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"Navigating Pressure: Insights into Occupational Stress in the Automotive Industry"

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Abstract: The automotive sector in India holds pivotal global significance, ranking as the fourth largest exporter after Japan, South Korea, and Thailand. This dynamic industry encompasses the production of two-wheelers, three-wheelers, passenger cars, and commercial vehicles, with a predominant focus on two-wheeler and passenger vehicle manufacturing. Work culture, a critical environmental determinant, profoundly influences individual behavior within organizations. It encapsulates psychological and sociological theories, shaping internal dynamics through organizational rules, values, norms, and beliefs that guide employee conduct.

Stress, a pervasive form of negative energy, manifests in various forms within the workplace, impacting motivation, self-confidence, performance, and overall organizational health. It arises from factors like job dissatisfaction, poor communication, and role conflict, categorized into beneficial "Eustress" and harmful "Distress."Regression analysis underscores the significant influence of Person-Organization Fit (PO-Fit) on organizational role stress, mediated by the organizational climate. Effective management practices align employee roles with expectations, mitigating role conflict and stress. Strategic recruitment, involving clear competency matrices and PO-Fit assessments, facilitates optimal employee placement, thereby reducing workplace stress. In conclusion, fostering a supportive organizational climate and aligning roles with employee capabilities are pivotal steps towards enhancing workplace well-being and performance in the dynamic automotive industry of India.

Key words: auto sector, distress, eustress, natural calamity, organizational climate, Role expectation, recruitment stage

Introduction

The automotive sector has a rich and storied history, dating back to its origins in 1808 when Francois Isaac de Rivaz created the first automobile. Karl Benz's introduction of the petrol engine car in 1885 marked a pivotal moment, propelling the industry forward. The United States emerged as a powerhouse in the 1890s, witnessing a proliferation of automobile manufacturers and becoming a global leader in production. By 1929, there were over 32 million automobiles in use worldwide, with the U.S. boasting one vehicle for every 4.87 individuals. Following World War II, the U.S. dominated global automobile manufacturing, accounting for 75% of production. However, by the 1980s, Japan began to surpass the U.S., achieving world leadership in 1994. Japan maintained this position until 2006 when its production exceeded that of the United States, a position it held until 2009. From 1970 to 2012, the variety of automobile models in America surged dramatically, increasing from 140 to 684 models. This expansion reflects the industry's evolution and innovation over the decades, driven by advancements in technology, consumer demand, and global competition.

This historical trajectory underscores the automotive sector's dynamic nature and its role as a cornerstone of industrial innovation and economic growth worldwide.

Automobile Industry in India

The automotive sector in India stands as a cornerstone of global industry, ranking fourth in automobile exports following Japan, South Korea, and Thailand. Employing approximately 12.5 million people directly and indirectly, this sector contributes significantly to the country's GDP, accounting for 7.1 percent.

India's automotive landscape spans the production of two-wheelers, three-wheelers, passenger cars, and commercial vehicles, with two-wheeler manufacturing holding the dominant position. Passenger vehicles follow closely as the second largest category. These segments play pivotal roles in driving economic growth across the nation, collectively producing 25 million units in 2017 alone.

According to a CII report, India holds prominent positions in various automotive segments:

- Largest 3-wheeler market
- Second-largest two-wheeler segment
- Fourth-largest tractor market
- Fifth-largest commercial vehicle market
- Fifth-largest truck and bus sector
- Tenth-largest passenger car market

The Indian government's strategic emphasis on automotive production aligns with the 'Make in India' initiative, aiming to elevate passenger vehicle sales to 9.4 million units by 2026, as outlined in the Automotive Mission Plan (AMP) 2016-26.

This strategic focus underscores India's ambition to consolidate its position as a leading player in global automotive manufacturing, fostering economic prosperity and technological advancement within the sector.

Challenges Faced by Automobile Industry in India

The automobile industry in India grapples with several significant challenges that impact its growth and sustainability. Regulatory complexities, including stringent emission norms and safety standards, continually evolve, adding compliance costs and operational uncertainties. Inadequate infrastructure, such as deficient road networks and insufficient EV charging stations, hampers logistics and adoption of new technologies. The rapid shift towards electric vehicles (EVs), coupled with advancements in autonomous driving and connectivity, necessitates hefty investments in R&D and workforce upskilling. Intense competition, both domestically and globally, challenges market differentiation and profitability. Moreover, supply chain disruptions, environmental pressures for sustainability, skill shortages, fluctuating financial landscapes, and evolving consumer preferences further compound the industry's complexities. Addressing these issues requires collaborative efforts among industry stakeholders, supportive government policies, and strategic initiatives to innovate and adapt amidst these multifaceted challenges.

Work Culture

Culture within an organization encompasses a wide array of elements that shape its unique identity and environment. Defined by values, beliefs, norms, rules, assumptions, principles, and networking practices, work culture essentially embodies the collective personality of the organization (Cartwright and Cooper, 1993). According to Lewin et al. (1939), culture in the workplace is intricately tied to the feelings, attitudes, and social dynamics among employees. They observed that managerial actions can significantly influence these dynamics, even when directives are indirect, thus shaping what is known as work culture.

