, and visible appreciation. These levers have strong evidence of impact on perceived support and performance outcomes (Eisenberger *et al.*, 2020; Wayne *et al.*, 2002).

Decision for H_{03}. Reject the null. The mean lies below the midpoint by a meaningful margin.

Job demands are high. The construct mean is 3.47 with a standard deviation of 0.45 on a four-point scale with a midpoint of 2.50. Respondents endorse items on workload intensity, sustained concentration, cognitive complexity, and constant task-focused thinking. Many also report insufficient time to complete all work. Therefore, reject H_{04} in favour of H_{a4}.

This pattern aligns with the Job Demands-Resources and Demand Control Support models, as well as sector evidence. Engineering work often combines quantitative workload with qualitative cognitive demands that load attention and effort for extended periods (Bakker & Demerouti, 2014; Karasek, 1990). South African project professionals report upper midrange demands that match the present results (Bowen, Edwards*, et al.*, 2014b). The split between cognitive intensity and workload also mirrors the qualitative versus quantitative subdimensions reported in job demand research (Fila, 2016; Kawada & Otsuka, 2011). Links between high demands and elevated strain in engineering

samples are documented well in regional and international studies (Amin *et al.*, 2024; Rahim & Siti-Rohaida, 2015).

Decision for H_{04}. Reject the null. The construct lies well above the midpoint.

The combined profile shows moderate work-life balance, moderate occupational stress, low perceived organisational support, and high job demands. The framework in Chapter 2 predicts this configuration. High demands and low support increase strain and erode recovery. This produces a work-to-life interference pattern that is stronger than the reverse direction (Bakker & Demerouti, 2007; Karasek, 1990; Rhoades & Eisenberger, 2002). Low perceived support removes a core resource that buffers stress and builds motivation, which helps explain why balance sits only at a moderate level despite the presence of some positive personal-to-work effects (Kurtessis *et al.*, 2017). The direction and magnitude of the present results align with South African evidence that suggests workload and support norms are key drivers of stress and balance outcomes for engineers and related professionals (Bowen, Edwards*, et al.*, 2014a; Mayer & Oosthuizen, 2021; Rothmann & Malan, 2006).

Actionable guidance follows directly from these findings and the literature. Trim demands during peak project phases by adjusting staffing levels and setting realistic deadlines. Expand decision latitude where possible. These changes reduce strain and improve control at work (Bakker & Demerouti, 2007; Karasek, 1990). Raise perceived organisational support with fair procedures, supervisor training, and consistent recognition practices. These steps enhance engagement and retention, while also supporting well-being outcomes (Eisenberger *et al.*, 2020; Kurtessis *et al.*, 2017; Wayne *et al.*, 2002). Protect your recovery with flexible scheduling that aligns with project cycles, stigma-free time off, and formal mentorship. These are effective in engineering contexts and align with the observed work-to-life interference pattern (Brega *et al.*, 2023; Franco *et al.*, 2020b; Lingard & Sublet, 2002).

5.3 Discussion of the impact of work-life balance on occupational stress among engineers in South Africa

The fifth research objective was to examine the impact of work-life balance on occupational stress among engineers in South Africa.

The results reveal a strong correlation between work-life balance and occupational stress. Work-life balance correlates negatively with workload and time imbalance stress, r_s = −0.568, $p < .001$. Engineers who report better balance also report less stress from long hours and scheduling pressure. Work-life balance correlates positively with interpersonal and administrative stress, $r_s = 0.482$, $p < 0.001$. This suggests that separate pressures from people and processes may persist even when balance is maintained. The analysis employed a non-probability cluster design, therefore, effect sizes guide the interpretation, and p-values are used descriptively for this sample (Bryman *et al.*, 2019).

The literature supplied aligns with this pattern. When balance improves, job satisfaction tends to rise. When balance is unhealthy, stress worsens (Pretorius, 2022). Studies have shown that office workers report more stress than those working from home, and they indicate that stress has a significant influence on balance in regression models (Thilagavathy & Geetha, 2021; Vispute & Kothari, 2023). Fisher (2001) defines imbalance as a stress state that drains time and energy for life outside work after long hours. That definition aligns with items such as coming home too tired to do things, and a job that makes it challenging to maintain a desired personal life (Fisher, 2001, as cited in Irfan *et al.*, 2023).

The consequences described in the literature review explain why the negative association is practically and essential. Occupational stress links to absenteeism, lower productivity, and poorer performance (Manivannan *et al.*, 2022). High demands, extended hours, limited support, and low control increase risks for depression, anxiety, and sleep problems (Irfan *et al.*, 2023; Sutton, 2023). Chronic strain undermines creativity, which engineers need for problem-solving (Sutton, 2023). Construction engineering evidence indicates that high stress is associated with interpersonal conflict, organisational culture, the work environment, and personal factors, which aligns with the positive correlation between balance and interpersonal or administrative stress observed in this sample (Manivannan *et al.*, 2022).

The mechanisms set out in the review are consistent with the statistics. Job demand control theory predicts strain when demand is high and control is low. Effort-reward imbalance predicts strain when effort exceeds reward (Karasek Jr, 1979; Landsbergis *et al.*, 2017; Siegrist *et al.*, 2004a; Stanhope, 2017). Within this framework, balance works as a resource that protects recovery time and reduces interference across roles. The

correlations supplied support this interpretation. Work-life balance is strongly related to work-nonwork interference and enhancement aspects. It is positively associated with work interference with personal life, $r_s = 0.765$, $p < 0.001$, and personal life interference with work, $r_s = 0.507$, $p < 0.001$. It is negatively related to work enhancement of personal life, $r_s = -0.725$, $p < 0.001$, and personal life enhancement of work, $r_s = -0.657$, $p < .001$. More interference pairs with more strain. More enrichment pairs with less strain. This aligns with the significant negative association between workload and time imbalance stress (Fisher *et al.*, 2009).

Two descriptive links help situate the finding. Work-life balance exhibits a small to moderate positive correlation with job demands, $r_s = 0.254$, $p = 0.002$. Engineers can hold demanding roles and still maintain balance, which helps keep workload and time stress lower. Work-life balance shows a weak and non-significant correlation with perceived organisational support, $r = 0.100$, $p = 0.233$. Within this dataset, support, as measured, does not explain the variation in balance.

The interventions listed in the review are directly related to these relationships. Employee assistance programmes, stress management workshops, and policies that promote a healthier distribution of time help preserve balance and reduce exposure to stress (World Health Organisation, 2020). The review also highlights resilience as a performance resource for engineers facing heavy demands. Resilience development supports satisfaction, engagement, and performance (IET 2023; Ibrahim & Hussein, 2024; Indeed Editorial Team, 2024a). These actions target the pathways shown by the statistics. Improving balance relates to a lower workload and time stress. People and process stressors require role-specific action alongside balance support.

5.4 Discussion of the mediating role of organisational support between work-life balance and occupational stress among engineers in South Africa

The sixth research objective was to investigate the mediating role of organisational support in the relationship between work-life balance and occupational stress.

This section examines the extent to which perceived organisational support (POS) mediates the relationship between work-life balance (WLB) and occupational stress (OS) among engineers in South Africa, integrating these findings with the theoretical and empirical literature. The hypotheses were: H_{06} - POS does not significantly mediate the

relationship between WLB and OS; H_{a6} - POS significantly mediates the relationship between WLB and OS.

The Job Demands-Resources (JD-R) model posits that resources buffer the health-impairment process by enabling recovery and control, thereby reducing strain (Bakker & Demerouti, 2007). Organisational Support Theory (OST) proposes that when employees believe their organisation values their contributions and cares about their well-being, they reciprocate with trust and engagement and experience less stress (Rhoades & Eisenberger, 2002). Consistent with these frameworks, prior research typically reports that WLB is negatively related to stress and positively related to satisfaction and commitment, with POS frequently operating as a mechanism that translates favourable work conditions into better outcomes (Aruldoss *et al.*, 2022; Xu & Yang, 2021).

The empirical results indicate that there is no mediation by POS. First, the direct effect of WLB on OS, as measured by the “influence-at-work” factor, was statistically significant and negative ($\beta = -0.281$, $p = 0.015$), indicating that better work-life balance is associated with lower stress. An alternative path was trivial and not significant ($\beta = 0.013$, $p = 0.875$). Second, the bivariate associations necessary for mediation were not met: correlations between WLB and POS ranged from −0.021 to 0.169, and between OS and POS from −0.059 to 0.157 - values that were weak and non-significant in this sample. Because POS was not reliably related to either the predictor (WLB) or the outcome (OS), the indirect path WLB → POS → OS was negligible and non-significant, warranting the retention of H_{06}.

In substantive terms, the evidence suggests that WLB reduces stress directly, rather than through perceived support, in this context.

These findings diverge from a broad body of studies that have shown POS to mediate essential work relationships. For example, POS mitigated the effects of stressors on compassion fatigue among frontline nurses during the COVID-19 pandemic (Liu *et al.*, 2024a); explained links among WLB, felt obligation, and engagement in academic settings (Tan *et al.*, 2024); and transmitted the effects of supportive HR practices and leadership on creativity (Asgari *et al.*, 2020; Suifan *et al.*, 2018; Tang *et al.*, 2017). POS has also mediated between perceptions of justice, and commitment/turnover intentions (Foley *et al.*, 2006; Nazir *et al.*, 2019; Ravi Kumar *et al.*, 2001), strengthened readiness for change under fair practices (Kebede & Wang, 2022), and channelled talent-

management and motivational effects to retention and commitment (Mensah, 2019; Shah & Asad, 2018).

The current engineering sample, however, did not reproduce these mediating dynamics. The divergence is interpretable. First, the entry conditions for mediation were absent, as there were no meaningful correlations between POS and either WLB or OS, indicating that a slight shared variance exists for POS to carry an indirect effect. Second, Chapter 4 profiled a context of high job demands, only moderate balance, and low/uneven support; in such conditions, engineers may anchor stress primarily in workload and recovery constraints, attenuating the role of support appraisals in the WLB→OS linkage. Third, WLB plausibly operates via non-social pathways—improved sleep, fewer time-based conflicts, and reduced cognitive carryover—which reduce stress irrespective of POS. These explanations are consistent with JD-R/R/OST, but indicate that, in this sectoral setting, POS functioned more as an independent buffer than as a mediator.

5.5 Discussion of the mediating role of job demand between work-life balance and occupational stress among engineers in South Africa

The seventh research objective was to investigate the mediator role of job demands in the relationship between work-life balance and occupational stress.

The Job Demands-Resources model states that job demands consume energy and increase strain. Job resources enable goal pursuit and protect health. A better work-life balance should be associated with lower stress, in part because it reduces exposure to excessive demands. Prior studies report such pathways. Job demands mediated the effect of a psychosocial safety climate on engagement and satisfaction in academics (Gan & Kee, 2024). Job demands partially mediated the link between high-performance work systems and emotional exhaustion (Kloutsiniotis & Mihail, 2020). Employment status and stress related to job demands among the self-employed and wage workers (Hessels *et al.*, 2017). Supervisors' workaholism increased subordinates' turnover intentions by elevating job demands (Kim *et al.*, 2020). Personal dispositions and support arrangements also shaped outcomes through perceived demands (An *et al.*, 2021; Wood *et al.*, 2020). Education studies have shown similar mechanisms where unclear organisational conditions, such as demands, carry effects from support and leadership to need satisfaction and engagement (Atiku & Van Wyk, 2024; Maas *et al.*, 2022). Health care studies have linked higher productivity expectations to higher demands and lower

engagement (Van De Voorde *et al.*, 2016). Together, these findings suggest a plausible mediating role for job demands.

Two structural equation models tested mediation. The first model used the influence at work facet of occupational stress as the outcome. The direct path from work-life balance to influence at work stress was significant and negative, with a beta of -0.281 and a p-value of 0.015. The path from job demands to work stress influence was significant, with a standardised beta of -0.262, and p = 0.047. The path from work-life balance to job demands was not significant, with a standardised beta of -0.133 and a p-value of 0.207. The indirect effect equalled 0. The percentage mediation equaled 0 percent. Fit was poor. The comparative fit index equalled 0.71. The root mean square error of approximation was 0.126, with a 90 percent confidence interval from 0.108 to 0.144.

The second model used the work-to-leisure time interference facet as the outcome. The path from work-life balance to job demands was significant, with a standardised beta of minus 0.384 and a p-value of 0.004. The path from work-life balance to work-to-leisure time interference was strong and significant, with a standardised beta of 0.811 and $p < .05$. The path from job demands to work-to-leisure time interference was trivial and not significant, with a standardised beta of 0.013, and p = 0.875. The indirect effect equaled 0. The percentage mediation equaled 0 percent. Fit remained below accepted thresholds. The comparative fit index equalled 0.871. The root mean square error of approximation was 0.101, with a 90 percent confidence interval from 0.081 to 0.121.

Across both models, at least one path in the chain failed to function. In the first, work-life balance did not predict job demands. In the second, job demands did not predict the stress facet. Job demands, therefore, did not mediate the association between work-life balance and occupational stress. The data support retaining H_{07}.

Many studies have detected mediation through job demands in various contexts. The present results do not reproduce this pattern in South African engineers. Three reasons are plausible. First, mediation requires a link between work-life balance and job demands, as well as a link between job demands and stress. The models did not display both legs simultaneously. Second, stress was measured as different facets. Influence at work reflects control and decision latitude. Work-to-leisure time interference reflects time-based conflict. Job demands may load more strongly on control-related strain than on time-based interference in this sample. Third, work-life balance can reduce stress through

direct recovery routes. Better sleep, fewer schedule clashes, and lower cognitive carryover reduce strain even when measured demands remain high. This aligns with the Job Demands-Resources model and explains the consistent direct effect of work-life balance on lower stress (Bakker & Demerouti, 2007).

5.6 Discussion of the revised conceptual framework

Based on the results, the revised conceptual framework explains how work-life balance, perceived organisational support, and job demands relate to occupational stress among engineers in South Africa. Descriptive results indicate that work-life balance and occupational stress are at moderate levels. Job demands are high. Perceived organisational support is low.

The framework reveals a strong, negative direct relationship between work-life balance and occupational stress. The rank correlation equals -0.568, with $p < 0.001$. Better balance is associated with lower stress, even when the model includes job demands and support.

Job demands show a direct path to stress, with p equal to 0.047. The path from work-life balance to job demands is not significant, with a p-value of 0.207. The indirect route through job demands does not meet the criteria for mediation. Engineers experience stress from both balance and workload, yet balance does not appear to reduce reported demands in this sample.

Perceived organisational support shows weak and non-significant links with both balance and stress. The mediation route through support is not supported.

The final framework points to a parsimonious structure. Work-life balance offers the most actionable lever for reducing occupational stress. Job demands remain a parallel driver. Perceived organisational support sits at the periphery in this dataset