Work culture serves as a crucial determinant of the organizational environment, exerting profound influence on individual behaviors. This concept integrates psychological and sociological perspectives, highlighting how organizational rules, values, norms, and beliefs impact employee conduct within the workplace. Each organization develops a distinct culture that sets it apart, influencing the attitudes and actions of its members.

Understanding and assessing work culture is essential as it can foster positive outcomes such as individual growth and organizational success. Conversely, challenges arise from detrimental cultures, which can hinder productivity and morale. Recognizing and nurturing a healthy work culture, therefore, becomes pivotal for achieving both individual and organizational objectives effectively.

Work Stress

Stress, defined as negative energy within the human body resulting from various factors, is a well-documented phenomenon in workplaces worldwide. It significantly impacts motivation, self-confidence, performance, competition, health, job satisfaction, and communication within and between departments (Schabracq and Cooper, 2000; Murphy, 1995; McHugh, 1993). Stress can be categorized into two main types: Eustress, which is positive stress that motivates individuals, and Distress, which is negative stress that can lead to adverse effects on health and performance.

Work stress specifically refers to the pressures related to one's role or responsibilities within an organization. It manifests differently across organizations and is influenced by several critical factors. One of the primary contributors to work stress is the organizational culture, which encompasses values, norms, and behavior patterns that shape the work environment. A culture that promotes excessive competition, unrealistic expectations, or poor work-life balance can contribute significantly to stress levels among employees.

Another factor exacerbating work stress is inadequate individual performance, whether due to lack of skills, resources, or support. When employees feel ill-equipped to handle their responsibilities, it can lead to heightened stress levels and diminished job satisfaction. Furthermore, insufficient training and development opportunities for new roles or evolving job requirements can create uncertainty and anxiety among employees, further contributing to stress.

Addressing work stress requires a holistic approach that considers both organizational and individual factors. Cultivating a positive work culture that prioritizes employee well-being, promotes open communication, and supports work-life balance can mitigate stress levels. Providing adequate training and developmental opportunities ensures that employees feel competent and prepared, reducing anxiety associated with role performance. By proactively managing these factors, organizations can foster a healthier work environment conducive to higher motivation, performance, and overall employee satisfaction.

Work Stress in Automobile Industry

The worldwide automotive sector is known for its rapid growth but also faces significant challenges related to consumer demand and market competition. While the IT industry is often associated with high levels of stress, work-related stress is prevalent across all sectors due to various factors. Employees in the automotive sector, like in many other fields, experience stress primarily related to their roles or work environment.

One common source of stress in the automotive sector is strained relationships with peers or supervisors, which can lead to interpersonal conflicts and reduced job satisfaction. Additionally, adjusting to new roles or responsibilities within the industry can create uncertainty and stress, especially when there is inadequate support or training provided. Heavy workloads, often exacerbated by deadlines and production demands, contribute to stress levels among employees who may feel overwhelmed or under-resourced.

Monotony in tasks and routines can also negatively impact morale and motivation within the automotive sector, leading to decreased job satisfaction and heightened stress. Performance expectations and the pressure to meet targets further compound these challenges, potentially affecting employee well-being.

Outside of work-specific stressors, automotive industry professionals also contend with personal and family-related issues, as well as health concerns that can impact their overall stress levels. Social pressures and economic uncertainties add to the complexity of stress management in this fast-paced and competitive sector.

Addressing work-related stress in the automotive industry requires a multifaceted approach that includes promoting a supportive work culture, providing adequate resources and training, and implementing strategies for

workload management and stress reduction. By acknowledging and addressing these challenges, organizations can create healthier work environments that support employee well-being and ultimately contribute to improved performance and job satisfaction.

Background of the Study

Organizations in the 21st century are navigating unprecedented challenges that vary widely based on their structure and size. These challenges are exacerbated by rapid changes in industries, driven by factors such as mergers and acquisitions, technological advancements, corporate restructuring, and shifts in the global and domestic economies. These dynamics profoundly impact work culture within organizations, influencing employee satisfaction, turnover rates, absenteeism, and overall performance. Organizations that fail to effectively manage these changes risk facing significant disruptions and negative outcomes.

Stress has become an inevitable aspect of modern, complex organizational life. It is defined within the organizational context as the demands placed on individuals within their roles. Roles can be viewed through two distinct systems: the role space, which pertains to the specific tasks and responsibilities a person undertakes, and the role set, which outlines the interrelationships between various roles within an individual's portfolio. This dual-system perspective helps conceptualize how individuals navigate and fulfill their responsibilities within organizations, highlighting the interconnectedness and complexity of organizational roles and their impact on stress levels.

Navigating these challenges requires organizations to adopt proactive strategies that promote resilience, adaptability, and well-being among employees. Cultivating a supportive work environment, providing opportunities for skill development and role clarity, and fostering open communication channels are essential steps in mitigating stress and enhancing organizational effectiveness in the face of 21st-century complexities.

Statement of the Problem

The statement of the problem, "Comparative study of work culture and job stress of engineers in semi automated and fully automated automobile industry," aims to investigate and compare the work culture and job stress experienced by engineers working in semi-automated and fully automated sectors of the automobile industry. This study will explore how differences in automation levels within manufacturing processes impact the organizational culture and stress levels among engineers. By analyzing these factors, the research seeks to provide insights into the varying dynamics of work environments and employee well-being in relation to technological advancements in the automotive sector.