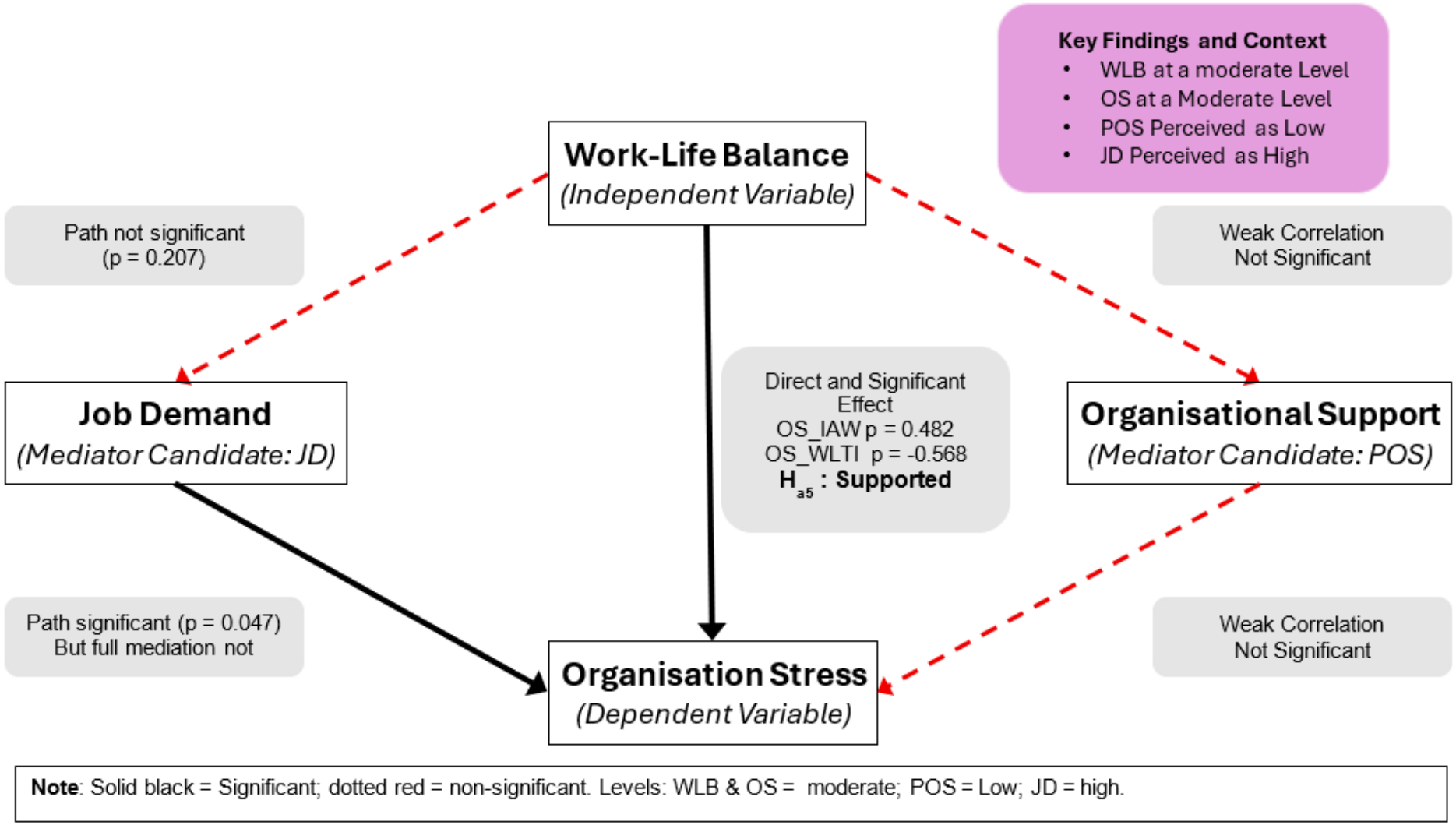


Figure 5-1: Revised conceptual framework

5.7 Managerial implications and recommendations

Low perceived organisational support signals a resource gap. Engineers do not consistently experience fair procedures, timely help, or visible recognition. Management should establish transparent criteria for resource allocation, workload distribution, and promotion to ensure fairness and accountability. Leaders should clearly explain their decisions and document the reasons behind them. Recognition should follow a consistent cadence and be linked to safety, quality, and schedule performance. Supervisors should act as first-line support. Training should focus on removing barriers, providing timely feedback, and facilitating rapid escalation of resources. The organisation should give instrumental help. Streamlined approvals, quick access to specialists, and removal of low-value reporting reduce daily friction. A quarterly support pulse should track progress. Results should be segmented by project, site, and supervisor. Leaders should publish actions taken in response to the data.

High job demands continue to be the primary burden on well-being. Planning should match tasks to engineer hours with explicit buffers for rework and compliance. Capacity dashboards should signal green, amber, or red utilisation, and persistent red should trigger escalation. Deadline compression should be reduced by implementing limits on work in progress during the design and review phases. Late changes should be frozen before milestones. Two daily focus blocks should protect deep work and reduce context switching. Decision latitude should increase where safe. Routine approvals should move to the lowest competent level. Standard deviations within tight tolerances should receive preauthorisation. Peak periods require preparation. Surge staffing should be arranged in advance. Consecutive long shifts should be capped. Recovery days should follow major milestones.

Work-life balance is associated with a direct and significant reduction in stress. Design choices should protect detachment and recovery. Teams should have no meeting blocks and quiet hours. Meetings should run for 25 or 50 minutes to allow for a smooth transition. Flexible arrangements should align with project cycles, offering options such as a nine-day fortnight outside peak phases and flexible start and finish times that accommodate site access. Boundary control should protect against non-urgent communication outside agreed hours, with a clear path for urgent exceptions. Short, evidence-based inputs on

sleep, fatigue risk, and mental detachment should be included in regular toolbox talks to promote awareness and inform decision-making.

Organisational support did not mediate the link between balance and stress. Management should not rely on support to carry the benefits of balance. Support remains valuable as an independent buffer. Protecting balance and supporting enhancements should proceed in parallel. Support should be concrete. Teams should receive shielding from non-critical work during peak weeks. Tasks should be reprioritised in line with capacity. Engineers should have fast access to expert help. Leaders should examine whether units with stronger support climates show better combined outcomes. Practices that work in those units should be adapted and spread.

Management should treat demands and balance as parallel levers of control. Actions should match the strain facet. Where the goal is greater influence at work, autonomy and approval speed should increase. Where the goal is to minimise work-to-leisure interference, limits on work in progress, a stronger planning discipline, and stable schedules should take priority. Governance should rely on simple, visible metrics. The organisation should track overtime hours, tasks in progress, cycle time, interruptions per day, and context switches. A cross-functional demand council should review these measures every month and agree on corrective actions. Short pilot cycles on selected projects should test which levers lower stress without harming delivery. Successful practices should scale, and ineffective practices should be retired.

5.8 Contribution of the study

This study makes theoretical, methodological, and practical contributions.

5.8.1 Theoretical contributions

The study fills a gap by examining work-life balance and occupational stress specifically among South African engineers, a context characterised by unique high-pressure challenges. It introduces an integrated model linking work-life balance (WLB), perceived organisational support (POS), and job demand (JD), as joint predictors of stress. Previous research has often examined WLB and stress in isolation; this thesis combines them with support and demand factors to add depth to the existing theory. The result is a comprehensive framework that maps how these variables interact in an engineering

context. This new framework is grounded in established theories (Job Demands-Resources and Demand-Control-Support models). Still, it extends them to include mediation effects, offering a richer understanding of employee well-being in demanding technical fields.

The findings broaden social exchange theory within engineering contexts. Specifically, the research shows that strong organisational support can buffer the negative impact of heavy job demands on stress. In theoretical terms, this means supportive workplace relationships (a form of social exchange) mitigate stress even when work pressure is high. This insight refines existing models of occupational stress by highlighting POS as a protective factor. It confirms that engineers with better WLB report higher job satisfaction and lower stress, reinforcing the theoretical link between balance and well-being. By incorporating these nuances of mediation and moderation, the study advances the theory on how stress and well-being interact in high-demand environments.

The research contributes localised empirical evidence to global theories. It addresses the South African engineering context, characterised by skills shortages and economic instability, which prior models did not explicitly cover. By validating the WLB-stress relationship and the mediator roles in this context, the study demonstrates that established theories remain valid, albeit with context-specific insights. For instance, high job demands increased stress levels but did not significantly mediate the WLB-stress link in the sample. This nuance suggests that while workload is a stressor, the balance-stress relationship largely persists regardless of demand levels—a finding that fine-tunes theory for similar settings in developing countries. In summary, the thesis enriches theoretical knowledge by delivering a new framework and evidence that integrates multiple constructs and adapts broad stress models to the realities of South African engineers.

5.8.2 Methodological contributions

This study employed a quantitative, post-positivist approach with a cross-sectional survey design. It made a notable methodological contribution by using Structural Equation Modelling (SEM) to test the proposed framework. SEM allowed the researcher to evaluate multiple relationships and mediation effects simultaneously with precision. This rigorous analytical technique enhances confidence in the conclusions by accounting for the complex interplay between WLB, POS, JD, and stress within a unified model. The study

combined theoretical rigour with advanced statistics, demonstrating how to empirically assess multifaceted occupational health models rather than relying on simple pairwise correlations.

The research design featured a comprehensive questionnaire divided into five sections (demographics, WLB, stress, support, and demand). It leveraged validated instruments from prior literature, adapting them for the engineering work context. For example, the Work-Life Balance scale by Fisher *et al*. (2009) was used, covering work interference/enhancement and personal life interference/enhancement across 17 items. Occupational stress was measured using a 21-item Work Stress Questionnaire, which focuses on organisational issues, individual demands, and work-leisure conflict. An established 8-item Perceived Organisational Support scale (Eisenberger *et al.*, 1986) was used to assess how valued and cared-for employees feel. Job demands were assessed using a 6-item scale adapted from the Brief Job Stress Questionnaire, which focused on workload and mental effort. Each instrument went through confirmatory factor analysis (CFA) and reliability testing to ensure it was statistically sound for this sample. The careful adaptation and validation of these scales for South African engineers is a methodological contribution, as it provides tested tools for future research in similar populations.

Collecting data from busy engineering professionals posed challenges that the study navigated successfully. The researcher implemented a non-probability, cluster-based sampling strategy in collaboration with industry bodies. Engineers across various disciplines were reached through ECSA-recognised voluntary associations, serving as gatekeepers, and additional respondents were invited via professional networks, such as LinkedIn. This approach respected privacy laws (POPI Act) by avoiding direct contact without permission. While not statistically random, the sample included participants from multiple engineering fields, enhancing the breadth of insight. The dissertation documents the recruitment process and challenges (e.g., some associations declined or lacked capacity), providing transparency and a case study from which researchers can learn. By overcoming access barriers and still achieving a meaningful sample (143 engineers), the study offers a methodological template for researching hard-to-reach professional populations in South Africa. It shows how to balance ethical constraints with the need for data and emphasises analytic generalisation—applying findings to theory—when full population generalisability is out of reach. In sum, the methodological contributions lie in the strategic use of SEM, the validation of multi-part instruments in a new context, and

the innovative, ethical sampling strategy that other scholars and practitioners can emulate.

5.8.3 Practical contributions

The study yields clear, actionable insights to improve engineers' well-being and productivity. It confirms that poor work-life balance significantly elevates stress, whereas better balance correlates with higher job satisfaction and lower stress. This evidence underlines the need for employers to facilitate a healthier work-life integration. Companies should consider flexible work arrangements (e.g., flexible hours, remote work options) to help engineers balance their work and personal responsibilities. By enabling flexibility, organisations can reduce work-family conflict and prevent burnout. The research also highlights the importance of a safe psychosocial climate—a workplace atmosphere where management actively protects mental health. Implementing policies that encourage reasonable work hours, regular breaks, and respect for personal time will foster such a climate. These interventions directly target the root causes of stress identified in the study, offering engineers practical relief in their day-to-day jobs.

A key finding is the buffering role of perceived organisational support in the stress process. When engineers feel supported by their organisation and supervisors, the negative impact of high job demands on stress is reduced. This implies that firms should invest in supportive leadership and culture. Training managers to provide encouragement and clear communication, and recognition of employees' contributions can enhance POS. Simple measures, such as mentorship programmes, open-door policies, and demonstrating genuine concern for staff well-being, go a long way in fostering a positive work environment. By improving supervisor support and overall organisational care, engineering companies can mitigate stress even if workloads remain heavy. In practice, this might include regular one-on-one check-ins, counselling or Employee Assistance Programs, and building a culture where seeking help is welcomed. Such supportive practices not only curb stress but also boost morale and loyalty.

Although high job demand was found to exacerbate stress levels, it did not significantly mediate the WLB-stress link in the analysis. This suggests that while heavy workloads and tight deadlines are clearly problematic, improving WLB and support can alleviate stress independently. Nonetheless, the practical takeaway is that organisations should

manage job demands to prevent excessive strain. Ensuring reasonable project timelines, adequate staffing, and providing resources (such as assistants or better tools) can help maintain a healthy workload. The study's context of South African engineering—where skill shortages often force engineers to juggle many tasks—makes this especially relevant. Companies and departments should monitor employee workloads and redistribute tasks or hire additional help when demand spikes. By proactively controlling job demands, employers address a direct stressor identified in the research, complementing the benefits of WLB initiatives and support programmes.

The results offer guidance not just for individual firms but also for industry-wide action. The thesis suggests that organisations rethink their well-being programmes and retention strategies, taking these findings into account. For instance, engineering firms can develop comprehensive wellness programs that include work-life balance training, stress management workshops, and family-friendly policies. Professional bodies, such as the Engineering Council of South Africa (ECSA), can utilise the research to establish workplace standards. They might issue guidelines or best practices encouraging member companies to adopt flexible schedules, limit overtime, or provide on-site wellness resources. Such standards would help create a more sustainable work environment across the sector. Importantly, these changes address the ongoing challenge of retaining skilled engineers in South Africa. The country has been losing many engineers (often mid-career professionals) to emigration, as they leave to seek better work-life balance and prospects abroad. By improving conditions locally—through supportive policies and balanced job demands—organisations can reduce turnover and "brain drain". This not only benefits individual companies (by keeping experienced talent) but also aids national capacity in engineering, which is crucial for infrastructure development and innovation.

On a broader scale, the study's insights inform public policy and align with development goals. Policymakers and government departments can draw on this evidence to craft labour policies or incentives that promote healthy work-life balance in high-skill sectors. For example, labour regulations could encourage flexible working hours or require companies to have employee wellness plans. By reducing chronic workplace stress, such policies would make engineering careers more attractive and sustainable, thereby helping to address the domestic skills shortage. The practical contributions also resonate with global and national development priorities. Improving occupational health and work conditions for engineers supports Sustainable Development Goals 3 (Good Health and

Well-being) and 8 (Decent Work and Economic Growth). A workforce of healthier, less-stressed engineers is likely to be more productive and innovative, driving economic growth while reducing healthcare burdens.

5.9 Limitations and recommendations for future research

The scope was narrow. The study focused on engineers in South Africa. The design was cross-sectional. This limits causal claims. The analysis centred on work-life balance, job demands, perceived organisational support, and occupational stress. Other relevant variables were not modelled together. Examples include autonomy, justice, leadership climate, and psychosocial safety climate. All measures used self-reports. This raises the risk of standard method variance and affect-driven responding. Several structural models showed a weak fit. This indicates missing paths, underrepresentation, or limited variance.

Sampling and access were the primary constraints. The study relied on gatekeepers. Participation required organisational permission and trust. This creates selection bias. Accessible sites and compliant teams were more likely to take part. A complete national sampling frame of engineers was not available. Small contractors, remote sites, and niche roles were likely underrepresented—high workload and concerns about confidentiality dampened response rates. Gatekeepers sometimes limit distribution inside firms. These features reduce external validity. They also compress variance in key constructs. Low spread in perceived support and high, uniform demands weaken correlations and indirect effects.

Measurement choices also constrained inference. Job demands were not fully disaggregated into quantitative and qualitative components, or into challenge and hindrance demands. The match between each demand type and each stress facet was not thoroughly tested. Perceived organisational support was measured globally. Instrumental support and socioemotional support were not separated. The mediation tests need aligned constructs. If the measures do not reflect daily instrumental help, the paths to stress weaken. Some scales showed restricted dispersion. This reduces the shared variance needed to detect indirect effects.

Future research should address sampling first; build a stratified, multi-stage sample; and use strata such as sector, discipline, province, firm size, and project type. Where full frames are missing, apply respondent-driven recruitment and calibration weighting

against external registers. Form partnerships with professional bodies and large employers through formal agreements. Use third-party brokers to protect anonymity and oversample underrepresented groups. Set quotas for small firms, remote sites, women engineers, and roles with scarce skills. Combine channels. Use employer distribution, association lists, and controlled social media for screening purposes. This broadens reach and reduces single-channel bias.

Design choices should strengthen inference. Use time-lagged panels and longitudinal cohorts. Model sequences such as work-life balance at time one, job demands at time two, and stress at time three. Add experience sampling to capture daily fluctuations in demands, detachment, and rumination. Align observations to project phases. Evaluate practical interventions with quasi-experimental designs. Examples include capacity-based planning, limits on work-in-progress, recovery rosters, and supervisor support training. Use stepped wedge or difference-in-differences designs for field settings.

Measurement should be refined. Disaggregate job demands into quantitative and cognitive intensity, as well as challenge and hindrance. Align each type to matching stress facets, such as influence at work and work-to-leisure interference. Differentiate perceived organisational support into instrumental and socioemotional forms. Add supervisor support and procedural and interactional justice as antecedents. Include objective and multi-source indicators. Add workload hours, tasks in progress, rework counts, and change orders. Include absence and turnover records. Add supervisor and peer ratings of support. Test measurement invariance across discipline, gender, career stage, and sector before comparing latent means or paths.

Analytical extensions will add value. Use multilevel models to estimate cross-level effects of team climate, leadership, and scheduling discipline on individual outcomes. Compare mediation with moderation. Test whether job demands or support buffer effects are carried rather than buffer them. Evaluate reciprocal models where stress later erodes balance. Utilise network and sequence analysis to map support-seeking and information flows within projects. Examine whether network bottlenecks explain variation in perceived support and demands.

Contextual breadth should expand. Compare sectors such as construction, energy, and manufacturing. Extend to regional samples in the Southern African Development

Community—study gendered experiences of balance and support in male-dominated teams. Follow early-career engineers through transitions. Assess hybrid and remote work on demand, detachment, and support signalling. Integrate psychosocial safety climate and justice as upstream enablers of support and demand management. Examine interactions with fatigue risk and permit work systems in safety-critical operations.

These steps will improve access, increase variance, and strengthen causal inference. They will help resolve inconsistent mediation results. They will also distinguish context-bound effects from generalisable patterns. The evidence will then support stronger organisational policies and project governance in South African engineering.

5.10 Conclusion

Chapter 5 addresses the research questions systematically. It documents the levels of the four focal constructs, evaluates each level against the midpoint, and states the resulting hypothesis decisions. Engineers report moderate work-life balance and moderate occupational stress, coupled with low perceived organisational support and high job demands. The analyses confirm a direct pathway whereby improved work-life balance reduces occupational stress. They do not provide evidence that perceived organisational support, or job demands mediate this association, and the model fit indices align with these conclusions.

The pattern is consistent with established theory: high demands and constrained resources predict strain, while social-exchange mechanisms explain why support remains valuable even when it does not function as a conduit in this context. The refined framework, therefore, retains two core arrows—work-life balance, which directly lowers stress, and job demands, which directly raise stress—while reserving unsupported mediation paths for more rigorous future testing.