Review Of Literature

The review of literature on work culture and job stress among various sectors provides valuable insights that can inform the comparative study of work culture and job stress among engineers in semi-automated and fully automated automobile industries.

Raghunadan et al. (2016) studied the consequences of work culture in public and private enterprises, identifying nine factors that influence managerial behavior and employee outcomes. Their findings underscored the positive impact of a strong work culture on productivity, attendance, employee unity, turnover rates, stress levels, loyalty, operational smoothness, and overall job satisfaction. They highlighted that organizational environment improves significantly with a healthy organizational culture, emphasizing its critical role in shaping employee experiences and performance.

Juris et al. (2015) investigated the effects of changes in work culture on organizational climate using a case study approach based on Yin's (1994) research design model. They employed statistical analyses such as Cronbach’s alpha and chi-square tests, complemented by qualitative case studies comparing firms undergoing restructuring due to market shifts. Their study revealed that employee satisfaction was a pivotal factor influencing managerial decisions during organizational change, emphasizing the dynamic relationship between leadership, organizational culture, and employee outcomes.

Angela et al. (2014) explored the association between leadership and organizational culture in the South African fast-moving consumer goods (FMCG) industry. Their research highlighted the unique values and leadership styles in African contexts, demonstrating a positive correlation between effective leadership and a supportive organizational culture. Their findings suggested that African leadership practices can significantly enhance organizational atmosphere and employee satisfaction, offering insights into leadership dynamics within diverse cultural settings.

Khaja et al. (2014) examined cultural factors in organizational contexts, including structure, peer relationships, physical environment, and values. Their study, involving 500 respondents from various banks, emphasized the importance of open communication, participative decision-making, adaptable policies, and technological advancements in improving working conditions and employee satisfaction. Their findings underscored the role of organizational culture in fostering a conducive work environment and supporting employee well-being.

Nasser (2014) analyzed burnout among physical education teachers in Ramian City, using questionnaires and statistical measures to assess the impact of school management behaviors on teacher burnout. Their study highlighted significant correlations between organizational behaviors and teacher stress levels, emphasizing the importance of supportive organizational practices in mitigating burnout and enhancing teacher engagement in school activities.

Jeevan (2013) investigated the impact of work culture on job satisfaction, commitment, and turnover intentions among university teachers, using regression analysis to explore relationships between variables. Their findings indicated overall high job satisfaction among university teachers but identified dissatisfaction among a minority, highlighting the role of work culture in shaping employee attitudes and retention in academic settings.

Shobha et al. (2011) assessed job satisfaction among customer service representatives in call centers, linking work culture to job satisfaction levels using scales and statistical analysis. Their study revealed varying levels of job satisfaction among employees, influenced by perceptions of role stress and organizational support, underscoring the importance of supportive work environments in enhancing employee satisfaction and performance.

Rani (2017) focused on work stress among employees in Sakthi Auto Motors, using a sample of 120 employees to analyze stressors related to work roles. Their study identified role overload as a significant stressor, emphasizing the need for organizations to create healthier work environments through workload management and supportive practices.

Priyanka (2016) examined work stress among Indian professionals across different sectors, finding correlations between stress levels and educational qualifications. Their study highlighted higher stress levels among professionals with higher qualifications, suggesting organizational factors play a crucial role in stress management based on employee demographics.

Sayeeduzzafar et al. (2016) studied work stress and commitment among faculty members in Indian and Saudi Arabian universities, using scales to measure stress and commitment levels. Their research revealed higher stress levels among Indian faculty members compared to their Saudi counterparts, underscoring the need for universities to implement supportive policies and routines to reduce stress and enhance commitment among faculty.

Kamala et al. (2015) compared work role stress between college teachers and bus conductors in Bangalore, identifying gender differences in stress levels and specific stressors within roles. Their study highlighted common stressors across professions and emphasized the importance of role clarity and support in mitigating stress among employees.

Singh (2015) explored work role stress among private and government school principals, using dimensions from the Work Stress Scale to assess stress levels. Their research identified higher stress levels among private school principals, influenced by workload and role expectations, highlighting disparities in stress management practices between school sectors.

Maduree et al. (2014) investigated the effects of emotional labor on work stress among service sector employees in India, using path analysis to examine associations between emotional labor strategies and stress levels. Their study found significant relationships between emotional labor and work stress, emphasizing the impact of emotional demands on employee well-being in service-oriented roles.

Santhosh (2014) analyzed work stress factors among teachers in higher education, using factor analysis to identify stressors affecting role stress. Their study highlighted organizational factors influencing stress levels among teachers, suggesting interventions to improve organizational support and reduce stress in academic settings.

Sneha et al. (2014) assessed work stress and challenges among women staff in private colleges, focusing on stressors related to organizational culture changes and job demands. Their study identified specific stressors faced by women employees in educational institutions, emphasizing the need for supportive policies and practices to address gender-specific stressors.

Vidya et al. (2014) investigated work stress among male and female managers in the Indian hospitality industry, using role stressors to assess stress levels. Their study revealed higher stress levels among female managers, attributed to challenges in work-life balance and organizational expectations, highlighting gender disparities in stress experiences within managerial roles.

These studies collectively provide a comprehensive backdrop for understanding work culture and job stress across various sectors, offering valuable insights and methodologies that can inform the comparative study of engineers in semi-automated and fully automated automobile industries.