Finally, the chapter translates evidence into practice and forward-looking scholarship. It recommends parallel action on the protection of balance and the management of demand, complemented by visible and instrumental support. It acknowledges the study's limitations, particularly sampling and access constraints, as well as the cross-sectional design. It proposes remedies: probability-oriented sampling, longitudinal and experience-sampling designs, finer-grained measures of demands and support, and multilevel analyses of unit climate. Taken together, these steps provide a clear roadmap for

practitioners and researchers: protect recovery and time adequacy, manage workload at its source, build credible support, and design subsequent studies to test conditional and longitudinal pathways. The chapter closes with an evidence-based framework and a focused agenda for practice and research

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ANNEXURES A: ETHICS APPROVAL

Extension of Ethics approval was done by Prof. P.A. Botha, September 2025

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15 April 2024

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Economic and Management Sciences Research Ethics Committee (EMS-REC)** on, 15/04/2024 the Economic and Management Sciences Research Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-REC) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Constructing an Empirical Framework for Measuring the Relationship between Work-Life Balance and Occupational Stress Among Engineers in South Africa

Study Leader/Supervisor (Principal Investigator)/Researcher): Prof PA Botha

Student: J. Pretorius (33464154)

N	W	U	-	0	0	6	1	8	-	2	4	-	A	4
Institution				Study Number						Year			Status	

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application Type:
Commencement date: 15/04/2024 **Risk:** **Minimal**
Expiry date: 15/04/2025
Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

- None.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principle investigator)/researcher must report in the prescribed format to the EMS-REC:*
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the EMS-REC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The date of approval indicates the first date that the study may be started.*

n the interest of ethical responsibility, the NWU-SCRE and EMS-REC reserves the right to:

ANNEXURES B: ECSA RECOGNISED VOLUNTARY ASSOCIATIONS

No.	Recognised Voluntary Associations	ACCRONYM	VA Number	CAT	Date From	Date To
1	Aeronautical Society of South Africa	AeSSA	VA A0026	A	19/07/2024	19/07/2029
2	ASPASA	ASPASA	VA B0022	B	11/05/2021	11/05/2026
3	Association of Mine Resident Engineers	AMRE	VA A0014	A	09/10/2023	09/10/2028
4	Association of Municipal Electricity Utilities	AMEU	VA B006	B	19/07/2024	19/07/2029
5	Chamber of Engineering Technology	COET	VA A007	A	09/10/2023	09/10/2028
6	Clinical Engineering Association of South Africa	CEASA	VA B0016	B	19/07/2024	19/07/2029
7	Consulting Engineers South Africa	CESA	VA B007	B	09/10/2023	09/10/2028
8	Corrosion Institute of Southern Africa	CorriSA	VA B0013	B	19/07/2024	19/07/2029
9	Engineering League for Progress	ELP	VA A0035	A	05/05/2025	05/05/2030
10	Finance and Asset Management Consultants	FAMC	VA A0033	A	09/10/2023	09/10/2028
11	Illumination Engineering Society of South Africa	IESSA	VA B0014	B	19/07/2024	19/07/2029
12	Institute of Electrical and Electronics Engineers South African Section	IEEE SA	VA A0034	A	19/07/2024	19/07/2029
13	Institute of Professional Engineering Technologists	IPET	VA A008	A	09/10/2023	09/10/2028
14	Institute of Quarrying SA	IQSA	VA B001	B	09/10/2023	09/10/2028
15	Institute of Timber Construction South Africa	ITC-SA	VA B0024	B	09/07/2021	09/07/2026
16	Institution of Certificated Mechanical and Electrical Engineers, South Africa	ICMEESA	VA A006	A	09/10/2023	09/10/2028
17	Institution of Municipal Engineering of Southern Africa	IMESA	VA A001	A	09/10/2023	09/10/2028
18	Institution of Railway Signal Engineers, Southern Africa Section	IRSE	VA B0028	B	09/10/2023	09/10/2028
19	International Council on Systems Engineering (SA Chapter)	INCOSE SA	VA A0024	A	19/07/2024	19/07/2029
20	Lift Inspectors Association of South Africa	LIASA	VA A0027	A	30/07/2024	30/07/2029
21	Lift Professional Development Association	LPDA	VA B003	B	19/07/2024	19/07/2029
22	Lifting Equipment Engineering Association of South Africa	LEEASA	VA A0028	A	19/07/2024	19/07/2029
23	Society for Automation, Instrumentation, Mechatronics and (Industrial) Computer Engineering	SAIMC NPC	VA A0010	A	09/10/2023	09/10/2028
24	Society of Telkom Group Engineers	STE	VA B0030	B	30/07/2024	30/07/2029
25	South African Colliery Engineers Association	SACEA	VA A0015	A	09/10/2023	09/10/2028
26	South African Colliery Managers Association	SACMA	VA A003	A	09/10/2023	09/10/2028
27	South African Federation of Healthcare Engineering	SAFHE	VA A0032	A	26/05/2022	26/05/2027
28	South African Flameproof Association	SAFA	VA B0017	B	19/07/2024	19/07/2029
29	South African Fluid Power Association	SAFPA	VA B002	B	11/03/2024	11/03/2029
30	South African Forum of Civil Engineering Contractors	SAFCEC	VA B0019	B	30/07/2024	30/07/2029
31	South African Glass Institute	SAGI	VA B0020	B	31/07/2020	31/07/2025
32	South African Institute of Electrical Engineers	SAIEE	VA A0019	A	11/03/2024	11/03/2029
33	South African Institute of Marine Engineers and Naval Architects	SAIMENA	VA A0017	A	09/10/2023	09/10/2028
34	South African Institution of Chemical Engineers	SAIChE	VA A005	A	09/10/2023	09/10/2028
35	South African Road Federation	SARF	VA B005	B	09/10/2023	09/10/2028
36	Southern African Asset Management Association	SAAMA	VA B0012	B	19/07/2024	19/07/2029
37	Southern African Institute for Industrial Engineering	SAIIE	VA A0011	A	09/10/2023	09/10/2028
38	Southern African Institute of Welding	SAIW	VA B0031	B	11/03/2024	11/03/2029
39	Southern African Society for Trenchless Technology	SASTT	VA B0011	B	11/03/2024	11/03/2029
40	The American Society of Heating, Refrigerating and Air-Conditioning Engineers	ASHRAE	VA B0029	B	09/10/2023	09/10/2028
41	The Institute for Work at Height	IWH	VA B0026	B	15/11/2021	15/11/2026
42	The Society For Asphalt Technology	SOCSAT	VA A009	A	09/10/2023	09/10/2028
43	The South African Institute of Agricultural Engineers	SAIAE	VA A0029	A	19/07/2024	19/07/2029
44	The South African Institute of Draughting	SAID	VA B008	B	19/07/2024	19/07/2029
45	The South African Institute of Refrigeration and Air Conditioning	SAIRAC	VA A0013	A	09/10/2023	09/10/2028
46	The South African Institution of Civil Engineering	SAICE	VA A0021	A	19/07/2024	19/07/2029
47	The South African Institution of Mechanical Engineering	SAIMechE	VA A0031	A	31/07/2020	31/07/2025
48	The South African National Committee on Large Dams	SANCOLD	VA A0018	A	11/03/2024	11/03/2029
49	The South African Society for Railway Engineering	SASRE	VA A0035	A	19/07/2024	19/07/2029
50	The Southern African Institute of Mining and Metallurgy	SAIMM	VA A004	A	09/10/2023	09/10/2028
51	Water Institute of Southern Africa	WISA	VA B0025	B	15/11/2021	15/11/2026

Associations whose membership consists of natural persons who, subject to the applicable provisions of the gazetted Rules for Recognition as a Voluntary Association and are practising in engineering in any particular discipline or sub discipline of engineering; or in any particular category of registration contemplated in Section 18 of the Engineering Profession Act.	A	28
Associations whose membership consist of juristic persons, including sole proprietors (corporate members) who, subject to the applicable provisions of the gazetted Rules for Recognition as a Voluntary Association, and are engaged in carrying out work of an engineering nature.	B	23

ANNEXURES C: ECSA VOLUNTARY ASSOCIATIONS COMMUNICATION

Category A									
Name of the Voluntary Association	Acronym	ECSA Recognision Number	Webpage	Feedback	Assist Yes / No	Date send Questions No.1	Date send Questions No.2	Send to Association CC No.1	Send to Association CC No.2
Aeronautical Society of South Africa	AeSSA	VA A0026	www.aessa.org.za				01/07/2024	08/02/2024	18/08/2024
American Society of Heating, Refrigerating and Air-Conditioning Engineers	ASHRAE	VA A0016	www.ashraesa.org					N/A	18/08/2024
Association of Mine Managers of South Africa	AMMSA	VA A002	www.ammsa.org.za				01/07/2024	08/02/2024	18/08/2024
Association of Mine Resident Engineers	AMRE	VA A0014	www.amre.org.za			12/05/2024	07/06/2024	08/02/2024	18/08/2024
Association of Municipal Electricity and Utilities	AMEU	VA A0022	www.ameu.co.za				01/07/2024	08/02/2024	18/08/2024
Institute of Municipal Engineering of Southern Africa	IMESA	VA A001	www.imesa.org.za	12/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
Institution of Railway Signal Engineers	IRSE	VA A0012	www.irse.org.za					N/A	18/08/2024
International Council on Systems Engineering (SA Chapter)	INCOSE SA	VA A0024	www.incose.org.za			12/05/2024		08/02/2024	18/08/2024
Lift Inspectors Association of South Africa	LIASA	VA A0027	www.iliasa.org.za				01/07/2024	08/02/2024	18/08/2024
Lifting Equipment Engineering Association of South Africa	LEEASA	VA A0028	www.leeasa.co.za				01/07/2024	08/02/2024	18/08/2024
Society for Asphalt Technology	SAT	VA A009	www.socsat.co.za				01/07/2024	08/02/2024	18/08/2024
Society for Automation, Instrumentation, Measurement and Control	SAIMC	VA A0010	www.saimc.co.za	11/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024

Category A									
Society of Telkom Engineers	STE	VA A0025	https://apps.telkom.co.za					N/A	18/08/2024
South Africa Colliery Engineers Association	SACEA	VA A0015	www.sacea.org.za			12/05/2024		08/02/2024	18/08/2024
South African Black Technical and Allied Careers Organisation	SABTACO	VA A0030	www.sabtaco.co.za				01/07/2024	08/02/2024	18/08/2024
South African Coal Managers Association	SACMA	VA A003	www.sacollierymanagers.org.za				01/07/2024	08/02/2024	18/08/2024
South African Federation of Healthcare Engineering	SAFHE	VA A0032	www.safhe.co.za					N/A	18/08/2024
South African Flameproof Association	SAFA	VA A0023	www.saflameproof.org.za				01/07/2024	08/02/2024	18/08/2024
South African Institute of Chemical Engineers	SAIChE	VA A005	www.saiche.co.za	14/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
South African Institute of Electrical Engineers	SAIEE	VA A0019	www.saiee.co.za	09/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
South African Institute of Marine Engineers and Naval Architects	SAIMENA	VA A0017	www.saimena.co.za				01/07/2024	08/02/2024	18/08/2024
South African Institute of Welding	SAIW	VA A0020	www.saiw.co.za				01/07/2024	08/02/2024	18/08/2024
South African National Committee on Large Dams	SANCOLD	VA A0018	www.sancold.co.za			12/05/2024		08/02/2024	18/08/2024
Southern African Institute for Industrial Engineering	SAIIE	VA A0011	www.saiie.co.za	12/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
The Chamber of Engineering Technology	COET	VA A007	www.engineeringchamber.yolasite.com			12/05/2024		08/02/2024	18/08/2024
The Institute of Professional engineering Technologists	IPET	VA A008	www.ipet.co.za		No		01/07/2024	08/02/2024	
The Institution of Certificated Mechanical and Electrical Engineering	ICMEESA	VA A006	www.icmeeasa.org.za	12/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
The South African Institute of Agricultural Engineers	SAIAE	VA A0029	www.saiae.co.za			12/05/2024		08/02/2024	18/08/2024

Category A									
The South African Institute of Mining and Metallurgy	SAIMM	VA A004	www.saimm.co.za					N/A	18/08/2024
The South African Institute of Refrigeration and Air-conditioning	SAIRAC	VA A0013	www.sairac.co.za				01/07/2024	08/02/2024	18/08/2024
The South African Institution of Civil Engineering	SAICE	VA A0021	www.saice.org.za				01/07/2024	08/02/2024	18/08/2024
The South African Institution of Mechanical Engineering	SAIMechE	VA A0031	www.saimeche.co.za	12/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
Category B									
Name of the Voluntary Association	Acronym	ECSA Recognision Number	Webpage	Feedback	Assist Yes / No	Date send Questions No.1	Date send Questions No.2	Send to Association CC No.1	Send to Association CC No.2
Aggregate and Sand Producers Association of Southern Africa	ASPASA	VA B0022	www.aspasa.co.za				01/07/2024	08/02/2024	18/08/2024
Built Environment Professions Export Council	BEPEC	VA B0010	https://bepec.co.za/					N/A	18/08/2024
Clinical Engineering Association of South Africa	CEASA	VA B0016	www.ceasa.org.za		No		01/07/2024	08/02/2024	
Consulting Engineers South Africa	CESA	VA B007	www.cesa.co.za	14/02/2024	Yes	12/05/2024		08/02/2024	18/08/2024
Corrosion Institute of Southern Africa	CorrISA	VA B0013	www.corrosioninstitute.org.za				01/07/2024	08/02/2024	18/08/2024
Contractors Plant Hire Association	CPHA	VA B009	www.cpha.co.za				01/07/2024	08/02/2024	18/08/2024
Finance and Asset Management Consultants	FAMC	VA B004	www.famc.co.za				01/07/2024	08/02/2024	18/08/2024
IEEE South African Section	IEEE SA	VA B0023	www.ieee.org.za					N/A	18/08/2024
Illumination Engineering Society of South Africa	IESSA	VA B0014	www.iessa.org.za				01/07/2024	08/02/2024	18/08/2024
Institute of Quarrying Southern Africa	IQSA	VA B001	www.instituteofquarrying.co.za				01/07/2024	08/02/2024	18/08/2024

Category A									
Institute for Timber Construction South Africa	ITC- SA	VA B0024	www.itc-sa.org				01/07/2024	08/02/2024	18/08/2024
Institute for Work at Height	IWH	VA B0026	www.ifwh.co.za				01/07/2024	08/02/2024	18/08/2024
Institute of Waste Management of South Africa	IWMSA	VA B0018	www.iwmsa.co.za				01/07/2024	08/02/2024	18/08/2024
Lift Professionals Development Association	LPDA	VA B003	www.lpda-sa.co.za					N/A	18/08/2024
Southern African Asset Management Association	SAAMA	VA B0012	www.saama.org.za				01/07/2024	08/02/2024	18/08/2024
South African Forum Of Civil Engineering Contractors	SAFCEC	VA B0019	www.safcec.org.za					N/A	18/08/2024
South African Fluid Power Association	SAFPA	VA B002	www.safpa.org.za				01/07/2024	08/02/2024	18/08/2024
South African Glass Institute	SAGI	VA B0020	www.sagga.co.za					08/02/2024	18/08/2024
South African Institute of Draughting NPC	SAID	VA B008	www.saidraughting.com					N/A	18/08/2024
South African Road Federation	SARF	VA B005	www.sarf.org.za				01/07/2024	08/02/2024	18/08/2024
South African Society for Railway Engineering	SASRE	VA B0015	www.sasre.org		No		01/07/2024	08/02/2024	18/08/2024
Southern African Society For Trenchless Technology	SASTT	VA B0011	www.sastt.org.za					08/02/2024	18/08/2024
Water Institute of Southern Africa	WISA	VA B0025	www.wisa.org.za				01/07/2024	08/02/2024	18/08/2024

ANNEXURES D: ECSA FEEDBACK

From: engineering-oconnect <engineering-oconnect@ecsa.co.za>
Sent: Tuesday, 11 April 2023 11:08
To: johanpretorius48@yahoo.com
Subject: Fwd: RE: Research for PhD

Good day,

We unfortunately are not able to assist with the request.

Mr Johan can try approach Voluntary associations they might be able to assist. I have included the link with the names of VAs: https://www.ecsa.co.za/stakeholders/VoluntaryDocuments/Consolidated%20list%20of%20VA%60s_Rev.2_July%202022.pdf

Kind regards,

Public Relations Officer

Engineering Council of South Africa

ANNEXURES E: PERMISSION LETTERS TO USE QUESTIONNAIRES

Request Permission	Receive Feedback	Question	Section of Questions	Questions	Research Paper	Year	Name of Researcher	Email	Contact Details and Notes
N/A	N/A	N/A	Section 1	Demographic Profile and Information	Generic Questions	N/A	N/A	N/A	N/A
30/01/2024	02/03/2021	WLB	Section 2	Work-Life Balance Survey	Beyond Work-Family: A Measure of Work/Nonwork Interference and Enhancement p.451	2009	Gwenith G. Fisher - University of Michigan	Gwen.Fisher@colostate.edu	
							Carrie A. Bulger - Quinnipiac University	Carrie.Bulger@quinnipiac.edu	
							Carlla S. Smith - Bowling Green State University	**Deceased July 11, 2022**	
30/01/2024	06/02/2024	OS - WSQ	Section 3	Occupational Stress (Work Stress Quesionnaire)	The Work Stress Questionnaire (WSQ) –reliability and face validity among male workers	2019	Elsa Kristina Margareta Holmgren	kristina.holmgren@neuro.gu.se	Kristina Holmgren, professor Department of Health and Rehabilitation Institute of Neuroscience and Physiology Sahlgrenska Academy University of Gothenburg Box 455 S-405 30 Gothenburg Tel +46766-185726 Email kristina.holmgren@neuro.gu.se Hemsida https://w w w .gu.se/forskning/tidas
30/01/2024		POS	Section 4	Perceived Organisational Support (SPOS)	Survey of Perceived Organisational Support from Prof. Robert Eisenberger and the research: Perceived Organisational Support and Engagement	2011	Dr. Robert Einsenbeger,	**Deceased May 2 2022** - Reisenberger2@uh.edu	Original Research Perceived Organizational Support Scale
					Art 27 Survey of Perceived Organisational Support (SPOS) Scale Format for the 8-item Survey of Perceived Organisational Support Scale (SPOS) - Survey of Perceived Organizational Support Eisenberger, R., Huntington, R., Hutchison, S., & Sowa, D. (1986). Survey of Perceived Organizational Support (SPOS) [Database record]. APA PsycTests. https://doi.org/10.1037/t01207-000 Description The Survey of Perceived Organizational Support (SPOS) was developed in 1986 to measure employees' beliefs concerning the extent to which the organization values their contributions and cares about their well-being, as well as the organization's commitment to them. A total of 361 employees used a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) to indicate the extent of their agreement with each of the 36 items on the SPOS. Finally, a reliability and item analysis was performed on the survey. The analysis resulted in a reliability coefficient (Cronbach's alpha) of .97, with item-total correlations ranging from .42 to .83. The mean and median item-total correlations were .67 and .66,		Huntington, Robin		
							Hutchison, Steven		
							Sowa, Debora		
							Gene L. Cherubin	Shallow37@aol.com	
30/01/2024		BJSQ	Section 5	Job-Demand	Relationship between job stress, occupational position and job satisfaction using a brief job stress questionnaire (BJSQ)	2009	Tomoyuki Kawada	kawada@nms.ac.jp	
							Toshiaki Otsuka		

Section 2 - Permission to use Work / Non-work Scale instrument

\\"Fisher,Gwen\\" <Gwen.Fisher@colostate.edu>
3/1/2021 5:57 PM

I am on sabbatical during the Spring 2021 semester and therefore not engaged in department happenings or university committees. Thank you for your patience if you are awaiting a response.