Research Gap

Based on the literature review, it's evident that existing research often examines work stress in organizations without explicitly considering the influence of work culture, while others focus on organizational culture without integrating the role-specific stresses experienced by employees. Notably, there is a significant gap in research regarding work role stress specifically linked with work culture within the automobile sector. Therefore, the present study aims to address this gap by investigating the impact of work culture on work stress in the automobile sector in Karnataka.

The study intends to explore how the prevailing work cultures in semi-automated and fully automated segments of the automobile industry influence the stress levels experienced by engineers. By analyzing these factors together, the research seeks to provide a nuanced understanding of how organizational culture interacts with job-specific stressors within the context of automotive engineering roles. This approach is crucial for identifying factors that contribute to employee well-being and organizational effectiveness in an industry undergoing significant technological advancements and operational changes.

Through empirical investigation and data analysis, the study aims to contribute valuable insights that can inform strategies for improving work environments, enhancing job satisfaction, and mitigating stress among engineers in the automobile sector. By bridging the gap between work culture and work role stress research, the study aims to offer practical recommendations for organizations to foster healthier work environments and support the well-being of their workforce amidst technological evolution and competitive pressures in the automotive industry.

Research Questions

1. What key factors shape both work culture and work role stress among engineers in the dynamic automobile industry?
2. How does socio-demographic factors impact stress levels among employees in the fast-paced automobile sector?
3. In what ways does work culture exert its influence on the levels of work role stress experienced by engineers?

4. How does the alignment between individual values and organizational culture (person-organization fit) impact work role stress among engineers in the innovative automobile industry?

Purpose of the Study

The primary objective of this research is to investigate the influence of work culture on organizational role stress among employees in the automobile industry. This study examines how fourteen dimensions of organizational culture impact ten dimensions of work role stress. Work role stress is the dependent variable, while work culture serves as the independent variable. The research aims to analyze how the specific climatic conditions within the automobile industry shape employees' roles and responsibilities within their respective companies, and how these conditions contribute to role stress among employees.

Objectives of the Study

The objectives of the research focused on the impact of work culture on work role stress among employees in OEM companies within the automobile industry in Karnataka:

1. Identify the key factors contributing to work culture and levels of work role stress in OEM companies of the automobile industry.
2. Evaluate how socio-demographic factors influence stress levels among employees in OEM companies within the automobile sector.
3. Compare work stress and work culture between employees in OEM companies of semi-automated and fully-automated sectors within the automobile industry.

These objectives aim to provide insights into the dynamics of work culture, role stress, and demographic influences specifically within OEM companies in the automobile sector, focusing on both technological environments and employee characteristics in Karnataka.

Hypotheses of the Study

H01: Socio-demographic factors do not exert influence on work role stress among employees in OEM companies within the automobile industry.
H02: The stress levels among employees do not significantly differ across various OEM companies.
H03: Work characteristics (WC) variables do not serve as significant predictors of work stress experienced by employees in OEM companies within the automobile industry.
H04: Person-organization fit (PO-fit) does not significantly influence the relationship between work stress and work characteristics in OEM companies within the automobile industry.
H05: There is no significant disparity in work stress levels and work culture between employees in Semi-Automated and Fully-Automated segments of the automobile industry.

Research Methodology

Research Design

This study adopts a dual approach incorporating descriptive and analytical research methodologies to examine the factors influencing work culture and work stress among employees in Karnataka's automobile industry. The descriptive phase will comprehensively outline the demographic and professional profiles of the study participants, offering insights into their characteristics relevant to workplace dynamics. Concurrently, the analytical research phase will employ statistical techniques to rigorously test hypotheses regarding the impact of socio-demographic factors, work characteristics, person-organization fit, and automation levels on work stress. By integrating these methodologies, the study aims to provide a thorough understanding of how organizational factors interact with individual experiences of stress within the dynamic environment of the automobile sector in Karnataka.

Methodology

A survey was conducted among 100 production engineers and technical operators working in various workshops within the automotive sector in Telangana, based on research by G. Sureshkrishna et al. The sample was selected using stratified random sampling, ensuring representation across different automotive sectors.

Participants completed a structured questionnaire designed to assess job stress using a five-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Prior to distribution, the questionnaire underwent pilot testing to refine its structure. The study focused on stress factors affecting production engineers, including physical, psychosocial, and social stressors, as well as high job demands and managerial tasks. The research aimed to understand how these stressors manifest among production engineers in the highly automated and digitized automotive industry in Telangana. Data collection excluded incomplete surveys, ensuring the reliability and integrity of the findings.