Thank you,

Gwen

\\"Fisher,Gwen\\" <Gwen.Fisher@colostate.edu>
3/6/2021 7:31 AM

Thank you so much for your interest in this scale. You are most welcome to use this measure for your research. Please cite the attached paper.

Best regards,

Gwen

Fisher Bulger Smith 2009.pdf

Section 3 - Permission to use the work stress instrument

SV: Final Research of "Measure of Work/Nonwork Interference and Enhancement", Quality of ...

Reply | Reply All | Forward | ...

KH Kristina Holmgren <kristina.holmgren@neuro.gu.se>
To johanpretorius48@yahoo.com
Tue 09/08/2022 13:59

This message has been replied to or forwarded.

Dear Johan,
Thank you, looking forward to read your document, and you are welcome to use the WSQ in your forthcoming research!
Best regards,

Kristina Holmgren

Kristina Holmgren, professor
Department of Health and Rehabilitation
Institute of Neuroscience and Physiology
Sahlgrenska Academy
University of Gothenburg
Box 455
S-405 30 Gothenburg
Tel +46766-185726
Email kristina.holmgren@neuro.gu.se
Hemsida https://www.gu.se/forskning/tidas

Från: johanpretorius48@yahoo.com <johanpretorius48@yahoo.com>
Skickat: den 24 juni 2022 10:27
Till: georges.steffgen@uni.lu; endds@uom.lk; Kristina Holmgren <kristina.holmgren@neuro.gu.se>; Gwen.Fisher@colostate.edu
Kopia: 'Petrus Botha' <Petrus.Botha@nwu.ac.za>
Ämne: Final Research of "Measure of Work/Nonwork Interference and Enhancement", Quality of Work", and "Work Stress".

Good morning

I have finished my research at the North-West University in South Africa for my MBA (Master in Business Administration) degree. I want to take this opportunity to thank you for the use of the questionnaire and research for the “Measure of Work/Nonwork Interference and Enhancement”, Quality of Work”, and “Work Stress”.

Attached is my final document, and I would appreciate it if you could have a look and give feedback and recommendations. I am considering doing further research and would appreciate it if I could use your questions again going forward.

Thank you very much

Johan Pretorius

johanpretorius48@yahoo.com

Subject: FW: VB: The Work stress Questionnaire
Attachments: Franz et al 2019.pdf; Holmgren_BMC.pdf; Holmgren_Early ID 2013.pdf; Holmgren_women.pdf; Holmgren_WSQ-development.pdf; WSQ score_Holmgren.pdf; Botha, Petrus.vcf

>>> Kristina Holmgren <kristina.holmgren@neuro.gu.se> 5/31/2021 10:00 AM >>>

Yes, you are welcome to use the Work Stress Questionnaire (WSQ) in your thesis as long as you make references to our published papers.

We also look forward to take part of your research! More information on our research you will find on the webpage: https://www.gu.se/forskning/tidas

References:

1. Frantz A, Holmgren K. The Work Stress Questionnaire (WSQ) – Reliability and Face Validity among Male Workers. BMC Public Health 2019 19:1580

2. Holmgren K, Fjallstrom Lundgren M, Hensing G. Early identification of work-related stress predicted sickness absence in employed women with musculoskeletal or mental disorders. A prospective, longitudinal study in a primary health care setting. Disabil Rehabil 2013 Mar;35(5):418-26.
3. Holmgren K, Dahlin Ivanoff S, Bjorkelund C, Hensing G. The prevalence of work-related stress, and its association with self-perceived health and sick-leave, in a population of employed Swedish women. BMC Public Health. 2009 Mar 2;9:73.
4. Holmgren K, Hensing G, Dahlin-Ivanoff S. Development of a questionnaire assessing work-related stress in women - identifying individuals who risk being put on sick leave. Disabil Rehabil 2009;31(4):284-92.
5. Holmgren K, Dahlin Ivanoff S. Women on sickness absence--views of possibilities and obstacles for returning to work. A focus group study. Disabil Rehabil 2004;26(4):213-2.

All the best,

Kristina Holmgren, professor
Department of Health and Rehabilitation
Institute of Neuroscience and Physiology
Sahlgrenska Academy
University of Gothenburg
Box 455
S-405 30 Gothenburg
Tel +46766-185726
Email kristina.holmgren@neuro.gu.se
Hemsida https://www.gu.se/forskning/tidas

ANNEXURES F: QUESTIONS CONSENT FORM

Measuring the Relationship between Work-life Balance and Occupational Stress of Engineers

Dear participant

You are requested to voluntarily participate in a study conducted by Johan Pretorius for his PhD through North-West University. The study aims to construct an empirical framework for measuring the relationship between work-life balance and occupational stress among engineers in South Africa, considering the mediating role of organisation support and job demand.

All information provided will be completely anonymous and treated with the highest standard of privacy and confidentiality. The questionnaire comprises five sections and will only take 25-45 minutes.

Inclusion criteria for participation:

- You must be a qualified engineer in any industry.
- You must work as an engineer in a company based in South Africa.
- Your only responsibility as a willing participant will be to complete this survey as honestly as possible. Therefore, please read each question carefully and select the answer that best suits your circumstances and work environment.

Important notices, terms, and conditions:

- You will have no negative consequences if you do not complete the survey.
- Any information that you provide will remain confidential.
- Any personal identifying information (for example, demographics) is handled according to the Protection of Personal Information Act (Act 4 of 2013) rules.

The following is essential to note in line with the Act:

- You are not obligated to complete personal information (i.e., demographics).
- When collected, the answer sheets will be securely stored for five years at the University. After that, only the student and his supervisor will have access to the data, and it will not cross the borders of South Africa.
- Results will only be used and presented anonymously from the total sample. The result will not be released because no reference is made to email, telephone number or name.
- By completing this survey, you agree that the information provided can be used for research purposes.
- There are no correct or incorrect answers to any questions in this questionnaire.

Please complete the attached questionnaire if you are comfortable with the content and have no objections. By completing this questionnaire, you consent to this information being used for research purposes. If you have any queries that need to be addressed and would like to discuss further, you are welcome to contact the researcher or supervisor using the contact information below.

Yours Faithfully

Researcher: Johan Pretorius
Contact: 072 572 7695
Email address: johanpretorius48@yahoo.com

Supervisor: Prof. P.A Botha
Email address: Petrus.Botha@nwu.co.za

Please note that when completing the MS Forms from your cell phone, you must scroll left to right for the different options. After each section, you will have a continue button, where the first page is displayed, and the following section questions will follow.

Thanks again for your assistance with this research.

ANNEXURES G: QUESTIONS

Section 1: Demographic Profile and Information

1. What is your age group?
    a. 20 – 29
    b. 30 – 39
    c. 40 – 49
    d. 50 – 59
    e. 60 and older

2. Indicate your gender.
    a. Male
    b. Female
    c. Prefer not to say

3. How many years are you working in your current position?

    a. 0 - 9 Years
    b. 10-19 Years
    c. 20 - 29 Years
    d. 30 - 39 Years
    e. 40 Years and More

4. Do you supervise others?
    a. Yes
    b. No

5. Highest qualification level.
    a. National Diploma
    b. GCC (Government Certificate of Competency)
    c. B-Tech Degree / BE or BEng
    d. Post-Graduate Diploma
    e. Honour's Degree

f. Master's Degree/ MEng
g. PhD
h. Others

6. What type of engineer (engineering discipline) are you?
    a. Agriculture engineer
    b. Automation engineer (Instrumentation)
    c. Chemical engineer
    d. Civile engineer
    e. Electrical engineer
    f. Industrial engineer
    g. Mechanical engineer
    h. Mining engineer
    i. Process engineer
    j. Software engineer
    k. Others not specified
    l. Not Applicable (Not an Engineer)

Work-Life Balance Survey

Work-life balance refers to the prioritisation between personal and professional activities in an individual's life and the level to which activities related to their job are present at home. Please indicate the frequency with which you have felt a particular way during the last three months using a 5-point scale: 1 (not at all), 2 (rarely), 3 (sometimes), 4 (often), and 5 (almost all the time).