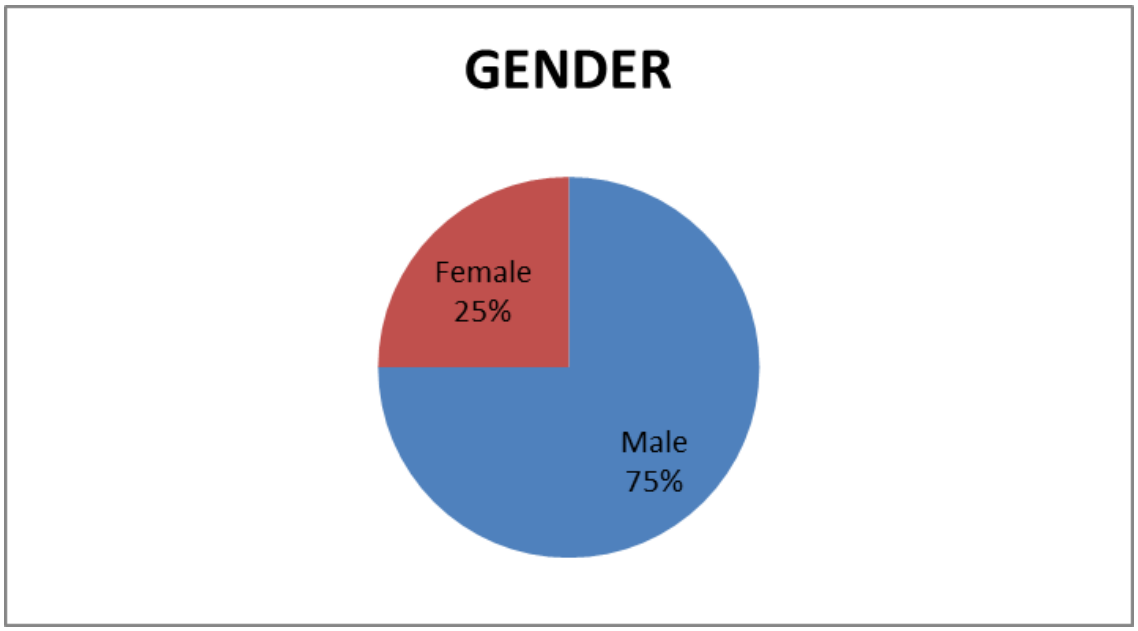
Survey Analysis

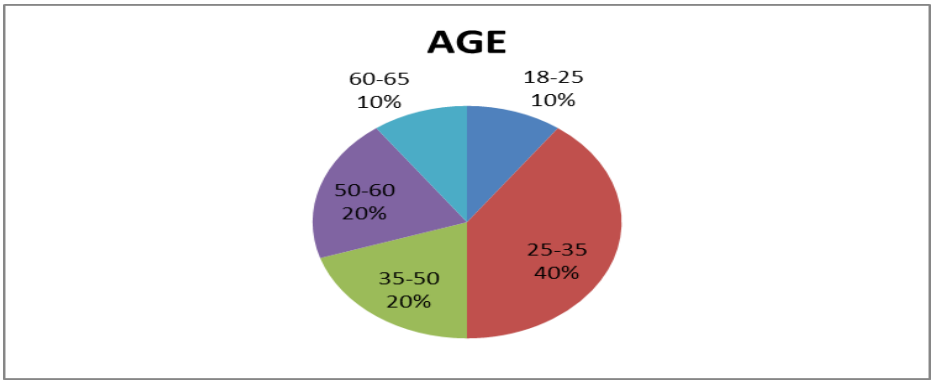
The demographic composition of the 175 production engineers and technical operators surveyed within Telangana's automotive sector reflects a diverse and nuanced workforce profile. Predominantly male, constituting 75% of the sample, with females comprising the remaining 25%, the gender distribution underscores the industry's prevailing demographic trend. Age distribution highlights a spectrum of experience and maturity, with 10% of respondents aged 18-25 years, indicating a younger segment entering the workforce. A significant 40% fall within the 25-35 years age bracket, suggesting a prime career phase, while another 20% each are aged 35-50 years and 50-60 years, demonstrating seasoned professionals contributing to the sector's operations. Notably, 10% are aged 60-65 years, reflecting a workforce retaining experienced personnel well beyond traditional retirement ages. Educationally, the workforce exhibits a balanced attainment level: 30% hold diplomas, B.Tech degrees, and PG/MBA qualifications respectively, with 10% possessing other specialized certifications. This distribution underscores a well-educated cohort equipped with diverse skill sets essential for the automotive industry's technological demands. Experience-wise, the workforce is evenly distributed across various tenure bands: 30% possess 0-5 years of experience, indicating a mix of entry-level and early-career professionals gaining footholds in the field, while another 30% boast 5-10 years of experience, consolidating skills and expertise crucial for operational efficiency. Additionally, 20% bring 10-15 years of experience, 10% each contribute 15-20 years and over 20 years of service, highlighting a blend of seasoned veterans providing leadership and stability within the sector.In terms of equipment and work hours, the distribution reveals operational realities: 40% work extensively with moderate machinery, crucial for the assembly and production processes, while 30% handle light machinery, catering to precision and smaller-scale operations. Another 20% manage heavy machinery, integral to large-scale manufacturing processes, and 10% primarily utilize computers, indicative of roles emphasizing digitalization and data management. Work-hour distribution indicates diverse work schedules: 60% of respondents work below 6 hours daily, reflecting efficient task management and specialized roles, while 30% engage in 6-9 hours of daily work, balancing productivity and operational demands. Notably, 10% work extended hours beyond 9 hours daily, underscoring roles requiring intensive focus and operational oversight. This comprehensive demographic analysis provides valuable insights into the workforce dynamics shaping Telangana's automotive industry. Understanding these profiles is crucial for designing targeted interventions, fostering career development pathways, and optimizing operational efficiencies tailored to meet the sector's evolving demands and challenges effectively.

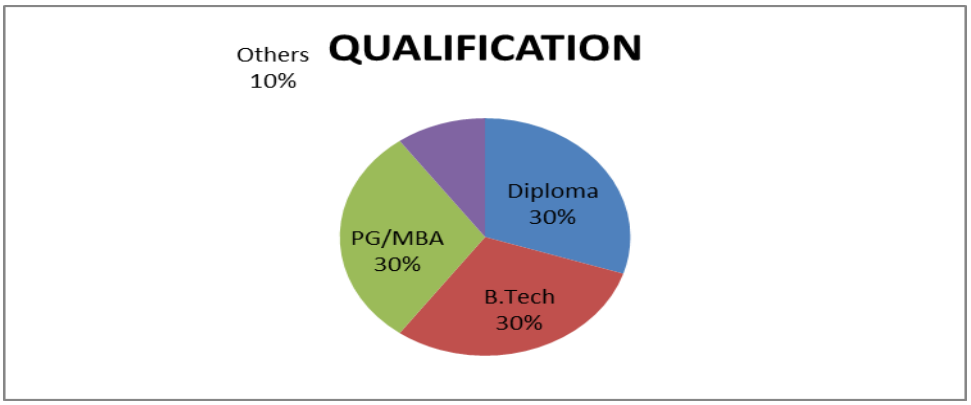
Table 1: Demographic Factors

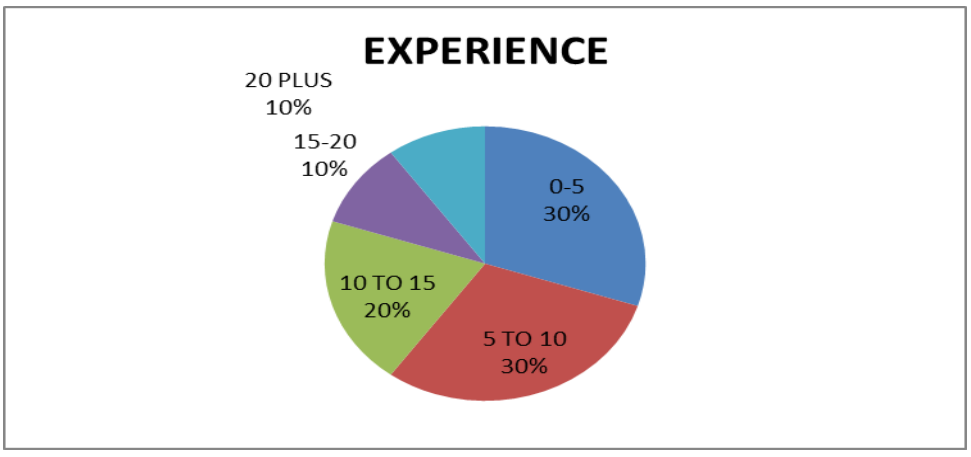
Sl. No.	Demographic Factors	Frequency	Percentage
GENDER			
1	Male	131	75%
2	Female	44	25%
AGE			
3	18-25	18	10%
4	25-35	70	40%
5	35-50	35	20%

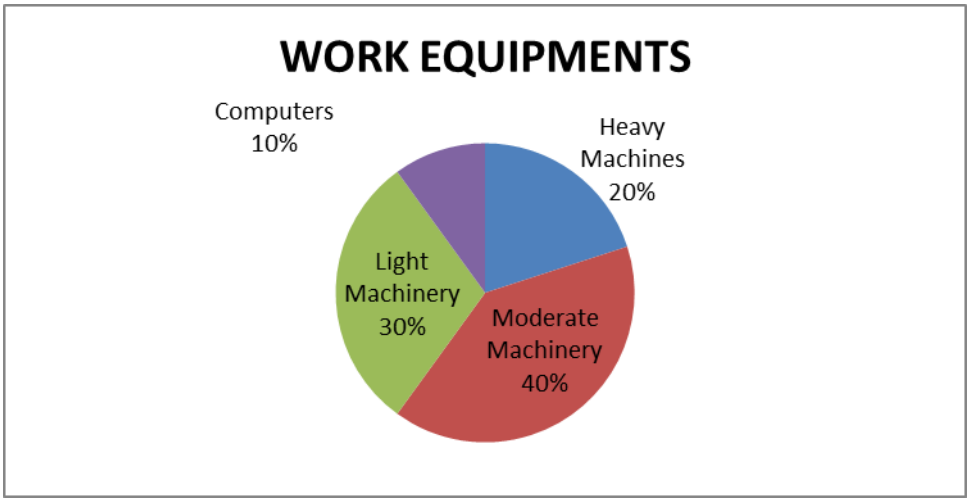
6	50-60	35	20%
7	60-65	17	10%
QUALIFICATION			
8	Diploma	53	30%
9	B.Tech	53	30%
10	PG/MBA	53	30%
11	Others	16	10%
EXPERIENCE			
12	0-5	53	30%
13	5-10	53	30%
14	10-15	35	20%
15	15-20	18	10%
16	20 PLUS	18	10%
WORK EQUIPMENT			
17	Heavy Machines	35	20%
18	Moderate Machinery	70	40%
19	Light Machinery	53	30%
20	Computers	17	10%
WORK HOURS			
21	Below 6hrs	105	60
22	06-09	53	30
23	Above 09	17	10