No.	Questions	Not at All	Rarely	Sometimes	Often	Almost all the time
7	I come home from work too tired to do things I would like to do	1	2	3	4	5
8	My job makes it difficult to maintain the kind of personal life I would like.	1	2	3	4	5

9	I often neglect my personal needs because of the demands of work.	1	2	3	4	5
10	My personal life suffers because of my work.	1	2	3	4	5
11	I have to miss out on important personal activities due to the amount of time I spend doing work.	1	2	3	4	5
12	My personal life drains me of the energy I need to do my job.	1	2	3	4	5
13	My work suffers because of everything going on in my personal life.	1	2	3	4	5
14	I would devote more time to work if it were not for everything I have going on in my personal life.	1	2	3	4	5
15	I am too tired to be effective at work because of the things I have going on in my personal life.	1	2	3	4	5
16	When I am at work, I worry about things I need to do outside work.	1	2	3	4	5
17	I have difficulty getting my work done because I am preoccupied with personal matters at work.	1	2	3	4	5
18	My job gives me the energy to pursue activities outside of work that is important to me.	1	2	3	4	5
19	Because of my job, I am in a better mood at home.	1	2	3	4	5
20	The things I do at work help me deal with personal and practical issues at home.	1	2	3	4	5
21	I am in a better mood at work because of everything I have going for me in my personal life.	1	2	3	4	5
22	My personal life gives me the energy to do my job.	1	2	3	4	5
23	My personal life helps me relax and feel ready for the next day's work.	1	2	3	4	5

Occupational Stress

Occupational or work stress is the tension and strain employees encounter on the job. It stems from such problems as harsh or time-consuming schedules, tough decisions, unions with other employees and supervisors, disagreeable working environments, tiredness, job dangers, extreme competition, or fear of potential unemployment. Please answer the questions below by marking the answer that best fits your circumstance in the last three months.

No.	Questions	1	2	3	4
24	Do you have time to finish your assignments?	Yes, always	Yes, rather often	No, seldom	No, never
25	Do you have the possibility to influence decisions at work?	Yes, always	Yes, rather often	No, seldom	No, never
26	Does your supervisor consider your views?	Yes, always	Yes, rather often	No, seldom	No, never
27	Can you decide on your work pace?	Yes, always	Yes, rather often	No, seldom	No, never

28	Has your workload increased?	Yes	No – Go to Question 30

29	If your answer to question 28 was yes, Do you perceive your increased workload as stressful?	Not stressful	Less stressful	Stressful	Very stressful

30	Are the goals for your workplace clear?	Yes – Go to question 32	Partly	No

31	If question 30 is partly or no: Do you perceive unclear goals as stressful?	Not stressful	Less stressful	Stressful	Very stressful

32	Do you know which assignments your work tasks include?	Yes – Go to question 34	Partly	No

33	If question 32 is partly or no: Do you receive not knowing which assignment your work task includes as stressful?	Not stressful	Less stressful	Stressful	Very stressful

34	Do you know who is making decisions concerning your workplace?	Yes – Go to question 36	Partly	No

35	If question 34 is partly or no: Do you perceive not knowing who is making decisions concerning your workplace as stressful?	Not stressful	Less stressful	Stressful	Very stressful

36	Are there any conflicts at work?	Yes	No – Go to Question 38

37	If question 36 is yes: Do you perceive conflict at work as stressful?	Not stressful	Less stressful	Stressful	Very stressful

38	Are you involved in any conflicts at your workplace?	Yes	No – Go to Question 40

39	If question 38 is yes: Do you perceive involvement in conflict at work as stressful?	Not stressful	Less stressful	Stressful	Very stressful

40	Have your supervisor done anything to solve the conflicts?	Yes – Go to question 42	Partly	No

41	If question 40 is partly or no: Do you perceive not solving conflict as stressful?	Not stressful	Less stressful	Stressful	Very stressful

42	Do you put high demands on yourself at work?	Yes	No – Go to Question 44

43	If question 42 is yes: Do you perceive putting high demands on yourself as stressful?	Not stressful	Less stressful	Stressful	Very stressful

44	Do you often get engaged in your work?	Yes		No – Go to Question 46	
45	If question 44 is yes: Do you perceive engagement in your work as stressful?	Not stressful	Less stressful	Stressful	Very stressful

46	Do you think about work after your working day?	Yes	Partly	No - Go to question 48

47	If question 46 is yes or partly: Do you perceive thinking of work after a workday as stressful?	Not stressful	Less stressful	Stressful	Very stressful

48	Do you find it hard to set a limit to work assignments, although you have a lot to do?	Yes	Partly	No - Go to question 50

49	If question 48 is yes or partly: Do you perceive not setting limits to assignments as stressful?	Not stressful	Less stressful	Stressful	Very stressful

50	Do you take more responsibility at work than you ought to?	Yes	No – Go to Question 52

51	If question 50 is yes: Do you perceive taking on more responsibility as stressful?	Not stressful	Less stressful	Stressful	Very stressful

52	Do you work after ordinary working hours to finish your assignments?	Yes	Partly	No - Go to question 54

53	If question 52 is yes or partly: Do you perceive working after hours as stressful?	Not stressful	Less stressful	Stressful	Very stressful

54	Do you find it hard to sleep because your mind is occupied with work?	Yes	Partly	No - Go to question 56

55	If question 54 is yes or partly: Do you perceive hard to sleep as stressful?	Not stressful	Less stressful	Stressful	Very stressful

No.	Questions	1	2	3	4
56	Due to work, do you find it hard to find time to be with your nearest?	Yes, always	Yes, rather often	No, seldom	No, never
57	Due to work, do you find it hard to find time to be with your friends?	Yes, always	Yes, rather often	No, seldom	No, never
58	Due to work, do you find it hard to find time for your recreational activities?	Yes, always	Yes, rather often	No, seldom	No, never

Perceived Organisational Support (SPOS)

The following question consists of statements that represent opinions you may have about your current working environment. Please indicate the degree of your agreement or disagreement with each statement. Select the answer that best represents your point of view about the company you work for. Please choose from the following answers:

Strongly disagree

Moderately disagree

Slightly disagree

Neither agree nor disagree

Slightly agree

Moderately agree

Strongly agree

No.	Questions	Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree
59	The organisation values my contribution to its well-being	1	2	3	4	5	6	7
60	The organisation fails to appreciate any extra effort from me.	1	2	3	4	5	6	7

61	The organisation would ignore any complaint from me.	1	2	3	4	5	6	7
62	The organisation really cares about my well-being.	1	2	3	4	5	6	7
63	Even if I did the best job possible, the organisation would fail to notice.	1	2	3	4	5	6	7
64	The organisation cares about my general satisfaction at work.	1	2	3	4	5	6	7
65	The organisation shows very little concern for me.	1	2	3	4	5	6	7
66	The organisation takes pride in my accomplishments at work.	1	2	3	4	5	6	7

Job-Demand

Job demands are the physical or emotional stressors in your current position. These include time pressures, a heavy workload, a stressful working environment, role ambiguity, emotional labour, and poor relationships.

The Job Demands question measures the level of demands or workload an individual experiences. The scale consists of six items that assess the frequency and intensity of various job demands.

Responses to the job demand items are scored on a 4-point Likert-type scale (4. agree; 3. somewhat agree; 2. somewhat disagree; and 1. disagree).

No.	Questions	1	2	3	4
67	You have to do an enormous amount of work.	Disagree	Somewhat disagree	Somewhat agree	Agree
68	You cannot complete all your work in the allocated time.	Disagree	Somewhat disagree	Somewhat agree	Agree
69	You have to work very hard.	Disagree	Somewhat disagree	Somewhat agree	Agree

70	You have to focus your attention quite a lot	Disagree	Somewhat disagree	Somewhat agree	Agree
71	You do a difficult job that requires a high level of knowledge and skill.	Disagree	Somewhat disagree	Somewhat agree	Agree
72	You have to constantly think about your work during working hours.	Disagree	Somewhat disagree	Somewhat agree	Agree

ANNEXURES H: LANGUAGE EDITING

DR PHILIP NOLTE
MA Classical Languages | PhD Practical Theory
Taalversorging | Language Editing

07 October 2025

I, Philip Nolte, hereby declare that I have completed the language editing of the PhD thesis of Mr Johan Pretorius (student number: 33464154), submitted in fulfilment of the requirements for the degree Doctor of Philosophy in Economics and Management Sciences with Business Administration at the North-West University.

The title of the thesis is

Developing a framework linking work-life balance, job demands, and organisational support in engineers' occupational stress

Kind regards.

Dr S. Philip Nolte
Language editor, translator and researcher
ORCiD ID: 0000-0001-6169-1122

084 209 1924 | stephanusnolte@gmail.com

SAWRITERS COLLEGE
CERTIFICATE OF ACHIEVEMENT

THIS CERTIFIES THAT

Philip Nolte

HAS SUCCESSFULLY PASSED

The Copy-Editing and Proofreading Course

COURSE TUTOR:
Di Smith

CERTIFICATE NUMBER: SAWC D7456

PRINCIPAL: Nichola Meyer

03/06/2021
DATE