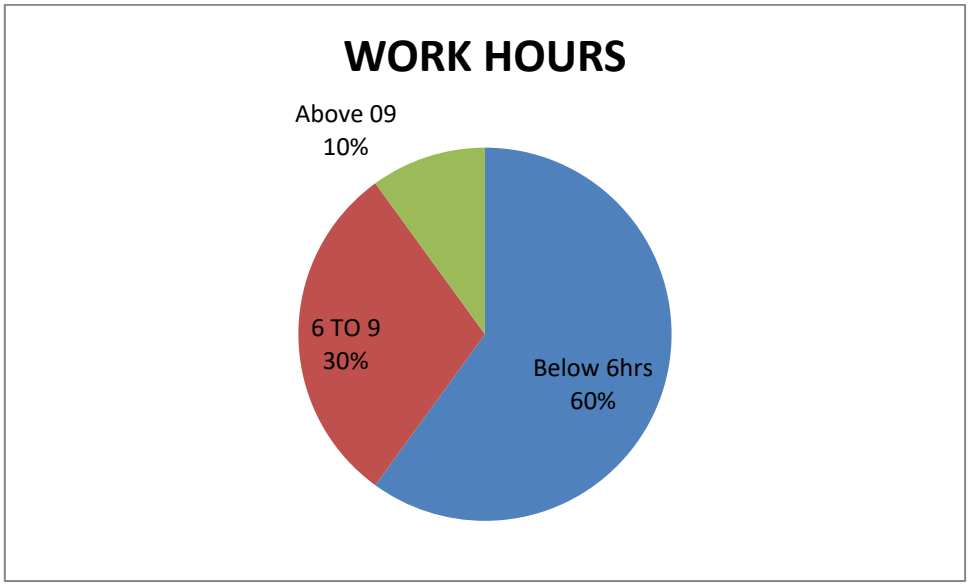



AGE
60-65
10%
18-25
10%
50-60
20%
25-35
40%
35-50
20%


Others
10%
QUALIFICATION
Diploma
30%
PG/MBA
30%
B.Tech
30%


EXPERIENCE
20 PLUS
10%
15-20
10%
0-5
30%
10 TO 15
20%
5 TO 10
30%


WORK EQUIPMENTS
Computers
10%
Heavy
Machines
20%
Light
Machinery
30%
Moderate
Machinery
40%



The data on stress factors among 175 production engineers and technical operators in Telangana's automotive sector reveals significant insights into the challenges faced within their work environment. The analysis, utilizing Cronbach's alpha values for internal consistency and t-tests for significance, indicates several prominent stressors. Robotisation work conditions exhibit a high Cronbach's alpha of 0.90, suggesting strong consensus among respondents regarding its stressful impact ($t = 2.01$, $p = 0.005$). Mental oppressiveness follows closely with an alpha of 0.89 ($t = 2.46$, $p = 0.004$), indicating widespread concern about psychological strain. Job insecurity, despite a slightly lower alpha of 0.79, remains a significant stress factor with a notable t-value of 2.33 ($p = 0.016$), highlighting fears about job stability. Lack of technological affinity and challenges related to artificial intelligence also contribute to stress, supported by respective alphas of 0.89 and 0.80, with significant t-values (2.46 and 1.88, respectively, both $p < 0.05$). Issues such as unpredictability in work processes (alpha = 0.89, $t = 1.68$, $p = 0.019$) and deficiencies in software knowledge and training (alpha = 0.79, $t = 2.05$, $p = 0.009$) further underscore the complex nature of stress in this industry. Moreover, high responsibility roles (alpha = 0.92, $t = 2.03$, $p = 0.002$) and social relations/anxiety (alpha = 0.90, $t = 2.31$, $p = 0.013$) also significantly impact workforce stress levels. These findings provide a comprehensive understanding of the multifaceted stress landscape within Telangana's automotive workforce, essential for targeted interventions to enhance workplace well-being and productivity.

Table 2: Significance of Mean Values of Individual Stress Factors

Sl. No.	Stressors	Cronbach α	t	p
1	Robotisation work conditions	0.90	2.01	0.005
2	Mental oppressiveness	0.89	2.46	0.004
3	Job insecurity	0.79	2.33	0.016
4	Lack of technological affinity	0.89	2.46	0.022
5	Artificial intelligence	0.80	1.88	0.004
6	Lack of predictability/ control of the work process	0.89	1.68	0.019

7	Lack of software knowledge/ Training	0.79	2.05	0.009
8	Performance monitoring and feedback /High responsibility	0.92	2.03	0.002
9	Social relations/Anxiety	0.90	2.31	0.013

Table-3: One way ANOVA

S.No	Stress Factors	F-Values p-values	F-Values p-values
Physical Stressors			
1	Sudden changes in enterprise	4.01	0.003
2	Work routines controlled by Machines	3.91	0.011
3	Technical problems/ Vulnerability to hacker attacks	3.70	0.012
4	Ventilation in work place	3.80	0.009
5	Attitude optimistic or pessimistic	3.50	0.010
Psychosocial Stressors			
6	Corporate culture/ Internal pressure to understand new developments	4.50	0.002
7	Electrical Shutdowns	4.53	0.005
8	Irregular working times/ Lack of time for training	4.51	0.015
9	Lack of technological affinity	3.90	0.015
Social Stressors			
10	Lack of Interaction/ Lack of predictability	4.90	0.012
11	Conflicts between peers/ Social exclusion	4.85	0.020
12	Stressful initial phase of digitalization/Isolation	4.55	0.025
13	Job insecurity	4.90	0.015
14	Challenge to keep up with developments	4.55	0.023
Technical Demand			

15	Time pressure, hectic activities / Loss of individual control	3.90	0.002
16	Dependency on technology	4.98	0.005
17	Enterprise Scale/High Production	4.65	0.007
18	Communication and Decision making	4.30	0.009
19	Mechanical artificial intelligence involvement/Robotisation of humans	3.95	0.005
20	Lack of software knowledge/Training	3.50	0.018
Management Tasks			
21	Quick implementation of new technologies	4.60	0.020
22	Constant availability /High responsibility	4.90	0.010

The One-way ANOVA results provide valuable insights into the various stress factors experienced by production engineers and technical operators in Telangana's automotive sector. Physical stressors such as sudden changes in enterprise ($F = 4.01$, $p = 0.003$) and work routines controlled by machines ($F = 3.91$, $p = 0.011$) demonstrate significant impacts on workforce stress levels, indicating challenges in adapting to dynamic work environments and automated processes vulnerable to technical disruptions ($F = 3.70$, $p = 0.012$). Issues like ventilation in the workplace ($F = 3.80$, $p = 0.009$) and maintaining an optimistic or pessimistic attitude ($F = 3.50$, $p = 0.010$) further contribute to physical stressors.

Psychosocial stressors such as corporate culture and internal pressures for understanding new developments ($F = 4.50$, $p = 0.002$) and coping with electrical shutdowns ($F = 4.53$, $p = 0.005$) highlight the emotional and psychological toll of workplace dynamics. Additionally, irregular working times and lack of time for training ($F = 4.51$, $p = 0.015$) exacerbate stress levels related to adapting to technological advancements ($F = 3.90$, $p = 0.015$).

Social stressors like lack of interaction and predictability ($F = 4.90$, $p = 0.012$) and conflicts between peers ($F = 4.85$, $p = 0.020$) underscore interpersonal challenges and social exclusion within the workplace. The stressful initial phase of digitalization and isolation ($F = 4.55$, $p = 0.025$) alongside persistent job insecurity ($F = 4.90$, $p = 0.015$) and keeping pace with technological developments ($F = 4.55$, $p = 0.023$) reveal significant concerns among employees.

Technical demands, including time pressure and loss of individual control ($F = 3.90$, $p = 0.002$) and dependency on technology ($F = 4.98$, $p = 0.005$), highlight the pressures associated with operational efficiency and technological integration. Moreover, managing high production scales ($F = 4.65$, $p = 0.007$) and effective communication and decision-making processes ($F = 4.30$, $p = 0.009$) are critical stress factors in meeting organizational demands.

Management tasks such as the rapid implementation of new technologies ($F = 4.60$, $p = 0.020$) and the constant availability and high responsibility roles ($F = 4.90$, $p = 0.010$) further amplify stress levels among leadership and supervisory roles. These findings provide a comprehensive understanding of the multifaceted stressors

impacting the automotive workforce in Telangana, crucial for implementing targeted interventions to promote workplace well-being and productivity.

Conclusion

The automotive industry is currently experiencing a profound transformation driven by rapid digital advancements. This shift not only impacts production processes but also revolutionizes how companies engage with customers and manage operations. Our study delves into critical factors and strategies necessary to navigate this digital evolution, posing essential questions about its efficacy in enhancing production efficiency, sales effectiveness, and customer connectivity. Central to our findings is the recognition of employee apprehensions regarding the adoption of new digital technologies. To effectively manage this transition, organizations must prioritize addressing these concerns through targeted initiatives aimed at reducing digitalization anxiety and fostering positive attitudes toward technological integration.

Creating a supportive work environment emerges as a cornerstone in cultivating employee dedication and job satisfaction, which are pivotal for achieving organizational objectives amidst technological disruptions. The balance between work and personal life assumes significant importance in sustaining employee well-being and productivity in the face of competitive pressures. Future research endeavors should explore comparative studies to generalize findings and better understand the diverse stress factors affecting production engineers. These factors encompass psychological, emotional, social, and occupational stressors, ranging from concerns about job security to challenges in adapting to advanced technologies and artificial intelligence.

Production engineers in fully automated automotive facilities often contend with demanding work schedules, intense supervision, and the complexities of managing sophisticated machinery. Moreover, issues such as inadequate training opportunities and uncertainties during the initial phases of digitalization further contribute to workplace stress. Addressing these challenges through comprehensive training programs and ongoing support mechanisms can mitigate stress levels and enhance morale among employees. Promoting awareness of the benefits of digitalization and facilitating smooth transitions to new technologies are crucial steps in alleviating anxiety and ensuring workforce readiness for future industry demands.

In conclusion, our research underscores the imperative for automotive firms to proactively manage the human aspect of digital transformation. By prioritizing employee well-being, offering targeted training, and fostering a supportive organizational culture, companies can effectively navigate the complexities of digitalization while maximizing the potential of their workforce. This approach not only enhances operational efficiency but also cultivates a resilient and motivated workforce prepared to thrive in an increasingly digitized automotive landscape.

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